

Administrative Committee



Regular Meeting ~Agenda~

www.ci.moscow.id.us

Laurie M. Hopkins
City Clerk

208-883-7015

Monday, July 22, 2024

4:00 PM

**Council Chambers
206 E. Third St.**

The Moscow Mayor, City Council and Staff welcome you to today's meeting. We appreciate and encourage public participation. For regular agenda items, an opportunity for public comment is sometimes provided after the staff report. However, the formality of procedures varies with the purpose and subject of the agenda item and limitations may be placed on the time allowed for comments. If you plan to address the Committee, you will find a list of "Tips for Addressing the Council" in the door pocket outside the City Council Chambers. Please note that Committee meetings are televised, videotaped and/or recorded. Links to view the Committee meeting live can be found on the City website, YouTube, Facebook and Spectrum Cable 1301. Thank you for your interest in City government.

REGULAR AGENDA

1. Approval of Administrative Committee March 25, 2024 Minutes (ACTION ITEM) - Taylor Riedner

2. Public Meeting: Proposed Lot Division at 322 and 328 Southview Avenue (ACTION ITEM) – Aimee Hennrich

The applicant, John Ficca, is requesting a lot division to create two lots of approximately 4,621 sf and sf, 4,497 sf in size from one existing lot of 9,118 sf in size. The intention of the lot division is to divide the existing twinhome dwelling along its shared common wall in order to allow for the individual sale of each dwelling unit. The subject property is located within the Medium Density (R-3) Zoning District which requires a minimum lot size of 3,250 square feet and a minimum lot width of 30 feet for twinhomes. Both proposed lots meet the minimum lot area and width requirements of the R-3 Zone, and the existing structure will meet all setback requirements. Property owners within 600 feet of the property have been notified of the proposed division and a sign was posted seven (7) days prior to the public meeting date.

PROPOSED ACTIONS: Recommend approval of the lot division with no conditions; or recommend approval of the lot division request with conditions; or recommend denial of the lot division request; or provide staff further direction.

3. Mural at Jackson & A: Selected Artist (ACTION ITEM) - Megan Cherry

During a call for qualifications open to artists from the United States, 52 artist submissions were received for the mural project at Jackson and A Streets. The Selection Panel met to review the submissions on April 22, 2024 and voted during that meeting to recommend three finalists: Jay Rasgorshek, Ernesto Maranje, and Darion Fleming. On May 14, 2024, the MAC voted to recommend the same three finalists, after which point the artists created site-specific designs. The designs were available for public viewing and comment from June 25–27, 2024. Of the 316 public comments received, 210 were in favor of the design submitted by Jay Rasgorshek of Boise, ID. The Selection Panel convened to discuss and score the designs, ultimately voting to recommend Rasgorshek as the selected artist, a recommendation that the MAC echoed in a vote during their regular meeting on Tuesday, July 9. Following Council approval of a recommended artist, staff will proceed with the completion of the artwork commission agreement previously approved by Council on January 16, 2024. Installation of the mural is anticipated to be complete

at the end of September 2024.

PROPOSED ACTIONS: Approve the selection of Jay Rasgorshek and his mural design submission, or provide staff further direction.

4. Pheenix USH, LLC d/b/a Spin-License Agreement for Shared Mobility (ACTION ITEM) - Cody Riddle

Staff will present a proposed one-year license agreement with Spin, for the operation of shared-use scooters within the City. If approved, the agreement will allow deployment of up to 150 shared devices (scooters). The shared mobility program was established through an amendment to Title 11, Chapter 2, of Moscow City Code back in 2022. The current proposal is similar to an agreement previously entered into with Bird Rides. They never deployed their devices and that agreement expired.

As specified by the adopted ordinance, the newly proposed license agreement includes a downtown dismount zone, where riding electric assist devices is prohibited on the sidewalk. Devices can be operated safely on the streets in this area. The mobility provider will geo-fence the designated area to ensure compliance, and the City has installed signage to communicate this standard. This will be especially important for private users whose devices are not regulated by a shared provider. The agreement also includes a no parking zone around Friendship Square, and another adjacent to the Student Union Building on the University of Idaho Campus. Additional provisions applicable on campus include a speed limit of 9mph around the core, a limit to parking devices only within established racks, and a prohibition from riding in the arboretums or on the President's residential property. Finally, the document includes a provision for impounding devices not operated, stored, or maintained in compliance with the ordinance or other agreement standards. If approved, the agreement will be in effect for one year. This will allow for an annual review of the effectiveness of the shared mobility program and inform changes to future agreements if necessary.

PROPOSED ACTIONS: Recommend approval of the License Agreement with Spin, or provide staff with further direction.

5. Proposed Sidewalk Café Standard Amendments (ACTION ITEM) - Bill Belknap

Currently, the City's Sidewalk Café regulations prohibit the service and consumption of liquor within licensed sidewalk cafés unless the establishment is a full-service restaurant. Drinking establishments (such as bars) that are not full-service restaurants are technically allowed to have a sidewalk café so long as liquor is not served or consumed within the sidewalk café area. Due to the challenge presented by policing the consumption of liquor in the sidewalk café areas, the City has historically denied licensing sidewalk cafés to drinking establishments that serve liquor. This has led to a disparity in the allowance of sidewalk cafés downtown. Staff have prepared a proposed ordinance to eliminate the full-service restaurant requirement for liquor service and consumption within the licensed area. The proposed ordinance also includes several other minor amendments to clarify allowed uses within the sidewalk café area and the application and license procedure, specify permitted physical barrier elements, and change violation of the ordinance from a misdemeanor to an infraction for the Council's consideration.

PROPOSED ACTIONS: Recommend approval of the ordinance; or provide staff further direction.

6. Emergency Radio Equipment Purchase Approval (ACTION ITEM) - Bill Belknap

The City's emergency radio equipment is at its end of life and many of the portable radios can no longer be serviced, and replacement parts are no longer available. The City's Emergency Radio Project will replace all existing portable (hand-held) and mobile (vehicle-mounted) radios as well as replace the existing radio repeater system with a new simulcast system with enhanced radio

coverage, as well as encryption for two police channels to protect officer safety during emergency events. The total cost for all radios and accessories is \$1,046,977.55. Per the City's adopted purchasing policy, budgeted purchases over \$150,000 must be approved by the Council. Staff is requesting the Council's approval to move forward with this purchase.

PROPOSED ACTIONS: Recommend approval of the radio purchase, or provide staff further direction.

7. Emergency Radio System Installation Agreement (ACTION ITEM) - Bill Belknap

The City's existing emergency radio system is reaching end of life and service and parts are no longer available. In addition, there are currently several locations within the City where radio coverage is not present and emergency responders are unable to communicate on their radios. The City Council has identified the replacement of the radio system as one of the City's strategic priorities within the City's strategic plan. The City recently solicited bids for the replacement of the emergency radio system and received one responsive bid from RACOM Communications for the project. Staff and RACOM representatives have refined the radio system design and have prepared an agreement for the project. The project will include the installation of a five-channel simulcast VHF radio system with repeaters to be installed on Moscow Mountain, Paradise Ridge, Well #10, City Hall, and the Latah County Courthouse, as well as interconnections with the Whitcom dispatch center. The proposal includes encryption for the Police dispatch and Police tactical channels to improve and enhance officer safety during critical incident response. The total contract cost is \$1,110,167.50. The City budgeted \$2,307,798 in funding for the project. The combined cost of the radio system and replacement portable and mobile radios is currently estimated at \$2,157,145.05, which is \$150,652 under the total project budget. Staff is seeking Council's approval of the agreement with RACOM to replace the City's emergency radio system.

PROPOSED ACTIONS: Recommend approval of the Agreement with RACOM in the amount of \$1,110,167.50, or provide staff further direction.

ADJOURN

NOTICE: It is the policy of the City of Moscow that all City-sponsored public meetings and events are accessible to all people. If you need assistance in participating in this meeting or event due to a disability under the ADA, please contact the City's ADA Coordinator by phone at (208) 883-7600, TDD (208) 883-7019, or by email at adacoordinator@ci.moscow.id.us at least 48 hours prior to the scheduled meeting or event to request an accommodation. The City of Moscow is committed to ensuring that all reasonable accommodation requests are fulfilled.

Administrative Committee



Regular Meeting ~Minutes~

Laurie M. Hopkins
City Clerk

www.ci.moscow.id.us

208.883.7015

**Monday
March 25, 2024**

4:00 PM

**Council Chambers
206 E. Third St.**

The meeting was called to order at 4:00 p.m.

PRESENT: Julia Parker, Sandra Kelly, Bryce Blankenship

OTHERS: Mayor Art Bettge, Council Member Gina Taruscio

STAFF: Bill Belknap, Cody Riddle, Mike Ray, Bob Buvel, Brian Nickerson, Alisa Anderson, Mia Bautista, Taylor Riedner

REGULAR AGENDA

1. Approval of Administrative Committee February 26, 2024 Minutes (ACTION ITEM) - Taylor Riedner

The minutes were approved as presented.

2. Proposed Lot Line Adjustment Between 1326 Orchard Avenue and 1412, 1418, 1424, 1430, 1512, and 1542 Lanny Drive (ACTION ITEM) - Aimee Hennrich

The applicants are requesting a lot line adjustment between seven properties located at 1326 Orchard Avenue and 1412, 1418, 1424, 1430, 1512, and 1542 Lanny Drive. The proposed lot line adjustment would reduce the lot addressed as 1326 Orchard Ave from 4.98 to 0.93 acres; 1412 Lanny Dr would increase from 23,263 to 38,332 sf; 1418 Lanny Dr would increase from 12,382 to 27,872 sf; 1424 Lanny Dr would increase from 12,312 to 27,872sf; 1430 Lanny Dr would increase from 12,229 to 53,578; 1512 Lanny Dr would increase from 11,831 to 56,192 sf; and 1542 Lanny Dr would increase from 22,735 to 66,211 sf. The subject properties are located within the Low Density, Single-Family Residential Zoning District (R-1) which requires a minimum lot area of 9,600 sf and a minimum lot width of 80 feet. All of the proposed lots currently contain single-family dwellings and will meet all setbacks, minimum lot size, and minimum lot width requirements of the R-1 Zone.

PROPOSED ACTIONS: Recommend approval of the lot line adjustment request; or recommend approval of the lot line adjustment request with conditions; or recommend denial of the lot line adjustment request; or provide staff with further direction.

Ray introduced the item as written above and reviewed the subject properties and zoning requirements. Needing no further discussion, the Committee recommended approval and that it be placed on the Council consent agenda.

3. A Street Reconstruction Project - Bid Results & Contract Award (ACTION ITEM) - Bob Buvel

This project's scope includes reconstruction of approximately two blocks of 'A' Street from Washington Street to Adams Street, including some curb and sidewalk. The reconstruction also included the replacement of the underground utilities, including water mains, fire hydrants, service lines, sanitary sewer mains, and manholes. The City advertised the project for bids on February 24, 2024, & March 2, 2024, and the Engineer's Estimate for construction was \$865,685.00 for Base Bid, \$67,600.00 for Alternate A, \$37,100.00 for Alternate B, and \$130,800 for Alternate C. Bids were opened on March 12, 2024, at which one (1) bid was received. The sole responsive bid received was

submitted by LaRiviere of Rathdrum, ID with a bid of \$1,008,734.25 for Base Bid, \$52,728.00 for Alternate A, \$60,473.00 for Alternate B, and \$145,155.00 for Alternate C. A bid tabulation is included in the packet.

PROPOSED ACTIONS: Recommend acceptance of the Base Bid only from LaRiviera Inc., award the contract in the amount of \$1,008,734.25, and authorize staff approval of construction change orders in an amount not to exceed 10% of the contract amount, or provide staff further direction.

Buvel introduced the item as written above and reviewed the engineer's alternate bid amounts. Staff reviewed the time frame of the project and determined the start date of May 6th and ending mid-August of 2024 would be the most reasonable. Conversation with Russel School is ongoing to confirm the best starting date for the project. Needing no further discussion, the Committee recommended approval and that it be placed on the Council consent agenda.

4. Alley East of Washington 5th to 8th Sewer Project - Bid Results & Contract Award (ACTION ITEM) - Bob Buvel

This project's scope includes construction of approximately 1100 linear ft of 8" PVC-sewer main, as well as surface restoration of alleys, streets, and sidewalks. Construction of the sewer main includes new manholes, and connections to existing sewer services. The City advertised for bids on February 24, 2024, & March 2, 2024, and the Engineer's Estimate for construction was \$447,630.00. Bids were opened on March 12, 2024, at which two (2) bids were received. The bids ranged from \$538,410.00 to \$709,575.00. Of those bids, the lowest responsive bid received was submitted by Big Sky ID, Corp. of Hayden, ID with a bid of \$538,410.00. A bid tabulation is included in the packet.

PROPOSED ACTIONS: Recommend acceptance of the bid from Big Sky ID, Corp., award the contract in the amount of \$538,410.00, and authorize staff approval of construction change orders in an amount not to exceed 10% of the contract amount, or provide staff further direction.

Buvel introduced the item as written above and although the engineer's estimate was lower than the bids received, the overall budget still covers the amount of the low bid received. The City has worked with Big Sky ID, Corp in the past was satisfied with the work done. Needing no further discussion, the Committee recommended approval and that it be placed on the Council consent agenda.

5. Staffing for Adequate Fire and Emergency Response Program Grant Application (ACTION ITEM) - Alisa Anderson / Brian Nickerson

The Moscow Volunteer Fire Department (Department) is requesting to submit a funding request to the Staffing for Adequate Fire and Emergency Response Program (SAFER) funded through FEMA. The purpose of the SAFER Program is to provide funding directly to fire departments and volunteer firefighter interest organizations to assist with increasing the number of firefighters to help communities meet industry minimum standards, to attain 24-hour staffing to provide adequate protection from fire and fire-related hazards, and to fulfill traditional missions of fire departments. There is a total of \$360 million available under the FY2023 SAFER Program and 10% of the funding is set aside for grants awarded to all volunteer or majority volunteer departments for the hiring of firefighters. There is no maximum award amount for FY2023 SAFER Program awards and no cost share or match or position cost limit. The period of performance is 36 months for all awarded grants. Staff is proposing to submit a request to the FY 2023 SAFER Program for three (3) full-time firefighter/paramedic positions for a period of three (3) years. At this time, the Staff is working within the grant parameters to determine a specific request amount which will not exceed \$1.3 million. If awarded, the goal is to have the three (3) positions filled by January 1, 2025.

PROPOSED ACTIONS: Recommend approval for the Moscow Volunteer Fire Department to submit a grant application to the FY 2023 SAFER Program for three (3) full-time firefighter/paramedic positions for a period of three (3) years in amount not exceed \$1.3 million, or provide staff further direction.

Anderson introduced the item as written above and mentioned at the latest, awards would be announced in September of 2024 and the grant submission is due April 12, 2024. A grant meeting will be held later this week to help finalize the application amount.

Nickerson reviewed challenges over the years with staffing shortage primarily with paramedic coverage. The City currently only has five paramedics on hand. The program is required to have a paramedic on hand 24/7 however, the City does have a waiver with the state to be able to flex this requirement. Two out of the five paramedics are full time administrative employees for the City and historically, those individuals have covered up to 51% of the calls. The volunteers unanimously voted in favor of applying to this program with the understanding of the importance and great need of the assistance.

Belknap reviewed the shared funding agreement between the City and the volunteer organization and the overall financial difficulty to support the staffing needed. The agreement states the organization will fund the positions 100% for the first 3 years, then the City will contribute 5% support each year after that up to 20%.

The Committee recommended approval and that it be placed on the Council consent agenda.

6. City Shop Design Services Agreement (ACTION ITEM) - Cody Riddle

In October 2023, Staff published a Request for Qualifications (RFQ) for professional design services for construction of a new shop facility. The City received seven Statements of Qualifications (SOQs). These submittals were reviewed by a panel consisting of four staff members that will be the primary occupants and users of the facility. The panel interviewed three of the firms and unanimously selected Lombard/Conrad Architects (LCA) for the project. Their services will include preparation of construction drawings and specifications, bidding assistance, project inspections, and closeout. Staff has prepared the attached professional services agreement and associated fee schedule for Council's review and approval.

PROPOSED ACTIONS: Recommend approval of the Professional Services Agreement with Lombard/Conrad Architects; or provide staff further direction.

Riddle introduced the item by reviewing past conversations with Council regarding the deteriorating City Shop. The goal is to start construction this fall at the earliest or next spring at the latest. LCA has worked with the City on projects in the past including the new police station. Needing no further discussion, the Committee recommended approval and that it be placed on the Council consent agenda.

7. City of Moscow Communications Plan (ACTION ITEM) - Bill Belknap

The City Council has expressed the desire to improve City communications with the City's various stakeholders. The City had intended to create a new Communications Manager position to lead this effort, but recent financial constraints have prevented funding that position. As an alternative, Administration has worked to develop a communications plan as well as leverage existing personnel to support a more robust communications program. The prior Digital Media Specialist position has been revised and reclassified as a Communication Specialist position who will work with a Communications Team and department liaisons which will include members from all departments to coordinate and assist with the City's communications efforts. The attached plan identifies proposed actions and strategies the City will be pursuing to improve both internal and external communications to help inform and educate audiences and stakeholders regarding the City's mission, purpose, services, and achievements.

PROPOSED ACTIONS: Recommend approval of the proposed City of Moscow Communications Plan; or provide other direction as deemed appropriate.

Belknap introduced the item as written above and the process staff took to develop a communication plan. The desired outcome of the plan is to improve overall outreach efforts, and improve community understanding of city activities. The goal is to also share accurate and non-biased information promptly

and available through a variety of platforms. Crisis communication efforts will also be directed in a timely manner. Improved communication with city employees will also be reviewed to ensure they have a better understanding of the City's mission, programs, activities, and initiatives. Tracking metrics will be closely reviewed to evaluate these communication efforts and their effectiveness in order to continue improvements in the future.

Other focal actions include enhancing relationships with regional and local media, improve training of staff and elected officials in crisis communications, and updating the City's website. Regarding crisis communications, an outside entity would perform the necessary training to staff which the City would need to anticipate budgeting for. The City Communications Team will consist of the Deputy City Supervisors, emergency personnel, and the Digital Media Specialist.

Committee requested staff to review potential improvements on how the public receives the information as well as monitoring and standardizing Council response to public inquiries.

The Committee recommended approval and that it be placed on the Council regular agenda.

ADJOURN

The meeting adjourned at 4:37 p.m.

COMMITTEE / CITY COUNCIL STAFF REPORT

DATE: Monday, July 22, 2024



AGENDA ITEM TITLE

Public Meeting: Proposed Lot Division at 322 and 328 Southview Avenue (ACTION ITEM) – Aimee Hennrich

RESPONSIBLE STAFF

Aimee Hennrich, Planner I

ADDITIONAL PRESENTER(S)

DESCRIPTION

The applicant, John Ficca, is requesting a lot division to create two lots of approximately 4,621 sf and sf, 4,497 sf in size from one existing lot of 9,118 sf in size. The intention of the lot division is to divide the existing twinhome dwelling along its shared common wall in order to allow for the individual sale of each dwelling unit. The subject property is located within the Medium Density (R-3) Zoning District which requires a minimum lot size of 3,250 square feet and a minimum lot width of 30 feet for twinhomes. Both proposed lots meet the minimum lot area and width requirements of the R-3 Zone, and the existing structure will meet all setback requirements. Property owners within 600 feet of the property have been notified of the proposed division and a sign was posted seven (7) days prior to the public meeting date.

REVIEWED BY

PROPOSED ACTIONS

PROPOSED ACTIONS: Recommend approval of the lot division with no conditions; or recommend approval of the lot division request with conditions; or recommend denial of the lot division request; or provide staff further direction.

STAFF RECOMMENDATION

Recommend approval of the lot division request with no conditions.

OTHER RESOURCES

FISCAL IMPACT

PERSONNEL IMPACT

ATTACHMENTS

1. Application
2. Before Exhibit
3. After Exhibit and Legal Desc
4. Notice of Public Meeting

June 21, 2024

City of Moscow Community Development
504 S Washington Street
Moscow, ID 83843

RE: Lot Division Request – 322 & 328 Southview Ave, Moscow (Parcel RPM049100)
Permit No. BLD2022-0934
Permit No. BLD2022-0522

City of Moscow City Council and Mayor Bettge:

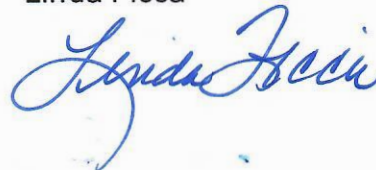
John and Linda Ficca are seeking a lot division for the property located at 322 & 328 Southview Ave in Moscow, ID. This property has recently constructed a Twin Home on the parcel and building permits were approved through the City of Moscow as Permit No. BLD2022-0934 and Permit No. BLD2022-0522. Upon completion of the units and working through preparing the Twin Home for sale, it was discovered that the unit still sits on one parcel. Keltic Engineering, Inc has been retained to complete a survey to complete this lot division request and the preliminary map is attached. Any questions regarding the preliminary map can be directed to Keltic Engineering, Inc at 208-743-2135.

We appreciate the Council's consideration of the request for a Lot Division on this property and look forward to hearing from you regarding the next steps in this process.

Sincerely,

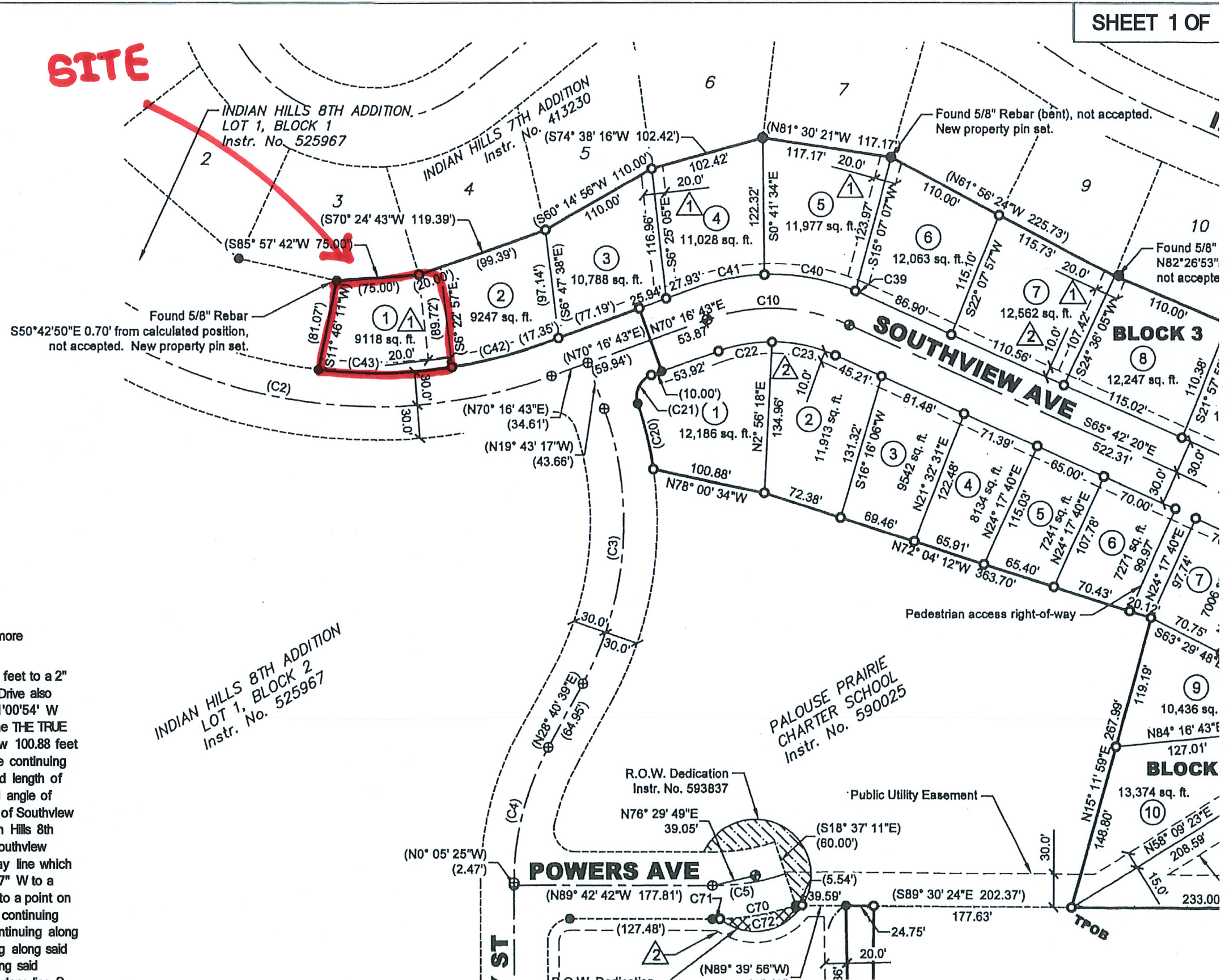

John Ficca

Linda Ficca



BEFORE EXHIBIT

SITE



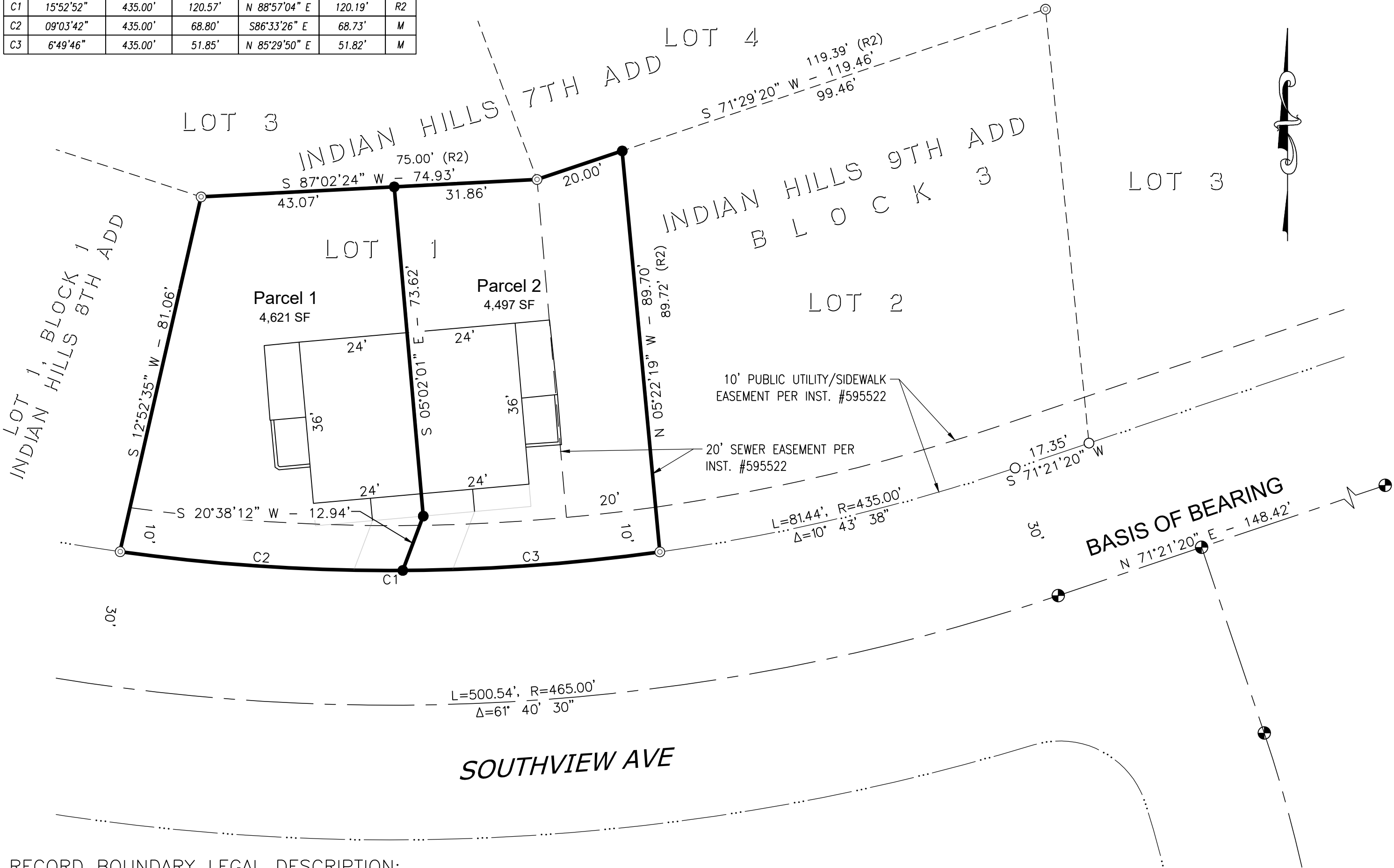
ING

or This Survey Is The South Line Of The Southwest Quarter of Section 17 As Per
he Nelson Addition Completed on 2-15-1974 by Hamilton and Voeller, Inc.

SCRIPTION

Southwest quarter of Section 17, T. 39 N., R. 5 W., B.M., City of Moscow, Latah County, State of Idaho, more
ows;
ast corner of Section 17 running thence along the centerline of Palouse River Drives 89°30'24" E 1441.13 feet to a 2"
ent; thence N 00°29'36" E 40.00 feet to a point on the northerly right-of-way line of said Palouse River Drive also
of Lot 1, Block 3 and the boundary of Indian Hills 8th Addition; thence continuing along said boundary N 1°00'54" W
ly line of said Int 1, Block 3 to the northeasterly corner of said lot; thence 5 89°30'24" E 202.37 feet to the THE TRUE
s description; thence N 15°11'59" E 267.99 feet; thence N 72°04'12" W 363.70 feet; thence N 78°00'34" W 100.88 feet
ht-of-way line of Nursery Street, also being the easterly boundary of said Indian Hills 8th Addition; thence continuing
ry line which is a curve to the left having a central angle of 10°30'50", a radius of 330.00 feet, and a chord length of
5" W; thence continuing 31.05 feet along said boundary line which is a curve to the right having a central angle of
feet, and a chord length of 28.03 feet bearing N 25°47'52" E to a point on the southerly right-of-way line of Southview
along said right-of-way line N 70°16'43" E 10.00 feet to a point on the easterly boundary line of said Indian Hills 8th
along said boundary line N 19°43'17" W 60.00 feet to a point on the northerly right-of-way line of said Southview
along said right-of-way line S 70°16'43" W 94.55 feet; thence continuing 202.05 feet along said right-of-way line which
a central angle of 26°36'47", a radius of 435.00 feet, and a chord length of 200.24 feet bearing S 83°35'07" W to a
ry of said Indian Hills 8th Addition; thence continuing along said boundary line N 11°46'11" E 81.07 feet to a point on
of Indian Hills 7th Addition; thence continuing along said boundary line N 85°57'42" E 75.00 feet; thence continuing
0°24'43" E 119.39 feet; thence continuing along said boundary line N 60°14'56" E 110.00 feet; thence continuing along
6" E 102.42 feet; thence continuing along said boundary line S 81°30'21" E 117.17 feet; thence continuing along said
225.73 feet; thence continuing along said boundary line S 67°12'04" E 330.00 feet; thence continuing along said
423.70 feet to a point on the westerly right-of-way line of Alley Street; thence continuing along said boundary line S

CURVE DATA TABLE						
#	DELTA	RADIUS	DISTANCE	CHORD DIRECTION	CHORD LEN.	REF.
C1	15°53'28"	435.00'	120.65'	S 89°58'19" E	120.26'	M
C1	15°52'52"	435.00'	120.57'	N 88°57'04" E	120.19'	R2
C2	09°03'42"	435.00'	68.80'	S86°33'26" E	68.73'	M
C3	6°49'46"	435.00'	51.85'	N 85°29'50" E	51.82'	M



RECORD OF SURVEY – LOT DIVISION

LOT 1, BLOCK 3, INDIAN HILLS 9TH ADDITION TO THE CITY OF MOSCOW, AS SHOWN BY THE RECORDED PLAT THEREOF, LYING IN THE SOUTHWEST QUARTER OF SECTION 17, TOWNSHIP 39 NORTH, RANGE 5 WEST, BOISE MERIDIAN, CITY OF MOSCOW, COUNTY OF LATAH, STATE OF IDAHO.

LEGEND

- SET 5/8"X30" LONG REBAR W/ PLASTIC CAP "PLS 8076" OR AS NOTED
- ⊕ FOUND CENTERLINE MONUMENT AS NOTED
- ⊙ FOUND 5/8" REBAR WITH YPC "HEDCO, INC. PE/LS 2102"
- CALCULATED POSITION, NOTHING FOUND OR SET
- SUBJECT PROPERTY BOUNDARY LINE
- - - CENTERLINE
- ... RIGHT-OF-WAY LINE
- - - LOT LINE
- - - EXISTING EASEMENT
- x - FENCE LINE
- (R1) RECORD MEASUREMENT PER SURVEY REFERENCES

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE IDAHO COORDINATE SYSTEM, WEST ZONE, NAD_83(2011), EPOCH 2010 AS SHOWN BETWEEN THE FOUND CENTERLINE MONUMENTS, BEARING BEING N 71°21'20" E.

SURVEY REFERENCES

- R1) WARRANTY DEED, INSTR. NO. 616886.
- R2) INDIAN HILLS 9TH ADDITION, INSTR. NO. 595522.

SURVEYORS NOTES

- FIELD SURVEY WAS CONDUCTED IN JUNE 2024 AND ALL MONUMENTS SHOWN AS FOUND WERE VISITED AT THIS TIME OR AS NOTED.
- THIS SURVEY IS A RETRACEMENT OF THE DEEDED DESCRIPTIONS STATED ABOVE AND DOES NOT PURPORT TO SHOW ANY UNRECORDED OWNERSHIP RIGHTS.

SURVEYORS NARRATIVE:

THE PURPOSE OF THIS SURVEY IS TO DIVIDE LOT 1, BLOCK 1 INDIAN HILLS 9TH ADDITION INTO TWO LOTS PER CITY OF MOSCOW LOT DIVISION PROCEDURE. THE BOUNDARY WAS DETERMINED FROM FOUND AND ACCEPTED MONUMENTATION PER INDIAN HILLS 9TH ADDITION TO THE CITY OF MOSCOW (R2), AS SHOWN HEREON. THE NORTHEAST CORNER OF LOT 1 WAS ESTABLISHED ON LINE BETWEEN THE FOUND MONUMENTS AT THE SOUTHEAST CORNER OF LOT 3, INDIAN HILLS 7TH ADDITION AND THE NORTHEAST CORNER OF LOT 2, INDIAN HILLS 9TH ADDITION AT RECORD DISTANCE.

SURVEYORS CERTIFICATION

I, MIGUEL A. MARTINEZ, DO HEREBY CERTIFY THAT I AM A PROFESSIONAL LAND SURVEYOR, LICENSED BY THE STATE OF IDAHO, AND THAT THIS MAP HAS BEEN PREPARED FROM AN ACTUAL SURVEY MADE ON THE GROUND UNDER MY SUPERVISION, AND THAT THIS MAP IS AN ACCURATE REPRESENTATION OF SAID SURVEY.

MIGUEL A. MARTINEZ – PLS 8076

RECORD BOUNDARY LEGAL DESCRIPTION:

LOT 1, BLOCK 3, INDIAN HILLS 9TH ADDITION TO THE CITY OF MOSCOW, AS SHOWN BY THE RECORDED PLAT THEREOF.

PARCEL 1 LEGAL DESCRIPTION:

THAT PORTION OF LOT 1, BLOCK 3, INDIAN HILLS 9TH ADDITION TO THE CITY OF MOSCOW, COUNTY OF LATAH, STATE OF IDAHO, AS SHOWN ON THE MAP FILED FOR RECORD PER INSTRUMENT NUMBER 595522 IN THE OFFICE OF THE LATAH COUNTY RECORDER, DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF SAID LOT 1; THENCE NORTH 12°52'35" EAST, 81.06 FEET TO THE NORTHWEST CORNER OF SAID LOT 1; THENCE ALONG THE NORTH LINE OF SAID LOT 1, NORTH 87°02'24" EAST, 43.07 FEET; THENCE LEAVING SAID NORTH LINE, SOUTH 05°02'01" EAST, 73.62 FEET; THENCE SOUTH 20°38'12" WEST, 12.94 FEET TO THE NORTHERLY RIGHT OF WAY LINE OF SOUTHVIEW AVENUE AND THE BEGINNING OF A NON-TANGENT CURVE CONCAVE TO THE NORTH, HAVING A RADIUS OF 435.00 FEET, THROUGH A CENTRAL ANGLE OF 08°19'16", AN ARC DISTANCE OF 63.18 FEET, THE LONG CHORD OF WHICH BEARS NORTH 86°11'13" WEST, 63.12 FEET TO THE TRUE POINT OF BEGINNING.

SAID PARCEL CONTAINS 4,621 SQUARE FEET.

PARCEL 2 LEGAL DESCRIPTION:

THAT PORTION OF LOT 1, BLOCK 3, INDIAN HILLS 9TH ADDITION TO THE CITY OF MOSCOW, COUNTY OF LATAH, STATE OF IDAHO, AS SHOWN ON THE MAP FILED FOR RECORD PER INSTRUMENT NUMBER 595522 IN THE OFFICE OF THE LATAH COUNTY RECORDER, DESCRIBED AS FOLLOWS:

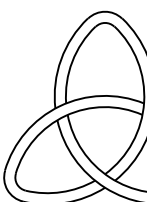
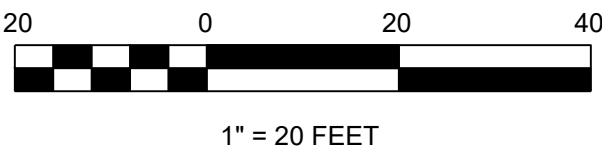
COMMENCING AT THE SOUTHWEST CORNER OF SAID LOT 1; THENCE NORTH 12°52'35" EAST, 81.06 FEET TO THE NORTHWEST CORNER OF SAID LOT 1; THENCE ALONG THE NORTH LINE OF SAID LOT 1, NORTH 87°02'24" EAST, 43.07 FEET TO THE TRUE POINT OF BEGINNING; THENCE CONTINUE ALONG SAID NORTH LINE, NORTH 87°02'24" EAST, 31.86 FEET; THENCE NORTH 71°29'20" EAST, 20.00 FEET TO THE NORTHEAST CORNER OF SAID LOT 1; THENCE ALONG THE EAST LINE OF SAID LOT 1, SOUTH 05°22'19" EAST, 89.70 FEET TO THE THE SOUTHEAST CORNER OF SAID LOT 1 AND THE NORTH RIGHT OF WAY LINE OF SOUTHVIEW AVENUE AND THE BEGINNING OF A NON-TANGENT CURVE CONCAVE TO THE NORTH, HAVING A RADIUS OF 435.00 FEET, THROUGH A CENTRAL ANGLE OF 07°34'12", AN ARC DISTANCE OF 57.47 FEET, THE LONG CHORD OF WHICH BEARS SOUTH 85°52'03" WEST, 57.43 FEET; THENCE LEAVING SAID RIGHT OF WAY LINE, NORTH 20°38'12" EAST, 12.94 FEET; THENCE NORTH 05°02'01" WEST, 73.62 FEET TO THE TRUE POINT OF BEGINNING.

SAID PARCEL CONTAINS 4,497 SQUARE FEET.

RECORDER CERTIFICATE

Filed for record this _____ day of _____
20 _____ at _____ in book _____ of _____
at page _____ at the request of _____
Instrument No. _____

County Recorder _____



KELTIC ENGINEERING, INC.

315 Adams Lane ♦ Lewiston, Idaho 83501 ♦ (208) 743-2135 ♦ (208) 743-2136 fax
♦ Development ♦ Planning ♦ Design ♦ Construction Management

LOT DIVISION - John & Linda Ficca
Sec. 17, Township 39 North, Range 5 West, B.M.
City of Moscow, Latah County, Idaho

DRAWN BY RGW	DATE JULY 2024	PROJECT NUMBER 24-0075
CHECKED BY MAM	SCALE 1" = 20'	SHEET 1 OF 1

NOTICE OF PUBLIC MEETING

Proposed Lot Division of a 9,118 Square Foot Parcel Located at 322 and 328 Southview Avenue within the City of Moscow as Shown on the Vicinity Map Below.
Permit Application LUP2024-0022

A public meeting before the Administrative Committee of the City Council will be conducted during which the following proposal will be considered:

Proposed lot division to create two lots of approximately 4,655 square feet and 4,463 square feet from the existing 9,118 square foot parcel. The intent is to separate the lot into two parcels for individual ownership.

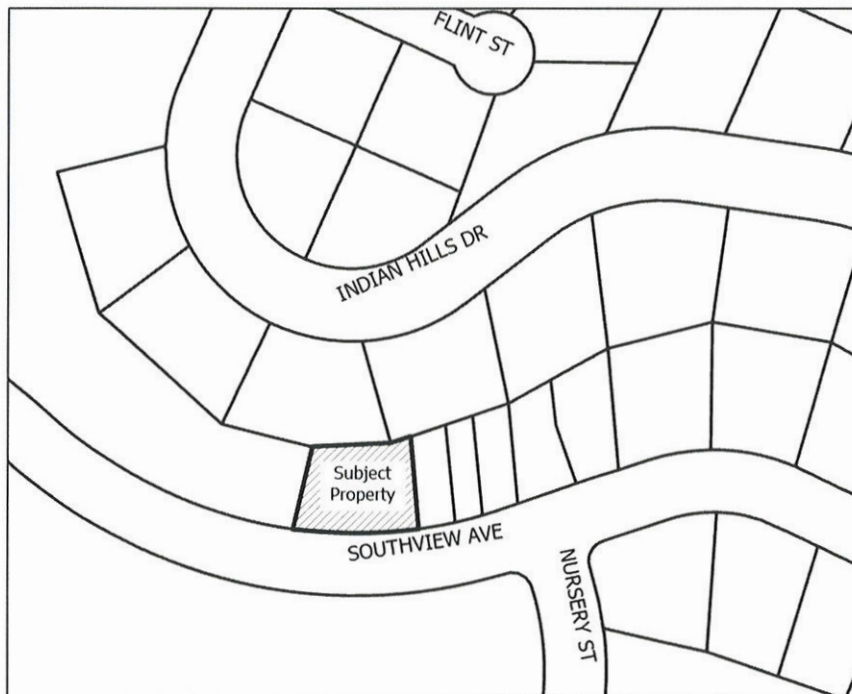
MEETING DATE: Monday, July 22, 2024

LOCATION OF MEETING: Council Chambers, Second Floor, Moscow City Hall
206 East Third Street, Moscow, Idaho

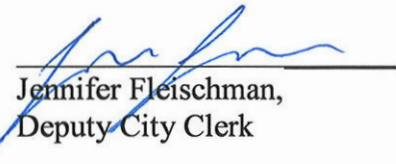
MEETING TIME: 4:00 p.m.

Note: Meeting start time is not necessarily indicative of the start time for the proposal advertised in this notice. Multiple hearings and/or agenda items may make it difficult to determine the start time, which could occur late in the meeting.

The file containing information on this matter is available for public review at the Community Development Department located in the Haddock Building at 504 S Washington Street, Moscow, Idaho. Call 883-7035 for a meeting agenda and further information about the matter. You may obtain further information about the public hearing process and procedures on the City Website at: <https://www.ci.moscow.id.us/593/Public-Hearing-Notices>



Laurie M. Hopkins
Moscow City Clerk


Jennifer Fleischman,
Deputy City Clerk

Publish: July 6, 2024

COMMITTEE / CITY COUNCIL STAFF REPORT

DATE: Monday, July 22, 2024



AGENDA ITEM TITLE

Mural at Jackson & A: Selected Artist (ACTION ITEM) - Megan Cherry

RESPONSIBLE STAFF

Megan Cherry, Arts Program Manager

ADDITIONAL PRESENTER(S)

DESCRIPTION

During a call for qualifications open to artists from the United States, 52 artist submissions were received for the mural project at Jackson and A Streets. The Selection Panel met to review the submissions on April 22, 2024 and voted during that meeting to recommend three finalists: Jay Rasgorshek, Ernesto Maranje, and Darion Fleming. On May 14, 2024, the MAC voted to recommend the same three finalists, after which point the artists created site-specific designs. The designs were available for public viewing and comment from June 25–27, 2024. Of the 316 public comments received, 210 were in favor of the design submitted by Jay Rasgorshek of Boise, ID. The Selection Panel convened to discuss and score the designs, ultimately voting to recommend Rasgorshek as the selected artist, a recommendation that the MAC echoed in a vote during their regular meeting on Tuesday, July 9. Following Council approval of a recommended artist, staff will proceed with the completion of the artwork commission agreement previously approved by Council on January 16, 2024. Installation of the mural is anticipated to be complete at the end of September 2024.

REVIEWED BY

Moscow Arts Commission
Mural Selection Panel

PROPOSED ACTIONS

PROPOSED ACTIONS: Approve the selection of Jay Rasgorshek and his mural design submission, or provide staff further direction.

STAFF RECOMMENDATION

Staff recommends approval of Jay Rasgorshek and his mural design submission.

OTHER RESOURCES

FISCAL IMPACT

The expenses related to this project will be offset by revenue to be received as part of an insurance claim.

PERSONNEL IMPACT

There is no additional personnel impact anticipated as a result of the artist selection.

ATTACHMENTS

1. 2024_Mural at Jackson & A_Rasgorshek, Jay_COMBINED

2. 2024_Mural at Jackson & A_Maranje, Ernesto_COMBINED
3. 2024_Mural at Jackson & A_Fleming, Darion_COMBINED
4. 2024_Mural at Jackson & A_Finalists_Public Comment
5. 2024_Mural at Jackson & A_Finalists_Public Comment_Kyle, Robin
6. 2024_Mural at Jackson & A_Finalists_Public Comment_Landis, Anna
7. 2024_Artist TBD_Artwork Commission_final

Title	Jay Rasgorshek	06/17/2024
	by Jay Rasgorshek in Moscow Public Art 2024: Mural at Jackson & A Streets (Round #2)	id. 46791719
	2839 Venus Pl Boise, Idaho 83704 ID United States 2086972371 jrasgor@gmail.com	

Original Submission	06/17/2024
Score	n/a
Artist Name	Jay Rasgorshek
References	Jrasgorshek_References.pdf
Artwork Title	Celebration of the Camas Lily
Artist Presentation	jrasgorshek_presentation.mp4

Artist Statement I am honored to be selected as a finalist for this unique mural opportunity in Moscow, Idaho. Public art is vital; it is one of the few art forms that not only celebrates the community that commissions it, but also remains accessible to its community members. Public art is an important entry point for individuals to discover art, and it also provides an opportunity to celebrate the local ecosystem. In all of my pieces, I seek to bring an educational aspect to my work by honoring lesser-known species found within the local community—the Palouse provides a fantastic palette to draw from.

I knew from the start that I wanted to design a mural with the camas lily as a focal point due to its biological importance to the region and its cultural significance for the Nimiipuu (Nez Perce). In talking with The Palouse-Clearwater Environment Institute and The Palouse Prairie Foundation, I sought to gain an understanding of the complex prairie and mountain systems of the Palouse—especially, the riparian ecosystems. In the design, I incorporated animals with a yellow element to highlight the importance of the University of Idaho to the region. If we are to prioritize the ecosystems we are part of, it is important to highlight their role in our life through art.

In all my mural work, I seek to compose to evoke attention at many different scales. The intricate details of the design will be apparent to pedestrians, while the refined color palette and the dynamic composition will capture the interest of drivers and other passersby over thirty feet away. My goal is to inspire individuals to connect with nature and examine the beauty of the world around them.

Site Specific Design Round #2 of the selection process invites the finalists to submit up to five renderings of the proposed site-specific design, preferably overlaid on photographs of the site and shown at the proposed scale. Photos of the building are available below.

Site Specific Design Image #1

[jrasgorshek_image1.jpg](#)

Site Specific Design Image #2

[jrasgorshek_image2.jpg](#)

Site Specific Design Image #3

[jrasgorshek_image3.jpg](#)

Site Specific Design Image #4

[jrasgorshek_layout__sketch.jpg](#)

Site Specific Design
Image #5

JAY RASGORSHEK

jayrasgorshek.com
jrasgor@gmail.com
208.697.2371

References

Lily McCann

Project Manager at Anomaly for the Albertson's Broadway x Beacon St Project
lmccann@anomaly.com
Project completed April 2024
Private Mural

Delta James

Economic Development Planner for the City of McCall
djames@mccall.id.us
208.634.3504
Project completed September 2023
Mural completed for the City of McCall

Doug Perala

Owner of P&B Contractors (Neighbors of Winstead Park)
pbcontractors11@gmail.com
208.841.7566
Project completed June 2023
Private Mural



56'

15'







Title	Ernesto Maranje	06/12/2024
	by Ernesto Maranje in Moscow Public Art 2024: Mural at Jackson & A Streets (Round #2)	id. 46755165
	8980 NW 25th Ct Sunrise, Florida 33322 United States 786-431-6000 hello@maranje.com	

Original Submission

06/12/2024

Score	n/a
Artist Name	Ernesto Maranje
References	Ernesto_Maranje_-_References.pdf
Artwork Title	"Changing Chroma"
Artist Presentation	Ernesto_Maranje_-_Changing_Chroma_Presentation_.mp4

Artist Statement

Design description: The design, "Changing Chroma," depicts a forest of quaking aspens and native Idaho birds and flowers. The design will move from summer (west wall) to fall (north wall).

In the summer section (west wall), elements include green quaking aspens (before their leaves turn yellow), syringa flowers (Idaho state flower), and mountain bluebirds (Idaho state bird). A unique, "worm's-eye view" perspective is used that shows the view from the forest floor and adds interest for viewers.

In the fall section (north wall), elements include bright yellow quaking aspens, a mountain bluebird flying toward summer (as they migrate in the fall), and a Steller's jay bird (which is a permanent resident).

Space: The design will make use of the north and west walls and use tree trunks to blend seamlessly with the wall's existing textured areas. The left section of the west wall will begin the transition into fall that carries viewers through to the north wall.

Colors: The design will make use of natural undertones and bold pops of color. The quaking aspen's coloring lends itself nicely to the University of Idaho's colors: gold and silver – Go, Vandals!

Inspiration: Quaking aspens can be found throughout North Central Idaho. These trees are easily recognizable for their smooth, white bark and striking yellow leaves in the fall. The design shows a forest in the summer, full of green leaves and mountain blue birds, the Idaho state bird. The design transitions to a forest of fall yellow leaves, where only permanent resident birds (Steller's Jay) are painted.

Theme: The design makes use of the artist call's theme of "water, seeds, and soil" creating "a playful dance of transformation" and "a celebration of potential, of opening and stretching toward the sunlight." The west wall's "worm's-eye view" perspective lends itself to the idea of stretch toward the sun as well.

The trees changing from green to yellow with the seasons represent transformation and the birds coming, going or staying represent the community and its residents, including the students.

Style: The mural will be painted in Ernesto's colorful and whimsical style with organic elements weaved throughout. The design fits well within Ernesto's typical style of flora and fauna. The mural will be modern, uplifting, family-friendly, colorful, and energetic.

Site Specific Design Round #2 of the selection process invites the finalists to submit up to five renderings of the proposed site-specific design, preferably overlaid on photographs of the site and shown at the proposed scale. Photos of the building are available below.

Site Specific Design Image #1

[**Ernesto-Maranje_Proposed-Design_Changing-Chroma_West-Wall.jpg**](#)

Site Specific Design Image #2

[**Ernesto-Maranje_Proposed-Design_Changing-Chroma_North-Wall.jpg**](#)

Site Specific Design Image #3

[**Ernesto-Maranje_Proposed-Design_Changing-Chroma_West-and-North-Wall.jpg**](#)

Site Specific Design Image #4

[**Ernesto-Maranje_Proposed-Design_Changing-Chroma_West-North-Labeled.pdf**](#)

Site Specific Design Image #5

[**Ernesto_Maranje_-_Where_the_Raspberries_Grow_-_Mockup_and_Mural.pdf**](#)

References

1. Samantha Robison, executive director at aptART
Email: samantha@aptart.org
Phone: 831-400-8739
Relationship: I've worked with Samantha on several mural projects in the US and abroad over the course of many years, including Lebanon, Iraq, Jordan and Greece, where I painted murals for refugee camps and communities-in-distress.
Project example(s): <https://www.maranje.com/projects/apt-art> & <https://www.maranje.com/projects/apt-art-portland>
2. Randy Ham, executive director at Odessa Arts
Email: randy@odessaarts.org
Phone: 432-438-0588
Relationship: I worked with Randy to complete the mural, "Ferdinand," for the city of Odessa on its new convention center.
Project example(s): <https://www.maranje.com/projects/odessa-longhorn>
3. Shantelle Rodriguez, director of experimental arts centers at Superblue Art
Email: shantelle@superblue.com
Phone: 786-303-8163
Relationship: I've worked with Shantelle on several mural projects with specific city and organization goals over the course of many years when she was the Director of Arts for Goldman Global Arts.
Project example(s): <https://www.maranje.com/projects/renewed-vision-fpl> & <https://www.maranje.com/projects/wynwood-walls>



15'





West wall

Full design, labeled



North wall



Past mockup design



Completed mural: [*Where the Raspberries Grow*](#) (2023) in Hopkins, MN



Title	Darion Fleming DaFlemingo	06/21/2024
	by Darion Fleming in Moscow Public Art 2024: Mural at Jackson & A Streets (Round #2)	id. 46829449
	da.flemingo.art@gmail.com	

Original Submission	06/21/2024
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Score	n/a
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Artist Name	Darion Fleming DaFlemingo
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References

[DaFlemingo_References.pdf](#)

Artwork Title	Roots
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Artist Presentation

[IMG_4821.MOV](#)

Artist Statement

I'd like to preface this submission with some background on my normal process. This is my first year applying for out of state projects because I really like the idea of traveling to new places, creating new relationships, and using these experiences to naturally develop who I am as a person and what I do as an artist. My normal process for developing a design is to meet with community members, discuss what they love about their home, the people in it, and share their unique stories. I then use this experience to develop a direction that I think will be most appreciated and relatable to the community it's in. As a visitor I think this is the most special thing I can do, and work that is developed in this way is always more meaningful and personal, both to myself and to those who see it everyday. With that said, I will admit I did struggle with deciding on a direction and am lacking some intricacies in design. If chosen to move forward, I would really love to meet with a group to backtrack the process just slightly and hopefully add some elements that will really set it off.

I stuck with a similar concept to what I originally pitched in my application. I did attempt a couple other ideas but felt this one was the most in line with what the call was asking for. I approached the artwork from left to right, almost like a timeline, telling a story. I turned the left side of the wall into a shed or shelf of sorts, housing old work boots, a hand trowel, and some gloves representative of the people's strong connection to the very fertile lands of Idaho. I'd like to dirty these things up a bit more to make them look older and more used and would also love to add in a few other elements/easter eggs for the history of Moscow. This is where a discussion with community members would be so important. If you zoom in I did add "IDAHO, MOSCOW" on the tongue of the boots and an "1877" on the tag as a taste for the kind of subtle things we can add to this side of the wall.

I wanted to have a pretty stark contrast between the two walls but also transition them in a way that makes sense. The main side of the wall is a focus on the beautiful growth that comes from the hard work and tools in the shed. Flowers fill the wall starting with a vintage grey scale layer that quickly glitches and transforms into a vibrant array of color. This is another area I'd love to get input on, specific flower types and colors. For me, this side is representative of the transition from old to new as the city develops into a more creative, colorful and art-filled community. Thanks so much for reading!

Site Specific Design Round #2 of the selection process invites the finalists to submit up to five renderings of the proposed site-specific design, preferably overlaid on photographs of the site and shown at the proposed scale. Photos of the building are available below.

Site Specific Design Image #1

[Moscow_Side.JPG](#)

Site Specific Design Image #2

[Moscow_Main.JPG](#)

Site Specific Design Image #3

Site Specific Design
Image #4

Site Specific Design
Image #5



Darion Fleming
DaFlemingo



Charlotte, NC



(703) 582-9456



www.daflemingoart.com



da.flemingo.art@gmail.com



[DaFlemingo](#)

Professional References:

- Jenny Vallimont | Gökotta | (704) 560-5811 | jenny@wearegokotta.com

I've been fortunate to work on multiple projects with Jenny. Most recently she was the project manager in charge of the Camden NoDa project which was incredibly involved and nearly a 4 year process from conceptualization to install.

- Darren Spicer | Clutch Coffee Bar | (669) 800-9172 | darren@clutchcoffeebar.com

Darren is the owner and founder of Clutch Coffee Bar who has been a repeat client of mine for two different mural installations and several planned for future locations.

- Wendy Hickey | ArtPop Street Gallery | (734) 320-1601 | wendy@artpopstreetgallery.com

Wendy is the founder of ArtPop Street Gallery which is a local non-profit here in Charlotte that specializes in funding and supporting artists and creative initiatives throughout the Carolinas. She was also the project manager during my mural installation with The Relatives.







Comment on Jay Rasgorshek's Proposal 210 comments in favor of the design	Comment on Ernesto Maranje's Proposal 55 comments in favor of the design	Comment on Darion Flemming's Proposal 21 comments in favor of the design
This is beautiful, and I appreciate how the artist engaged with local organizations to understand our ecosystem.	This is also cool, and I like how it incorporates local fauna and flora, but I have a hard time imagining how it will look it real life. It could be overwhelming for passing drivers.	I think this is too disconnected from the local community.
Jay's mural is my favorite by far! Thanks!	second fave, but wish there were more ungulates in it.	Not a huge fan of this one. 3rd pick.
This is great, if not a bit dry in terms of color.	This is beautiful, but I'm struggling imagining being welcomed with such an autumnal image all year round coming into town from the north.	I enjoy the colors on the west-facing wall, but the black and white on the "worker boots side" seems to cast a dimness on the work the city does. Could it also be in color? I like the image itself just not the lack of color.
This is absolutely my number one pick. The style vastly different from much of Moscow's other murals, but still fits like a puzzle piece with the rest of Moscow's artwork and architecture.		
		This is the best representation of Moscow - We work, we plant, and we grow together as a community.
I like the way the Nez Perce is incorporated. I like this art very much. The arches are very complimentary to the building. I like the realistic look of the pieces.	I like the aspen trees but that is all. The sizing of things meshed together creates something that lacks realism. I do not like this art.	I dislike image A. Image B is beautiful. Maybe image B could be used on both side of the building.
Clearly the best. Jay's work looks like it belongs there.		
	Love hers!	
Good, but I feel like the blur of realism and pattern leaves more to be desired.	This one is the best. The pure Idaho nature feel is fitting for a mural of this type	Fine, but I feel like the colors are a strange mix.
This mural seems to reflect the project theme best - marrying organic with structure, the nature of our area with the order of our education systems. I appreciate the artists attention to what is unique and native to our specific area and heritage. This piece seems to fit the aesthetic of our community well so it doesn't feel out of place while still catching the eye. And I love how it complements the existing landscaping around the building.	While this artist is unquestionably talented at executing realism in his murals (I appreciate his example of a past mural) he proposes a design reflecting Idaho but not focusing on the Palouse's unique flora & fauna. I would prefer a design that showcases animals & plants unique to the Palouse and our community.	While I love how the grayscale mural smoothly transitions the building's side into vibrant color, this mural feels the most generic, the least reflective of our community's nature, history or aesthetic. And it's more contemporary feel is the most likely to be polarizing between the tastes of our diverse population. If more local plants were used and the color palette was more indicative of those native Palouse species I think this piece would be well received. I wish the artist had already shown initiative in researching this and incorporating it into their first proposal rather than including all the details to be in their statement alone.
As someone deeply interested in Palouse Prairie restoration, Jay Rasgorshek's mural proposal truly resonates with me. The thoughtful layering of local elements and the artist's dedication to understanding Moscow's unique environment are evident in his design. Featuring indigenous peoples and the camas lily adds profound cultural and biological significance to this mural. It's a beautiful celebration of our community and ecosystem.		
I like this one. It's not as busy as the other two. Less is more. Plus the camus is distinctly local.		
I like this a lot. A fun style and beautiful imagery - neither too cheesy nor too dark, and elevates the space very nicely. Less "photographic" than the others which is good.	Not bad, but I think it looks a little too Hallmarky. A bit too Thomas Kinkade-like.	Kinda cool but it's not really pleasant to look at.
This is the most visually cohesive of the mural proposals, as both walls clearly fit together as one piece of artwork, and the theme is simple, consistent, and intelligible yet captivating. The color palette is pleasant, gentle on the eyes, and not garish or offensive. This makes the mural fit well with its surroundings and look like it belongs there. Aside from beautifully representing the Camas lily, Jay pays tribute to a range of other beloved local species, such as the Idaho Giant Salamander, and other turtles and birds.		
The lizard on the side is jarring. I would change that to something more inviting. But otherwise, this is very nice.	I love this one. Love the selection of the aspen, mountain bluebird and steller's jay. Love how the Jay appears to be behind the aspens of the front side.	No. Please no.
		B is the best!!!!
		I love the flowered side, but the dark side is just too foreboding. Not much to do with the Palouse, IMHO.
Love this one!	This would be my 2nd choice.	
attractive, but a bit retrogressive in terms of the style. not a huge fan of the aedicala.	Nice atmosphere. exciting! (although the perspective on image A is a bit disconcerting.)	the boots and trowel are TERRIBLE.
My number 1. I live south of Paradise Ridge along Cow Creek. We have tons of birds, but I've never seen a gold one or a turtle (!) I'm sad that no female artists were selected, and I hope all these male artists are from this area.	Again with the yellow birds... we DO have mountain bluebirds and an unbelievable amount of ungulates and lots of purple penstemon.	Love the design, I'd love to see syringa or penstemon...
Quote: where water, seeds, and soil create a playful dance of transformation.		
Water, yes. Seeds, yes. Soil, obviously, and playful, absolutely. Jay's work is thoughtful, talented, clear, and leaves little doubt as to what he's trying to express. The beauty of our Palouse through nature. I love this. If there was a vote, he has mine. (24 year resident of Moscow and U of I alum)		
I love this one!!! It represents our community and respects the people whose land we live on.		
The complementary colors bring a bold visual to this stunning rhythmic mural proposal. It's clear that Rasgorshek put time and effort into understanding the region in choosing local wildlife. The movement of the foliage creates a feeling of play and the yellow nods to the university colors. This is my top pick for the murals. Not only is is beautiful, but it's clear the person did the research beforehand.	While this mural is stunning, it's hard to tell what's going on from far away. It doesn't translate as well. While the fall portion is radiant, the perspectives on the "worms eye view" portion contradict and upset the eye: a bird wouldn't be seen from the side or even the top view of this was from the perspective of a worm on the ground. It doesn't work, we would need to see the underside of the birds. Which could still be beautiful, but isn't what is presented here. The clashing perspectives make this my last choice. Though the fall side is almost flawless, it could use more movement visually: from far away it's just a bird in some gold colors.	At first glance, with the boots and shovel I considered this the win; but after reading how the artist essentially didn't think this out all the way and plans to essentially potentially change the mural in significant ways that we wouldn't see until it was done and after voting I cannot bear the thought of this mural proposal having won against other ones to even be in the top 3. The black side is incredible and I love a good piece of art that jumps off the page; but this artist didn't take the time to get to know the area or place symbolism or meaning for the Town in the art and stated so. Let's respect and give our money to those that have shown they will put thought and work into this beautiful piece. Will this artist actually come through? Maybe. They didn't in time for this deadline, though. I don't want to risk it. Especially when others have proven themselves already and given us beautiful options.
I think honoring the Nez Perce tribe while celebrating the camas flower is beautiful. This should be the selection	This is so pretty with the worm perspective, but it doesn't speak to me like the first option does.	Love the flower design
I like this proposal but after seeing the others, it's my least favorite of the three. I do appreciate how he celebrates the camas lily and its key role in our ecosystem.	This was my favorite at first glance - absolutely stunning. I was concerned that it looks too good in the images and the actual mural couldn't possibly be that vibrant and beautiful, but I looked up his other murals online and they ARE that beautiful. This proposal gets my vote.	This is my second choice of the three proposals. I LOVE the black and white side and I also love how he wants to meet with local community members and personalize the design based on those conversations. I personally like the "glitch" of transitioning from black & white to color, but I wonder if it's a little too modern for many others in Moscow.
This one!!		

At first glance, Proposal One was my least favorite. Visually stunning, but, with its focus on reptiles, I felt it lacked a connection to our community. Boy, was I wrong. This artist did their homework. And I learned something about the habitat of the region I have called home for almost 30 years. All of the submissions are beautiful, but this one truly shines.	This is my second favorite.	While pretty, this could be found on a wall in any town. Nothing here says "Moscow" to me except the slight nod on the boots. It feels as if this could have been a mass-submission to many towns.
This one gets my vote. I love the thought put into it with the native camas flowers and wildlife as well as the movement of the piece.		
Love the colors chosen and how the art honors our local landscape and wildlife. This is my favorite.	Nice representation of local life but feels like a snapshot from a camera and not a painting.	The flowers are mesmerizing and draw me in. This is my second favorite. The boots and tool are thought provoking.
Beautiful! My favorite.		
This is my favorite.		
This image is beautiful, clean, appropriate to this area, and uses the space well. It would be my first choice!	These images are colorful and appropriate, but do not use the space as well as Proposal 1.	The use of two quite different images is interesting, but not as beautiful nor as appropriate for our town as Proposal 1 or 2.
This proposal seems like it comes from someone who really knows the Palouse and gets the town. The mural is is not bright and flashy and does an excellent job of capturing the simplicity yet vibrancy and variation of life on the Palouse. Kids would adore seeing the nature depicted here. It's beautiful and well thought through. If I wanted to describe what the Palouse and essence of nature in Moscow is to my kids in an picture, this would say it all. You want to stop and smell it, look for the detail, spend time reflecting. This mural out of all of them is the most unique and true to Moscow.	Though vibrant and colorful, this artwork seems like many images places together in a chaotic scene that is kind of hard to follow. Though it introduces some wildlife, it doesn't reach for the detail and educational aspect that the first proposal does. It also seems similar to the other project created by this artist which makes it not seem as unique and special to Moscow.	Boots and flowers. That's all I see from this design. Though beautiful and bold it doesn't reach for the heart of Moscow. I believe a Mural should give a sudden sense of what Moscow is to the visitor that passes by it. I believe the first mural projects that well. This one would take a bit of reaching.
This one is amazing! Pick this one!		
Love this one. Adds to the natural beauty of our downtown without pulling away from it.		
I love this one! The thoughtfulness of including local flowers, the enjoyable color scheme, and all the wildlife! Yes!	While I appreciate the wildlife in this one, I don't find the style as attractive as the first, and think that the loud colors might feel overwhelming in a space that big.	This one has far less character than the others and I wouldn't appreciate hot pink leading to the stop light.
Visually fits the building very well. Pleasing design. What are the birds,turtles,salamanders? Assume native to the area? Colors pleasing. Seems to fit theme.	Beautiful mural. Like the transformation of seasons and yellow colors. Other than UI colors and flora/fauna, how does it connect to Moscow specifically?	Like the idea of shoes and gardening tools to connect to to the earth. The rest of the mural/flowers don't really seem to connect me with Moscow or Palouse area.
		He shows the working and life in this whole area
No	Yes	No
I love Your submission. It doesn't seem like there's another agenda in any way. It's real raw and lovely. What a great depiction of art. I would love to drive by this every day.		
This is the only one that is remotely attractive. The colors are more subtle than the other proposals. Please, please chose this one.	This is garish. The colors are too bright. Imagine driving by this in December. Ugh. Also, why do we have to have such bizarrely massive birds and animals? It's freakish.	This is terrible. And he's not even a local artist. More garish than the previous one. Please don't make us look at that as we drive by. What about some of the beautiful architecture at the University of Idaho? We are a college town, we should not have this junior high locker look.
This is the best submission--beautiful and not obnoxious. You can pay it tribute, but you don't have to deliberately look away from it after the fifteenth time walking by. Choose this one!	Beautiful, but a bit loud to be comfortable. My second choice.	Obnoxious and weird. Stay away from this one. We want art that can last, not art that merely shocks.
This one		
So beautiful! Would be my #2 choice.	This is so idaho! This is my #1 choice.	Beautiful! This woods be my 3rd choice.
This is far and away the best mural proposal of the three!		
I wish there was more variation in the design. A little bland, but pretty.	I love all the vibrant colors; extremely eye-catching and attractive. I like the varied mix of native flora and fauna.	I think this is too modern and has nothing to do with Idaho or Moscow. This mural could be seen in any city.
	This one is my favorite. Very colorful!	
This one is my favorite! I love the way the subjects are framed between the windows and decorated so elegantly.		
I really love this, and can see Moscow's children loving these animals also! Well done!	This is really beautiful! I really like your past artwork in Image E! I think the perspective of the trees in your current proposal might possibly be a little bit visually distracting to drivers? In my humble opinion! :) But I do really love the seasons and colors and Idaho birds respresented!	In my humble opinion, this would be most visually distracting to drivers. While it is interesting, it is also eye-catching in a negative way. It also does not really represent Moscow and the beautiful Palouse region as well as the other proposals.
Style and color palette fit into the existing Moscow art and add a lovely touch to this building. Excellent choice of subject matter to honor and represent the region. This composition will also draw questions and encourage viewers to learn more about the camas lily and animals portrayed thus supporting life long learning.	This is too broadly "Idaho." There is nothing specific to Moscow and the Palouse.	The color palette is too shocking and bright. The artist does not seem to have a clear vision for this piece.
Very pretty. It would fit in well with the theme, but it doesn't demand attention. I don't understand the turtle and salamander ???do we have those around here???	I feel like this is really busy and loud. Not quite sure where to look. Too much going on.	This is really different and unique. Would really make it a focal point in moscow.
I would rank this 2nd. I like the camas lilies. The birds, turtles, and salamander don't really connect me with what I think about Moscow, though. I wish this had a human element to this.	I would rank this 3rd. Quaking aspens really aren't part of Moscow for me. UI's colors are black and gold, not silver and gold. I think this proposal would result in a mural that is less relatable.	This is my #1 pick. Darion Flemming's described process of interviewing members of the community and asking what they like and backtracking his design a bit really intrigued me. I like the human aspect (the shoes) with the nature part, which something the other 2 artists left out. I liked how he would add other elements/"easter eggs." This is the riskiest of the 3 proposals because this is the artist most likely to do something different than presented, but this is also the artist that I intuitively feel we would be most delighted by.
I enjoy the soft colors and juxtaposition of the turtle swimming in grass. It's also nice to recognize the salamander, the official state amphibian. Special thanks to the artist.	I enjoy the deep perspective of the mural. It would do a great job distracting from the urban environment surrounding. Thank you to the artist.	Thank you for submitting from out of state and sharing your talents with our community. The boots are the most bold and I think fun of all the submissions. Although I wear cowboy boots.
I believe this proposal most strongly showcases the fullness of the region. There's clear thought not just given to the well known, but to the old roots of the area as well.	I like this design, but to me, it doesn't speak "Moscow."	Again, I don't see or feel much of the area's charm and richness in this proposal.
Oh my goodness, I love this one. Definitely my favorite. I think the scale of the images is perfect. The most common perspective it will be viewed from is by people waiting at the East-bound or South-bound stop light. The other two images seem too large scale- life they would be better viewed from further away. This design has the most potential to be interesting to kids in waiting cars, too, I think. Enough detail and variety to keep their attention week after week. I feel like as an adult (who drives through this intersection almost daily, and really enjoyed the previous mural), even I would stop looking very closely at the other two options after I've seen it for a month or two, but I would keep finding new details in this one. I love it!!	Not a fan. I realize that we do have quite a number of deciduous trees in the area, but when I think of forests around Moscow, this is not what they look like. And I don't know if I've ever, in my 20+ years of living here, seen a blue bird of any variety in Moscow. It doesn't ring true to me or capture the spirit of the town.	I really like the North-facing wall, with the boots, but not the garish colors or too-large scale of the flowers on the other wall. It doesn't look like any local garden I've seen in Moscow, either, so if the intent is to represent our community, I don't think it's the best option.
This is the least offensive to me and the only one that remotely has any connection to the Palouse. Sighâ€¦	This is not the Palouse.	I see no connection to the Palouse in this mural.
This one please!		
		The shoes and trowel are a dark and somber entrance to our beautiful downtown! No thank you!

This is amazing! My only concern is about whether the flora and fauna displayed are native to the Palouse. This would be my first choice.	I also like this one. It would be my second choice.	I'm not sure I understand or appreciate the stark contrast between the two walls.
Tasteful and fitting! Love it.	Too gaudy.	We don't like the digital look of this one.
This is subtle enough and beautiful that I would enjoy seeing it daily. This is a winner.	I like birds and wildlife, but I do not think the bright colors and overly detailed style will look good on the building.	I do not enjoy this, and it will not age well.
This is lovely and my top vote! It's a true reflection of the Palouse! I hope this one wins!	This is too visually busy in my opinion	The colors are too aggressive and this doesn't reflect the Palouse in any way. Definitely not a great choice.
This is the best proposed design because it creates the appearance of architectural interest which is lacking in the building. The theme appeals to all ages and beauty can be apparently appreciated by all viewers regardless of artistic understanding.		
	Much more visually stunning, more depth in artistic perspective and beautifying realism, and simply more beautiful and representative of Moscow while still as thought-provoking as the others.	
	This is stunning! I appreciate the artist's inclusion of recognizable Idaho flora and fauna. This one is a clear winner for mural art in Moscow.	
I like this one EXCEPT for the weird turtle with the clearly webbed feet *swimming through camas* which is not an aquatic plant. The bird panels are nice and the mural overall lends itself well to display on a wall. It would be a delight beside, on jackson, or across the street at the intersection.	I dislike this pretty strongly. It looks like stock art with more stock art plastered over it. The worm's perspective side, the main side, does NOT map well onto a wall. The perspective is less jarring on the other side but it still feels like something a fifth grader did for a nickelodeon ad in the 90's.	This is my favorite of the three. While the disjointed flowers is not my favorite artistic style, it would look nice on the sun-catching wall, and be well-suited to the direction of traffic. Of the three this one has the most direction and sense of growth. I also LOVE the boots and spade when i think of our farmers, they are the boots and spade type. Very true to Moscow's roots, and well suited to the mural location.
I think this would be a beautiful addition to downtown Moscow. I hope you win!		
This is the most pleasing to the eye of the three. The softer color palette makes the mural feel more organic, and the rising lines cause a sense of upward lift.	This is the most captivating and interesting of the three. I like the photorealism, color choice, lines, and subject matter.	Hard no. Color choice is garish, and the two panels are completely incongruous.
This is my favorite option. It represents our region the best. I like the color scheme as well.		I feel like this one isn't as inviting or personal.
Love this!		
This art work is a beautiful color palette, incorporating regional considerations in a more classic and earthy style. This one I believe with age best with time and fit the Moscow NW style		
This is BEAUTIFUL! This option would definitely add more beauty and interest to our downtown.		
This is BEAUTIFUL! This option would definitely add more beauty and interest to our downtown.		
Amazing, this submission is much better than the other two. I feel like this stylized mural will look much better than the other two hyper-realistic murals. I think it will also be easy to execute as well. I really like that it includes Camas Lilies.	I think this design is alright but it doesn't seem to flow very well. I think the perspective is odd and the colors have too much contrast. I think the design is a bit too busy for such a large mural I think it would look out of place.	No offense to the artist I can see where the artist is coming from but it's just too disjointed. I feel like it is jarring and not in a good way. I think that this design feels like some odd corporate minimalist version of what the theme is. The grey scale to high contrast coloring is very off putting.
	This is my favorite. It captures the changing beauty of our landscape.	
My choice is #1		
Despite the hideous worm creature on the side, this one is the least garish and not as stylistically offensive as the other two choices. I vote this one, minus that creature.	Idaho, where the woods are randomly populated with GIANT birds...why??? The one good thing about this design is the birch trees work well with the windows. But the giant birds and other shapes placed on top of them don't look good - like someone took a nice photo of the woods, but then a kid added stickers.	The work boots and tools on the side are nice and go along with the "theme" of the building being a utility (although not a gardening utility, of course), but the rest of the work is just unpleasant to look at - no focal point. And cutting it all up into angular shapes with garish colors just makes it look like an old Windows background the kind that comes pre-installed on that computer you bought at Office Depot, and which you replace with better photos from the internet as soon as you can.
I love it. I like that it works with rather than fighting the architecture, especially the windows.	Steller's Jays don't live here.	Image A is incredible. Image B seems garish to me.
This is my favorite of the three options. Not all the color choices are fantastic, but there is some complexity and interest, and I love that the artist is choosing to work with the layout of the windows in making the panels, rather than ignore them and leave gaps in the design.	There's really good energy and color possibilities in this one, but it doesn't work with the layout of the wall as well as the first option.	Hard pass. No coherence in color or style between the panels, lacks the complexity/interest of the other options.
Although the idea is cool, the actual look comes of cheap and needs a more refined look for something people pass daily.	This is really pretty color wise. It would need to not turn out TOO whimsical otherwise it won't achieve the desired affect. Idaho is rooted and to make it a bit sharper. This one is my favorite.	Cool for something else, it would become boring very quickly and has nothing to do with Idaho for visitors to quickly understand. Not pretty for the day to day.
		This one please!! I love both of his. A mix of hard work and beauty!
Such beauty! I love the focus being the camas lily and bringing in more of the Palouse ecosystem. This would certainly be my choice for the Jackson Street Mural.		
I vote for celebration of camas lily. Both beautiful and has meaning, matching the vernacular of our region.		
This is my first choice of the three. Beautiful and meaningful.	This is a close second.	Also lovely. Third choice for me but still a great option.
This is the BEST! It connects us to native plants and creatures of the Palouse and the artwork is delicate. I prefer focusing on the fact that many of our birds have yellow hints due to the dapples of yellow in the landscape over spring, summer, and fall: flowers, grasses, and turning leaves. By far the strongest proposal.	I am not as convinced about the perspective represented here, though appreciate the focus on wild creatures and plants that may be associated with the Palouse. Stylistically, not as appealing as Proposal 1, but by far more compelling in connecting the audience to our region - the Palouse - than Proposal 3.	"Roots"? This reads more like "Uprooting." The boots, the gardening trowel, and gloves juxtaposed with generic flowers that have no connection to soil, insects, or creatures of the Palouse. Please do not select this one. Proposal 1 is the strongest, with Proposal 2 being okay in its effort to connect us to the Palouse specifically. The flowers and objects in Proposal 3 are generic with no specific connection to the Palouse regiona.
	This one. It's lovely.	
Excellent use of local plants and animals in the mural, especially native to our palouse and Moscow Mountain. Beautiful and eye catching.	Looks like an AI-generated Truck wrap.	Colors are garish.
This is the best one.		
This prominent corner is one I pass by multiple times on a daily basis. This mural of local flora and fauna would be a beneficial, beautiful, and educational addition to our downtown space. These murals inspire joy and affection for my city.	This mural has promise but is a bit garish and will likely become tiresome over time.	I appreciate these murals family friendly nature and the fact they are on theme but they don't inspire joy or affection for my city. They're just okay.
This is stunning and really fits in beautifully with Moscow		
I vote this one!		
Image A	None of them	None of them
My favorite of the three. The other proposals, I believe, are too bold and overpowering, while this one blends colors and contrasts that don't demand as much attention. I prefer subtlety in public art and this one comes closest to meeting that goal.		
Very thoughtful, place-based, and visually appealing mural. This would be a great piece of art in Moscow.	Stunning colors and design and, as with Proposal 1, rooted in the local natural environment. This would be a beautiful addition to downtown.	This is far too generic compared to the other two submissions, which are clearly more rooted in place. This would be a disappointing pick.
Love this one!		
Why not leave it blank. It's a waste of money and none of it looks professional.	Why not leave it blank. It's a waste of money and none of it looks professional.	Why not leave it blank. It's a waste of money and none of it looks professional.
These are beautiful. My favorite of the proposals, I love how it improves the architecture without fighting against it.		

This is beautiful! The yellow mixed with local animals perfectly reflects the beauty and uniqueness of Moscow! I especially love the long-toed salamander as it can be found in my own backyard.		
I think it's beautiful, much better than the last one, which just made no sense.		Not this one please
		This one!
This is my second place pick. I enjoy how the artist really thought about the cultural roots of the area and that is reflected in the art. I don't particularly enjoy this vintage art style for a mural - I think there's better display options for this art.	This is my favorite design! This design follows the brief the closest. It shows nature's yearly transformation using local elements. It is my favorite of the three proposals. Eye catching and gorgeous! It's bold, bright, and beautiful. I work with kids and I can see how this design could be a great starting point for many discussions about nature and the biodiversity of this area.	I am least excited about this design. Doesn't seem to match what the city asked for. I don't think it matches the character of Moscow.
This is my second place pick. I enjoy how the artist really thought about the cultural roots of the area and that is reflected in the art. I don't particularly enjoy this vintage art style for a mural - I think there's better display options for this art.	This is my favorite design! This design follows the brief the closest. It shows nature's yearly transformation using local elements. It is my favorite of the three proposals. Eye catching and gorgeous! It's bold, bright, and beautiful. I work with kids and I can see how this design could be a great starting point for many discussions about nature and the biodiversity of this area.	I am least excited about this design. Doesn't seem to match what the city asked for. I don't think it matches the character of Moscow.
I would vote for the selection of this one. It seems to best meet the criteria for the mural, is attractive and noticeable without being distracting to drivers and suits the size and shape of the building.	I don't think this suits the building. It's more of a "billboard" than a mural, plus mountain blue jays may be the state bird, but they aren't prominent locally. Overall doesn't do a good job of meeting the design criteria.	Like this the least of the three designs, in fact don't particularly like it at all. Despite the artist's statement about why he thinks the side wall design ties into the main wall design I don't think it accomplishes that goal and looks like it is completely separate. I also think the "bright bold" colors and design won't wear well over time.
This is by far my favorite! I appreciate the connection to the Nimipuu and the Palouse Prairie ecosystem. The design is beautiful, and I believe will blend in well with the vibe of the City of Moscow.		
I feel as though this one captures the people of Moscow, ID and the beauty of the Palouse best.	While vivid and colorful, and I like how the mural uses the entire wall as its canvas, I don't think this captures the beauty of the Palouse very specifically, nor the people here.	While I admire this artist's use of space to make a statement about "two sides", I don't think this would connect very closely to anything specific to the people nor the environment here.
Definitely like this one the best!		
	FVI, a deer can't have moose antlers (paddles). This will get made fun of.	
	This is my favorite.	This is too basic.
This one does an impressive job of working with the building actually elevating what I think we can all agree is not a great architectural masterpiece. ;-) I like the thoughtful intentionality of that. Plus he can actually draw.	Somehow he's made nature look garishly unnatural.	I ran this one by Simon Cowell. He said, "That's a no from me."
This one !		
	This would be my pic of the three choices. I love the colorful, impactful bluebird's point of view depicted on the north side of the building that people will see first when they come down Jackson Street. The rest of the mural that follows along the west side makes a nice continuation of the concept the artist has in mind.	
This proposal is absolutely lovely.		
	This one is my favorite.	
	This is the best one! It complements the surrounding area best	No please!
Very pretty. I love that he consulted with indigenous stakeholders.	Very pretty with bold color statements. Well thought at design relevant to the region.	Not well thought out. Generic.
I love this design and how it reminds us of our ties us to the environment.		
Do not like!	Does not really represent Moscow	Best design of the 3 options. Really like the boot/shovel. The Jackson Street side design with the bright colors will really help brighten up the area. This design gets my vote!
Yes please!		
This is incredibly beautiful! I absolutely love the arches and how they make a pattern and their placement corresponds to the windows of the building. The turtles and the bird motif are so well designed and it truly embodies the Camas Prairie and the Palouse region. I live in Moscow and would adore having this mural on Jackson Street. The colors are classic and vibrant without being distracting for drivers. The artist's comments on the region shows they've certainly done their homework on the region and I think that shows in their work! This is my first choice for a mural and I truly hope this is chosen as the winner! It's fresh and unique while remaining classic and timeless.	This design is loud and doesn't feel as intelligently designed for this region. What makes this mural set apart and designed with this Palouse region in mind? Most forests have these elements. I have never once seen a bluebird here in Idaho and most certainly never in Moscow. I had no idea Idaho's state bird is a bluebird. They're just not really visible around here in this landscape.	This mural is generic. I can see what the artist did with the transition from monochromatic to bright colors, but I think it looks like it was made using CGI which has a cheapening effect. This mural is one dimensional and lacks special interest to the eye.
I don't want to drive by amphibians or reptiles for 10 years but the camas are lovely. It's a little one note, repetitive and jarring with the animals swimming in the flowers.	Definitely the most dynamic without being ugly. The color and scale are more harmonious. Appreciate the real palouse flora and fauna. Something I would prefer to look at but honestly, are these the best you could get, Moscow?	One dimensional, boring from the minute you see it- would be awful to see every day.
I think the art is beautiful, and the flowers do represent the Palouse well. However, the art seems to be more tropical than inland Northwest.	I really enjoy this art and how deeply it represents our beautiful state. Though our area is more defined by pine trees, I love the forest and nature.	I like how this art represents the agricultural nature of our area. Growing up for several years on a 100 acre plot of farmland, I know the work my great great Grandpa had to do to tame the land and farm it. That said, I think our state has done well to preserve more of the wooded areas, allowing for more wild animals to flourish. I think the flowers do represent a sub-section of the area, but not the area as a whole.
This is by far the best design, both in terms of artistic merits and design, and also direct tribute to Indigenous inhabitants and their culture and land/water use traditions. Also makes clear the role water plays both literally and metaphorically as the single most important connection between human inhabitants of the Palouse and the rest of our living environment. Of the three designs, this also seems the most in the spirit of the original mural that was vandalized, presumably by someone with a Taliban-like agenda against artistic representations of women relaxing or enjoying themselves in nature. Important that the City of Moscow not allow such people to unilaterally censor or dictate the kinds of public art we can have in our town.	Subject matter is fine, but scattered and not to my eye a representation of an ecosystem so much as a cut & paste job via a computer, including stock background. Low in terms of artistic merit and design.	Low artistic and design merit, and misses the idea of nature in favor of emphasizing the human hand in reshaping the natural landscape. Boot and shovel image does nothing for me.
A little overdone for the side of a building, but the most pleasant and tasteful of the three proposals, and has to do with the Palouse.	Too bright and overdone.	Too random.
This is the best one. Local wildlife and flora represented in well-done paintwork.		

This is my favorite design! Its styling and color are reminiscent of art deco or craftsman stained glass, which hails back to the heyday of Moscow's downtown while being very modern in scale. I could happily look at this long term.	This is my second favorite submission. It is still beautifully colored and fun to look at, but the photo realism gives it less stylistic flair, and is more reminiscent of a natural science museum display.	This is my least favorite submission. The colorful flowers have merit, but they are so stark in relation to the black and white that I find the aesthetic jarring and gritty rather than pleasing. I understand the emotion behind the working boots, but they are presented in a charmless way that is, again, stark, and more like a lifeless museum display. It evokes more feelings of sadness than nostalgia.
This is my number 2 choice. It's busy but cheerful.	This one is my favorite. Blends with the sky more than the others.	Please not the giant shoes. Just no. No garish flowers either.
Reminds me of Alphonse Mucha, my favorite artist. I like the animals and I know my kids would like seeing this too.	Colorful!	Kind of hurts the eyes though! I appreciate the idea. Finding a kind of flower more familiar to the area would be good, even succulents. Succulents can be visually stunning, they're all over our neighborhoods, and they can stand for adapting to hard weather and perseverance through tough circumstances.
1 vote for this one!		
Yes, this one is great! This one has my vote. I particularly like the long-toed salamander on this one.	I don't like this one so much. It's alright.	Hard no. This one is too garish and the boots and shovel look odd.
I find this mural to be very beautiful and also the easiest to see how it might look as a final project. The artist renderings are beautiful and I love the movement. One thought or potential adjustment would be to highlight a few other animals instead of a repeat of the same turtle and bird species. For example, a moose is often an iconic Moscow visitor, and the mountain bluebird is a state bird and could be highlighted. I also appreciate the artists attention to the palette so emblematic of the Palouse.		
Absolutely love this!		
This is pretty and reminds me of the artistic style of well illustrated children's books from the 90's. Soft on the eyes, not jarring. I'd be glad to see this as a mural!	This is the best option by far! Striking colors with ties to regional and local animals and trees. It attracts the eye to the building in a really good way and represents the natural world of our section of the PNW beautifully! It's bold without being alarming. I'd love to see this as the mural!	The digital glitch combination of black and white into the bright colors is not great. It's stark and not pleasant to look at or drive by. It seems like it's attempting a transition from black and white to color, but it looks like a permanent state of indecision. Also, by nature of the color of the walls and the shadows that the north facing wall is constantly in, the boots, gloves, and trowel (best part of the painting) will be very hard to see. This painting finishes in last place. :/
Love this one!		
This is the best of the three options. Simple, beautiful, and works well around the windows. The colors also seem like they will work all times of year.	This is the second best of the options. Pretty but pastes right over the windows and does not incorporate them which is a bit jaunting.	This is my least favorite of the three. The color with the non-color and the completely different subject matter bothers my eyes. The mural itself looks like a Shutterstock photo with a bunch of pixel and b/w layers on top. Please don't use this one.
I really like Jay's design. It's beautiful and pays homage to both the natural beauty of these Palouse and to historic architectural elements with the rounded arches. Their color palette is subtle and inviting.	Proposal number 2 would be my second choice. Again, I appreciate the celebration of nature. Though I still prefer #1, I find the colors and composition of #2 pleasing.	I do not like proposal #3. It does not have the personal touch that #1 and #2 bring. These panels feel like stock images I could find on Google. These colors are out of place with the natural color palette of our region and town. As impressive and eye catching as this mural would be, nothing about it seems rooted in the character of Moscow. We want a mural that celebrates our city, not generic clip art.
	Love the emphasis on local flora and fauna. Also love seeing something beautiful being displayed. This one gets my vote!	This one seems to fit better in a warmer climate, not North Idaho so much.
Love this! So Moscow!		
This is the piece where its details showcase Northern Idaho's beauty in three main ways: - Colors references both farming and U of Idaho. As well as being easy on the eyes for drivers passing by. - Content references the natural beauty of Northern Idaho. This just shows the artist's attention to detail and efforts to learn from local experts / professionals. - Concept design overall is simple to understand, has longevity and is presents more subtle details the longer you look; kind of like Idaho as a state.		
I like this composition. Can't say, as a Moscow resident, that I've seen an amphibian like the one that dominates the side mural. I don't associate that with Moscow.	This design seems busy. I think too busy to be enjoyed by passing traffic.	Interesting. I enjoy the dissociated association between the side and front of the building. Are any of these artists local? We are fond of the "local" mantra when it comes to the Farmers Market. If we have to spend \$25K (taxpayers money?) shouldn't it feed back into our community?
This proposal makes me want to look for days. The colors, theme, and objects are a delightful composition. I appreciate that this catches the eye but is not garish.	While I like this one, it does not feel locally specific to Moscow. It could work in Boise or CDA. A great runner up.	I appreciate the concept but find this one garish and disjointed. The other two have a better understanding of local flora.
Beautiful and captivating! My choice is Proposal 1		
Love the camas and finches. I don't think the arched doorways are necessary, kinda distract from the plant/animals for me. How about a Palouse giant earthworm?	Though it grows here sporadically, I don't personally associate aspen with the Palouse or Moscow. There's other places aspen really dominate - Midwest, parts of the NE, parts of CO and Utah, etc. I'd prefer another tree species or focus on the syringa or other flowering native shrubs like roses, ninebark, currants, serviceberry or native forbs like blanketflower and bunch grasses, or crops like wheat, canola, or legumes.	Love the boots! It'd be great to swap out the flowers for some native flowers like blanket flower, camas, spirea, currants, etc and/or some local crop flowers like canola, garb/lentil or wheat.
This proposal is my favorite since it is the most natural looking and the colors aren't jarring as they are in the other proposals. In my opinion, art on buildings should complement the area that they are located in instead of overpowering the area.	I am not a fan of this proposal. The colors aren't natural and it doesn't fit the surrounding area of the building.	This is my least favorite of the proposals. The colors are unnatural and don't complement the building or the area in which the building is located. Also, the photo and the flowers do not go together well.
It is very pretty but the turtle and salamander are not common themes seen in the City of Moscow. I am also concerned that the paint will look dirty overtime with the light colors.	These are nice murals but the mural represented in Image E with flowers, deer, and birds seems like something more fitting for the City of Moscow, even though this was designed for MN. This would be my second choice.	I love this mural the most! The vibrant flowers are consistent with spring and summer in Moscow. The boots with Moscow, ID on the tongue represents many in our community who enjoy the great outdoors that surround us and gardening. I feel that this one fits the city the best.
This one is amazing!	This one is pretty good.	This one is terrible.
In my opinion, this is clear winner among the three finalists. The design is GORGEOUS, with a direct and deeply rooted connection to our community. Even in the mock up image, this mural looks "meant to be."	While I enjoy this design, it feels more out of place on the wall. When compared to Mr. Rasgorshek's design, a clear winner is apparent, and it is not this design.	This mock up strikes me as one designed by someone unfamiliar with the area and community. While choosing a local artist is not a necessity for a successful outcome on this project, this entry and the accompanying description from the artist demonstrate an unfamiliarity with this community and, consequently, do not reflect a design that is most compatible with our town. I appreciate the artist's honest about his unfamiliarity with the area, but I do not believe that this design is the best choice for our new mural.
This mural is the best because it highlights the history and artistry of the Palouse in the spring with the camas lily -- but what's interesting is it also chooses animals from across our biomes to get the point across. We have so few native species of amphibians, so it's great to see one used beautifully, and of course a reptile and a bird bring a lot of joy as well. Please choose this one!	This looks AI generated and about the level of a temporary vinyl wrap for a utility box. Not that that's a bad thing -- but not for something permanent that everyone will see, many people twice daily!	The concept of work boots to capture the spirit of Moscow Idaho is bizarre, and flower to represent our community was captured better by proposal 1, the camas lily.
This is beautiful and light and would make a wonderful addition to our city.	This one is also wonderful.	

This submission is excellent. It highlights local flora and fauna of the region in a beautiful and compositionally interesting way. This submission also gives us a great feel for the lovely limited color palate and rendering style that will be employed. This would be a stunning addition to our community.	This submission is also excellent. The extreme perspective on the quaking aspens is compelling, although our region has fewer quaking aspens than other tree varieties, aspens are a lovely choice based on the contrasting texture of the bark. This highlights local fauna beautifully. Because this mural highlights the state flower and state bird, it seems like it would make more sense to also highlight the Western Whitepine, however the yellow leaves of the aspens make an effective backdrop with adequate contrast for the highlighted fauna.	This submission doesn't highlight the diversity of our region as well as the others. The nod to the hard work it takes to cultivate a community is appreciated. This submission also doesn't give as clear an idea of rendering style as the others and the color pallet is not focused.
I like this one a lot this is by far my favorite of the 3	This one's okay, I don't love it but I'm not upset about it	I really do not like this one the black and white is weird and the boots look dumb
This is my top choice, by a wide margin. The subject matter is appropriate, there's a great sense of artistry and composition, the colors are harmonious, the turtles and salamander bring a whimsical character to the mural, and the overall concept obviously works well with the existing building (something the other two finalists just simply ignored).	Beautiful images, and the Syringa flowers are appropriate, but the Mountain Bluebird and Stellar's Jay are very infrequent visitors to the Palouse, and the Aspens are not at all emblematic of this region - yes, they exist here, but they don't remotely rise to the level of being symbolic of the local flora as they do in other geographic areas. This would be my second choice.	The flowers are nice - not extraordinary in any way, just nice - but the other facade is too dark and over-simplified. I understand that the artist was aiming for this contrast, so I suppose that's a mission accomplished. But there's just not very much of a story being told here. I would rank this entry third.
This is the sauce, let's go with this. It feels unique and classy, what a public art display should always endeavor to be.		A bit gaudy.
Beautiful and a perfect representation of the Nez Perce tribe and the local land.		
This is the best one!		
Jay is talented, but this appears too muted.	This one is my absolute favorite. Captures the Palouse nicely. This is my favorite - I really delight in the perspective of the aspens and could get lost in that forest with joy. Love the Stellar's Jay! Please select this one. So beautiful. I came back to add another comment: as I scroll through all of the options, this one catches my eye again and again - I have to stop and look more in depth. It's so good!	While I love the portion of this mural that honors the blue collar history and roots of Moscow, the contrast on the Jackson St side is not as appealing to the eye. I do like the vibrance of the colors, though. If the bright right side spanned across that face of the building it would perhaps be too bright for some, but would settle that conflicting appearance that negates the consumer's ability to enjoy the mural. This would be my second choice, personally.
Beautiful. Fitting.	Style seems odd for such a large space. There is "pop" but seems obnoxious and out of place.	This is awful.
	I appreciate the boldness of Ernesto's colors and overall design. I believe this design will be the most striking and memorable to visitors.	
	My FIRST CHOICE among the three	I like the Trompe l'oeil of the boots, but the flower choices leave me "cold." Perhaps native flowers would "warm my appreciation." Darion has a good story ... and his idea of customization is intriguing.
		The only proposal I have objections with is Darion Flemming - Image A. Too masculine. Women work and live in the City too.
It's been a long time since I've seen a turtle in Moscow, but perhaps I'm just missing out. Maybe another aquatic animal would be more representative of Moscow and the Nimiipuu culture.	I love all of Ernesto's submissions.	
Best option of the three and the Art Deco influence fits better with the architecturally interesting water department roof next door.	While generally beautiful, our area is not known for quaking aspens.	While interesting, the big boots are a little "shocking" and can produce double takes. Not a great option near a stop light where the risk for rear-end collisions is higher. Something calmer is a better choice.
This would be my choice! The colors of the flowers would brighten up a dreary day!	To me this is too busy and distracting.	Probably my 2nd choice. I like the flowers. Not so sure about the boots.
This one 100% is the finest please do this one		
Love this! Perfect blend of beautiful art, cultural significance, and local flora/fauna.		
This one is best.		
This is beautiful. I however don't know that it represents Moscow.	This is probably my favorite of the options you have given us. However, all options fail to really represent the Moscow agriculture that the town is based on. This is a generic mural that could be seen in any town.	While this mural is pretty, there is nothing in it that speaks to Moscow. You could find this mural anywhere. It shows a lack of knowledge of our town. Maybe you should focus on someone local that understands the culture of our town.
All of the muralists are great, but I vote for Jay's camas mural. It honors local species and nez perce culture, which I think is important. And it's tasteful and beautiful!		
Is this a local artist? I have not heard of him.	Is this a local artist? Although very pretty, I'm not sure this captures Moscow or the Palouse's essence.	This one is my favorites, but Darion is not native to the Palouse.
Fantastic! This gets my vote.		
I like this one!		
This is not right for our community. What about a landscape of the palouse? Or hiring a local?	This is not right for the area. We should have something that follows the flow of other murals in our town.	These are plain ugly. This is the furthest thing from Moscow. The palouse is a beautiful place to live and this fails to highlight that. Please hire someone in our area.
My favorite! THIS ONE! I love Jay's inclusion, significance, and importance of our Indigenous/Nez Perce/Nimiipuu culture with the camas lily, plus our prairie and mountain influences. And yes, he's correct in composing in a scale that is pleasing to the eye, both driving by and walking past. (The other proposals, while having unique and aesthetic aspects, are overwhelming in scale.)	Stunning images, but way too overwhelming in scale. And, even though I am a UI alum, I don't think nor want this mural to be a "go vandals" shout out.	Colorful, but way too large in scale, and the boots/trowel do not appeal to me for what this mural needs as image.
This is my 2nd choice. Very nice.	This is my 1st choice! I love this proposal so much! It incorporates our native flora, fauna, & the changing seasons. The size & colors are perfect. The aspens are magnificent.	This is my 3rd choice. I feel that the flowers are too big & too bright, & that it represents much less than it could compared to the other mural choices.
I really enjoy the use of locally important camas lily. The image is soothing, inviting, and doesn't overwhelm the eye. I don't typically think about turtles locally so I think this piece brings up the importance of the local ecosystem, learning, growing, and getting back in touch with our roots. Would love to see this piece added to our community.	I enjoy the local elements and bright bold appearance. It looks like it fits with our local area in foliage and fauna. I do personally feel like the singular bright blue bird is a bit overwhelming, but I love them use and symbolism through out their piece. I would also enjoy seeing this piece in our community.	While this is beautiful it feels too literal and simplistic. I don't see much of a story or local roots in this imagery. It doesn't scream PNW or Idaho to me, it's just some gardening imagery.
Out of all the submissions this one is the most satisfactory. The colors are quite pleasant and they go well with the rest of the surrounding buildings. However, I fail to understand why they have included a turtle and salamander. Once again I think we should veer away from random wildlife and instead stick with a simple mural of the skyline of the palouse would be stunning and a true representation of our area.	while this mural includes a good variety of wildlife, I think that it misses the mark. The colors are not cohesive with the surrounding buildings or landscape. I also think that instead the mural should incorporate wildflowers from the area as well as mountain bluebirds, as they are Idaho's state bird.	This submission is horrendous. The colors are absolutely assaulting. Not only does it not capture the beauty of the palouse but it also fails to capture the essence of the community of Moscow. Moscow is truly a unique place because of the rolling hills, the historic buildings, the countless farms and fields, and the beautiful people that make up this sweet and small community. I think that the mural should pay homage to the people and things that make this town so amazing. A mural of the palouse for example would be beautiful.
This one for sure!		
This one gets my vote! Love the colors and brightness and all the local creatures.		
This is my favorite. The appreciate Jay's efforts to research the local wildlife and to include yellow for U of I. It is beautiful.	Nice art, but too much color contrast and the animals are too large.	The flowers are too bright and the shoe is too large and not beautiful to look at.

I love this one the most - how it transforms the wall into a series of arches with the illusion of the plants growing from a garden bed below. I love the camas lilly too. Pick this one!	too busy	I'm not crazy about the photographic look to the image and am not sure the boots, shovel and flowers hang together.
yes please, proposal #1 get's my vote		
Absolutely beautiful! I love how cohesive it is. This is my favorite by far!		
Mango votes for this mural! Having rehabbed painted turtles in this region, I think they are the not so often highlighted wildlife here that also need awareness!		
This is absolutely beautiful, and I think it really captures the beauty of the Palouse		
Love this one!	Not a fan	Thanks, but no thanks
This is by far the best proposal! Fantastic work.		
	Love the wildlife	Love the bright colors!
Beautiful!!! Really love all the themes and colors!		
I love the Camas in this one.	My favorite. I think the colors here are the most eye catching.	Love the boots, and I did notice the Moscow, Idaho tag! Perhaps a few flowers native to the Palouse.
I love this!! I got a tattoo of the camas flowers to remind me of Moscow! To me that is the Palouse!		
This is my favorite because it works so nicely with the windows and features local plant and animal life. I will vote for this one as soon as I figure out how-or is this my vote?		
The colors on this are natural and beautiful, but the floating amphibians just don't fit. Instead of admiring the art, I look at it and wonder why turtles and newts are flying through grass.	This is my favorite of the three.	I don't like this mural at all. It two scenes do not go together or compliment one another. The colors are too bright and unnatural. The whole thing is garish.
This one has my vote! Love the arches and the muted colors.		
	This is beautiful and would love to see this around town!	
This one!		
Wonderful!		
	This one!	
This is lovely work. Thumbs up.	Beautiful, my favorite. Love the colors.	
This is my favorite. The color and composition is harmonious. However the turtles and newts are off-putting and evoke a general feeling of mucus that suffuses the whole piece. consider editing to not be so slimy.	photorealism seems excessive, no?	this is horrendous. please do not paint this assault to the eyes
This one should win! Absolutely hands down my favorite!		
This one looks the most like art, not like photography or bad photoshop.	This looks like really bad photoshop. The colors are too bold and clashing, and the perspective is unnatural and confusing.	This one is not cohesive at all. The two walls are too highly contrasting against each other. The digital glitch effect is also unnerving and does not look like human art.
I really like the camas being displayed. I vote for this one. I've also seen many turtles here - maybe not many salamanders myself!	Colorful and bright! Would be okay, also.	Although I understand the garden boots, I prefer color over black and white.
This is by far the most attractive of all three.	This looks like it was generated by AI	This is the least attractive option by far.
This mural is absolutely fantastic. Feels very "Moscow" and the elements included create a deeper meaning to the mural, which I think reflects our wonderfully region and community! Jay Rasgorshok is also an amazing artist, his murals in Boise are amazing! We'd be lucky to have a mural of his in our area.		
#1 pick		
I think Jay's mural is beautifully rendered and would be the best mural of the three proposed. Not only does the diversity of the flora and fauna successfully portray Idaho's natural beauty, but from an artist's standpoint, it fits the space the best. It looks measured and calculated, is far more classic and timeless than the other proposals (i.e. does not look isolated and modern, but the illustration style is not dated), and the color palette is beautiful, subtle, and simple. It is clear that the artist did their research, and interacted with the community and with local organizations in order to compose it.		
This mural would be my #1 choice. I really appreciate the reference to the Camas Lilly, which has sustained generations of people in our area. I think this mural is most closely tied to our particular location.	This mural would be my #2 choice. I like the bold images and colors and the references to local wildlife.	This mural would be my third choice. To my eye, Image A appears to be a billboard advertisement for an outdoor goods store. I prefer artwork that is more symbolic and full of color.
		Represents the lovely rural aspects of Moscow. Also the workworld that supports our gardens.
This is my favorite! I love how the colors are reminiscent of the wheat fields!		
This is pretty and not too distracting for people trying to drive.		
None of the above. We can do better than this.	None of the above. We can do better than this.	None of the above. We can do better than this.
My favorite of the three proposals by far. I like the whimsical nature and the style. I think it will fit very well with the other public art that is around town already. The color palette works really well with its surroundings too.	The design feels busy to me - losing detail from the background a big more might have helped the eyes focus on a few main subjects of the piece. A solid second place behind Proposal 1. I don't really see the "worm's perspective" because the angle seems off.	This work, while very nice, does not feel very Moscow or Idaho to me. It could be in any city in any state - minus the "subtle things." Stylistically it also doesn't fit in with the other public artwork in town. Of the three proposals, this is third place for me.
I love how this artist considered the building when creating their piece. The windows are part of the plan rather than an interruption to it. This one gets my vote for sure!	This one feels like an art that doesn't know it's a screensaver.	This proposal feels like it doesn't know our city and also isn't clear on its own direction. It feels very disjointed and therefore unpleasant for something meant to add beauty to the town.
I love this one! It looks beautiful from all angles, honors Idaho, as well as adding architectural interest to an otherwise bland space with its arches. I can imagine children and adults taking equal delight in the design.		
	I love proposal 2. Ernesto Maranje's Changing Chroma.	
	I love proposal 2. Ernesto Maranje's Changing Chroma.	
This is my top choice.		
This one is amazing!! Hope it is chosen		
	This one best depicts Idaho in its natural beauty.	
This is beautiful!		
So beautiful and perfect for the Palouse!		
Absolutely love the style and look of this. The salamander really sold me on this proposal as well. Gorgeous work.	This is a really interesting and colorful piece. I think I have a hard time fully imagining what the final piece will look like without a rough style guide or colored sketch. I do enjoy the idea of the bird flying through the different seasons.	I see what you're going for with the tools and crop sort of idea. I think what would really help your proposal is to make the crop more unique to the area or feature some of our colorful native plants. This would assist in making the mural more personal to the town!

This one is beautiful! The artist is clearly talented. This one looks unique and goes with local flora and fauna in the region. I also love how he worked with the building's architecture to create the piece. The colors are cheerful without being loud and aggressive. They clearly put a lot of time into drawing and designing a nice, harmonious piece. I love community art that inspires curiosity, and I can easily imagine being with kids who want to stop and look at the plants and animals, and ask about what kind of salamander or bird or flower is that and learning about that means they know more about our environment and history.	I can see where the artist is going with this, but I feel like the hyper-realistic, clip-art style is not the best design for a wall mural. The blue jay seems like it doesn't match with the background and the colors are a bit jarring. I also feel like the style doesn't stay consistent throughout the piece which makes it look disjointed.	This would make a great piece for a work boots ad or billboard, but I'm not sure if it works as a wall mural. The emphasis on the boots and the shovel is reminiscent of an Amazon Prime ad for free shipping on shoes. I think the hazy flowers are kind of fun but again, the more hyper-realistic pieces never seem to work well with murals because they look like an advertisement for something. In addition, the colors are a little loud for that area.
Of the three proposals, I think Jay's best captures the color palette and ecosystem of the Palouse. I appreciate his representation of different people inhabiting the region - the indigenous Nimiipuu and the university crowd.		
I love the portrayal of this mural! The colors also match the surroundings much better.		
This one is beautiful! Definitely my favorite of the three :)	Very nice, a little bit busy as a mural design, would prefer something a little more simple.	Not a big fan of the glitches and greyscale, doesn't seem to represent Moscow as well as the other two.
This is absolutely awful!!	This isn't representative of the Palouse at all. Why are we portraying a community that isn't ours???	If they could change this to be flowers native to the Palouse that would be great! But these flowers are not!! Your choices for "finalists" are very confusing! Why do none of these portray our region? They don't have to be a "traditional" Palouse mural, but none of these are appropriate choices. Also, take pride in our local talent! Choose a local and not someone that doesn't even know our community. Put your money to work in our own community there are plenty of options! Please kindly thank these 3 for their time and try again with something that isn't a generic mural that can be found anywhere.
I prefer this one because it looks like original artwork and it represents the area best.		
Love the colors on these! My favorite of the 3.	Bright	Interesting
The art style and color palette seem the classiest of all of these. I like the animals and flowers inside the arches, each one gets a focus and the message is clear but beautiful.	This is 2nd in my opinion. Beautiful realistic scenes but a little too realistic to be plastered on a building I think. The bold colors could be obnoxious. Looks more like a screensaver.	No thank you. Looks like a billboard ad on the boots side and an art film on the flower side.
Love it! I vote for this one!		
This is lovely, first place.	2nd place	3rd place; pretty garish and loud on one side, and boring colors on the other side.
My vote is for Jay!		
	This one is my favorite.	
Beautiful		
I really like this proposal. I like the colors and the focus on camas which is an important flower to this area.	I do not like this proposal as much, I do not like the photo-realistic style.	I do also like this proposal. I like the contrast between the two sides of the building and the boots and the shovel.
We have a treasure in the springtime when the Camas lily blooms. Including the camas in this mural is appropriate for this area. This mural image has a nice depiction of a variety of plants animals with a nice balance of color and design. This is my favorite of the proposals.	This mural has nice strong colors and illustrations that stand out, I especially like the Stellar Jay.	
The artist has obviously put a lot of thought into the theme and context of the mural. The images draw the eye and provoke interest. Hands down the most interesting and theme appropriate proposal.	This proposal looks a lot like random computer generated or altered stock photo imagey slapped on a wall. Not very creative or inspiring.	Oh joy, more random edited stock photos slapped on a wall.
I like that the camas is prominently featured. This mural is my favorite of the three finalists.	ABSOLUTELY LOVE THE BIRDS! DO EEET!	
This one is excellent! I'd love to see it in Moscow.	I like the vibrant colors. I don't feel this murals scale matches with the building.	My favorite part of this mural are the shoes.
I like this one the best.	This would be my second choice! Also lovely.	
I like the connection with local plants and animals and how it looks like columns. Love this one.		
		This is the best of the three
Aquatic animals not very Palousie.	Love, love the blue birds. Deer forest scenes less so. Ernesto is clear #1.	Does not feel cohesive. Kind of like boots, trowel, gloves.
	This my second choice	I really like this one best! The contrast is meaningful and reflects the work that many do on the Palouse.
This mural does not at all represent the essence of "Moscow" yes we do have salamanders and turtles in Moscow, but that's not what I'd want to see in a mural that's supposed to reflect our Moscow community.	We don't have mountain blue birds or stellar Jay birds here in Moscow ?? This does not in any way capture the culture or core of Moscow.	Flowers? And not even wild flowers and a garden spade, not even a shovel?? We are a farming community, how about a wall mural that captures our wheat fields at least.
I really like this submission. It is clear to me that Jay Rasgorshchik took the time and effort to understand what makes the Palouse ecologically and culturally unique, and put that into his design. The use of complimentary colors brightens the piece, while maintaining a good grounding in earth tones. Also, I really like that the piece compliments the architecture of the building, expanding on the repeating pattern of windows with the panels in between. I'd be happy to see this mural every time I drove by.	While I see a lot of Idaho in this piece, I don't see much of the Palouse. The mural doesn't seem to interact with the buildings architecture at all. This one is not my favorite.	I like this one the least, the colors are garish and don't reflect the Palouse to me. The West and North walls lack a unifying theme to me, and I can imagine myself frowning at it every time I drove by. Please don't select this one.
Colorful but too busy	Love the trees but the birds don't seem to fit and not a huge fan of the animals.	Voting yes for this one. Super interesting and the flowers are so cheery.
How the artist uses color is pleasing to the eye. But the mural looks like a fish tank except there are lizards and turtles in the fish tank.	Raspberries do not grow in the wild as the artist depicts. But with a slight change in shape, they could be Thimble Berries which you can see growing here.	The contrast is too much for me as well as the flowers and their color and size.
Second best. Messy. Flying turtles are cool but not really Moscow.	The best option. Nice to look at. I want to see this driving home from work.	Please no.
I love the way the arches align with the windows! And the animals flow smoothly from frame to frame.	The native birds is an excellent touch! Very vivid and would be inspiring during bleak winter!	I like the more realistic nature better for this part of town
I do not think that the creatures in this mural represent the Palouse. This artist obviously hasn't spent much time on the Palouse	My fav!	
	This is a beautiful design. However Quaking Aspen aren't something that comes to mind when I think of Moscow and the Palouse. What about the rolling hills and wheat fields? This could have been designed from afar and not by someone who has experienced the special aspects of the Palouse region. North Central Idaho, yes but not the Palouse.	I like this concept and would hope that this artist would work with local farmers and community members to create something that truly reflects the Palouse region.
This is sparse and uninspired.	Please choose this one. It's lovely and represents Idaho well.	Meh. Its kind of okay? I don't like it much though. Just choose proposal #2. It really is the best and only worthwhile option.
This is sparse and uninspired.	Please choose this one. It's lovely and represents Idaho well.	Meh. Its kind of okay? I don't like it much though. Just choose proposal #2. It really is the best and only worthwhile option.
Beautiful!! Choose this one		
I love the camas lily. I also like the style and color scheme of this mural. I also appreciate the conversation with PCI.	I'm in love with the birds in this proposal. I find the colors of the rest of the mural a bit chaotic. I appreciate all the research on Idaho specific flora and fauna but I'm not sure they all go together well. For example, the syringa flower stands out and the contrast is a bit much.	This mural does not feel like it represents Moscow to me. I don't identify with the digital-looking flowers. I also find the black and white mural to be drab.

I like this one but the salamander and turtles feel odd mixed with the birds. If this one was selected I'd recommend just sticking to birds!	This one feels the most "Moscow" to me! It would feel like home :)	I like how this one has a bright pop of color! It would be fun to drive by and bring joy. I do think more could be done to give it that "Moscow" feel. Perhaps changing the flowers to more local flora.
	I love the use of the ID bluebird and syringa, bringing in symbols of Idaho. This is my favorite of the three, and I am much happier with the final images, without the deer. They are striking and will be amazing to see once installed	
	This one is my favorite. I'm a sucker for quaking aspens but it's the variety of color, natural elements, and native birds that make it my first choice.	
	I love this one!	
Select this artist		
	Winner, winner, chicken dinner. This is what I would like to drive by, and have visitors drive by to get a glimpse at the vibe and culture of our town.	
Pretty, but there are no sea turtles in the area.	Pretty, but I feel like the birds are too big.	This is beautiful! I LOVE it and it would be perfect!
I like the patterns in this mural and appreciate his use of the camas as a foundation element of design. The style is reminiscent of Tiffany glasswork.	A colorful dynamic design, this captures much of Idaho's natural landscape. Enjoyed his use of seasons.	This is my least favorite because it is still an idea in formation. The artist does not capture a sense of place.
Why is the City of Moscow WASTING Taxpayer money on such a ridiculous project? I did not like the old mural and was happy when the building was repainted a solid color. It was unfortunate that the building was vandalized and painted with graffiti, that is never ok. However, I was happy with the decision to paint the building a solid color. I think all these murals all over town make Moscow look ridiculous not improved. I understand that my opinion is only one of many, but I definitely should not be funded with taxpayer money. If an outside group or organization wants to pay then let them, but stop using tax money for "beautification" because what some see as beautiful others see as an eyesore. That's how I see these murals as an eyesore!	Why is the City of Moscow WASTING Taxpayer money on such a ridiculous project? I did not like the old mural and was happy when the building was repainted a solid color. It was unfortunate that the building was vandalized and painted with graffiti, that is never ok. However, I was happy with the decision to paint the building a solid color. I think all these murals all over town make Moscow look ridiculous not improved. I understand that my opinion is only one of many, but I definitely should not be funded with taxpayer money. If an outside group or organization wants to pay then let them, but stop using tax money for "beautification" because what some see as beautiful others see as an eyesore. That's how I see these murals as an eyesore!	Of all the options given Side A of proposal 3 is the only one that matches the Palouse! The others look out of place and do not match the natural scenery of the Palouse region. I we have to do this mural please do proposal 3 side A and have sides B and C look more like side A in composition and color!
I like this one!		
Beautiful! Love it!	Rich and beautiful	I vote for proposal 1!
	Image C and D: We love the Idaho aspen trees in the fall and the mountain bluebird flying into summer with the green aspen trees and the syringa flowers.	
Very good. Interesting. In my view, second of the three proposals.	Please choose this as the winner. I love seeing the blue birds and the aspens. I would love to see this each time I pass the building. It is uplifting and absolutely beautiful.	Interesting and artistic. I like the bluebirds and aspens better - but this is very nice.
Of the three beautiful proposals, I think Jay Rasgorshek's would best fit the public space. The colors and design work well with the building layout and are not too distracting to drivers. The detail is exquisite, offering people something new to spot with each passing. It feels the most balanced too which I like. So, this is my choice for the mural. But the others are great too. Thanks, Rebecca Phillips, Moscow		
I love this! Great work Jay.		
This one is the best!		Ugly
This has got to be the one, it just screams Moscow, Idaho.		
This is clearly the best fit for Moscow and for the Water Department Building. I love the way the Jay Rasgorshek has come to know and respect our local environment and history. He shares it well in murals that fit the proportions of the building. As someone who drives and walks by this building, I will appreciate it while doing both. I see myself looking for these animals as I walk the trails at PCEI, stroll from pond to pond at the UI Arboretum, or hike at Idlers Rest etc.	While this is beautiful, I don't feel that it fully respects its canvas. It could be anywhere and doesn't speak to me as, "Moscow".	This is interesting, but it is too overwhelming for the location.
This artwork captures species native to Moscow beautifully. Jay Rasgorshek represents both the aspects of Moscow as a city, and the natural beauty of Moscow as a part of the Palouse well. I especially love the Camas both for its value as a native plant that can be found, and for the historical value to Moscow (formerly called Camas Prairie).		
I think this mural nicely weaves the artwork with the canvas of this particular building. I like how it does not conflict with the windows and that adds a sense of calmness to the display (but I must confess, I cannot recall noticing the windows when drive-by viewing the original mural). However, I did not readily make the historical connection represented by the purple flowers because I didn't recognize the camas lily, but I like that symbolism now that I've read about it. My initial impression was that the flowers and reptiles were a connection to water, and thus, the Water Department. And while the artist may intend to tie the yellow with the University of Idaho, when it's combined with the purple, it immediately makes me think of the University of Washington's colors. So I have mixed feelings about this mural, I like the design layout and concept but I think there's too much yellow paired with the purple.	I like the bluebirds and the stellar's jay and the syringa blossoms, and aspens are one of my most favorite trees. In concept, I like the perspective of looking up at the trees, but I worry that it doesn't work here because of how the tree angles conflict with the building's windows. In the photo, it's jarring. But since I cannot even remember how the windows fit into the original mural, maybe this will work when viewed close up by drivers on Jackson Street. And while I like aspens a lot, the grove depicted on the north wall, while beautiful, doesn't make me think of Idaho... the topography in the image is too flat.	The boots and tools image on the North Wall immediately gets my attention. It's clever and gives the impression that we don't take ourselves too seriously. I like how the grey-scale image takes advantage of the north side shadows. The west wall mural doesn't make a specific effort to incorporate the windows, but it doesn't conflict with them either. If I think about it, I can make sense of the transition from the north wall's black and white to the bold colors on the west wall. And while I wouldn't mind if the artist added some green (gardening) to the west wall, the color choices seem to be symbolically neutral in my mind. Flower beds and gardening promote a positive feeling about our community. All things, considered, this is my pick.
I think this is a beautiful piece that really shows how important and gorgeous the nature and history of the area is.		
This is my favorite of the three, by far. I love the natural colors contrasted with the purple. The gold and green feels very Palouse to me, as the grass and hills change with the seasons. And the archway motif is so elegant, as if displaying or showcases, elevating the turtles, birds, etc.		
My vote!		
		I do not think this design reflects on Moscow's unique qualities, nor does it beautify the building.
This is a beautiful design, moderately reflects Moscow's unique qualities, and would improve the building.	This is a detailed design that carefully reflects Moscow's unique qualities, and it would be a beautiful addition to our city.	
	I like this one best of the three final proposals. It would be amazing to walk and drive by!	
	The one with the turtle is not very Idaho. 2 or 3 are good	Not the boots and shovel, flowers are better
This is perfect		
This is so beautiful! Thank you for considering the perspectives of both the driver and the individual walking the neighborhood. Using the camas lily and local wildlife as inspiration really exemplifies the Palouse as our home and honors our native roots. I appreciate the nod to Vandal gold without using the mural as a full-blown advertisement. Moscow is so much more than the University. Of the three finalists, this is the most visually appealing, thoughtful, and unmistakably nails the project theme prompt.	Doesn't really feel authentically Moscow. I appreciate that the artist intentionally incorporated the state flower and bird, but it still looks more like a generic forest scene found anywhere.	The artist themselves admits that this is a little lackluster... Looks like an ad for Home Depot rather than a playful celebration of Moscow community.

This one looks like old lady wall paper.	This one is terrible! It looks like stock photos and we don't even have aspen groves here. Also the birds included aren't that common here either.	This one is okay. Not that mural-like. Also like a banner with photographs. I think it's the best of the three though.
PROPOSAL 1: "Celebration of the Camas Lilly" by Jay Rasgorshek		
Is wonderful and has my enforcement for best use of the mural space. The colors feel somewhat washed out, making the mural feel dated before it's even been installed.	I really like the north wall, but I feel like the birds in the west wall could be more local than our state bird, since I don't know if I've ever seen a mountain bluebird in Moscow. I like the vibrant colors, they make the mural feel alive and energetic.	The "old shed" part of the mural feels depressing. In Moscow our historic areas aren't beaten down or drab, but vibrantly highlighted by our beautiful weather and landscape. The "new flowers" also seem to be pretty disconnected from Moscow, not really representative of our local flora.
	There is no Palouse native Fallow or Roe deer, Aspens are not a major ecosystem to the Palouse, Purple Coneflowers is non-native to the area. This should not even be an option for representation of the unique Palouse prairie region. Disgraceful.	
First choice, appreciate the included thought for the Nez Perce	No, it's not cohesive, just the same scene in different seasons crammed together. Also doesn't feel representative of anything Moscow related	2nd choice, it's pretty and like the subtle Easter egg moscow references but no one will ever really see them on that side wall
This is by far the best mural. Public art that feels is in a hand painted or illustrated style feels more authentic to Moscow and its art scene. The subject matter does well to represent the theme and is unique from other art around town but won't feel out of place		
This one is my favorite! It really represents the theme		
This submission Portray the theme in the best way out of the three. Public art that has a hand drawn or illustrated feel Aligns with Moscos art scene much more than photography or hyper realism. The details in this are make it interesting and will be something that people can find something new in every time.	Although this piece is drawing in Idaho's plants and animals, the trees and birds are not something you see is much in Moscow. It feels like an image of somewhere else.	
This proposal is fitting for Moscow. I find this one to be the most pleasing out of all the proposals. Thank you		
I like this one the most out of the 3 options.		
		Not a fan of this one. This is Moscow not Detroit
This is my favorite. It's on target and pretty. I appreciate the artist's inclusion of Palouse native flora and fauna.	There are no Aspens near here! Don't like this one at all.	I like the flowers and glitching digital look. The boots and potting shed side is terrible though.
I like this one the best, sort of an Art Nouveau look, very clean. Illustrative but not smarmy. And who doesn't love a camas flower?		
This aligns with our small town. Beautiful		
This is our family's number one choice.	We do not see many quaking aspens here and this does not seem to fit the Palouse, but I understand the artist will become more familiar with our landscape and adjust accordingly. Concept is great for a mural.	We need color and the gray scale on the side will disappear in the winter when the skies are gray for days on end. Also, a small spade seems out of touch. Flowers that grow here naturally would best. Keep it local or go completely abstract. Doesn't make sense to not be reflective of the Palouse.
I think this design work well with the architecture of the building, highlighting it rather than hiding it. The color palette will be pleasant all year round. This would be my first choice.	I like the idea of bringing more nature into the city. This would be my second choice.	This design is goes from bright and distracting to dull and depressing. I wouldn't have understood the message behind the mural if it hadn't been explained.
this one	not this one	not this one
I really enjoy the color palette of this one! Feels very natural and complementary for each of our seasons- won't be too garish in the dead of winter. Also appreciated the specific nod to the cultural significance of this flower for the Nimipuu		
	this is the one I like the most	
Very nice, simple, soothing #2	Nice, too busy and distracting #3	Great. #1 Rural, common working values The best
This mural looks the best and honors a local flower and food source.	I find the colors jarring and the subject matter very generic.	This looks like AI designed hotel art.

From: [Robin Kyle](#)
To: [Megan Cherry](#)
Subject: Arts mural project
Date: Wednesday, June 26, 2024 1:15:19 PM

CAUTION: This message originated from outside the City of Moscow's network. Exercise caution when clicking links or opening attachments. If in doubt, please contact Information Systems at extension 7004.

As a lover of the country here I am concerned that the mural be by local artists depicting local scenes.

We have amazing artists to choose from. The unique landscape of the Palouse along with the farm workers who artfully paint our fields with crops, row contouring, varied hues, and tints of vibrant color rainbows while growing our food. The unique buildings, grain elevators, churches and towns, not to forget the many cultures represented in the barns need to be given true representation by those who know it best. When we lived in Phoenix for our employment, artistry "sculptures" "adorned" our new freeways to add beauty. They had commissioned someone nonlocal. We had modern art of pots, toilet looking things and nonSouthwest art pieces that looked ugly in our environment. There was such an uproar, they were removed. Don't waste our eyes or \$\$\$ on nonlocal talent. Thank you
[Yahoo Mail: Search, Organize, Conquer](#)

From: [anna landis](#)
To: [Megan Cherry](#)
Subject: Mural Proposals Comment
Date: Thursday, June 27, 2024 11:05:11 AM

CAUTION: This message originated from outside the City of Moscow's network. Exercise caution when clicking links or opening attachments. If in doubt, please contact Information Systems at extension 7004.

Dear City of Moscow,

It is so wonderful you guys are working hard on getting proposals for the mural in our city that would represent the people and place the best. I looked over these three that have been sent in and did not think that any of them truly represented the Palouse. They just don't seem to really embody accurately this area. I would encourage the council and voters to re evaluate and take your time to find a really great one. So that all this work and money doesn't go into something that's only mediocre.

The birch trees and bluebirds are just not what you see when you look around the Palouse and northern Idaho.

Granted, the mountain bluebird is our state bird, the view would be more of golden and green Palouse hills, maples and evergreens.

And the camas lily with all the reptile critters are just too much in their larger than life size crawling on a building.

An outdoor view that is a horizon or mountain of this caliber is so much more appealing in this size. And the gardening shoes with tools might represent the farming, but those neon daisies and electric colors don't accurately represent the kind of flowers we see thriving around here.

I know this is just one residents humble opinion, but if anyone else is also thinking that these murals are missing the mark, maybe we can re-evaluate the style and imagery we want to see representing us on a huge mural, and not just settle for what has been turned in. We can spend more time looking further to make it great.

Thanks for your consideration,

Sincerely,

Anna Landis

ARTWORK COMMISSION AGREEMENT FOR
PUBLIC ART PROJECT 2024 MURAL AT
THE CITY OF MOSCOW BUILDING AT JACKSON & A STREETS

THIS ARTWORK COMMISSION AGREEMENT FOR PUBLIC ART PROJECT 2024 MURAL AT THE CITY OF MOSCOW BUILDING AT JACKSON & A STREETS (hereinafter "Agreement"), is made and entered into this _____ day of _____, 2024, by and between Artist TBD (hereinafter "ARTIST") and City of Moscow, Idaho, a municipal corporation of the State of Idaho, 206 East Third Street, Moscow, Idaho, 83843 (hereinafter "CITY").

WHEREAS, CITY invited artists and artist teams to submit qualifications for a mural to be installed on the City of Moscow building located at Jackson and A street; see RFQ attached as Attachment "A" (hereinafter "Project"); and

WHEREAS, CITY's Selection Panel recommended finalists to take part in submitting site-specific designs for the Project; and

WHEREAS, CITY, after completing its review and selection process of all site-specific design proposals, has determined that ARTIST's proposal, as detailed in Attachment "B", meets the selection criteria and would best serve the needs of CITY for Project; and

WHEREAS, ARTIST and CITY wish to enter into an Agreement regarding Project;

NOW THEREFORE, the Parties to this Agreement, in consideration of the mutual covenants and stipulations set out herein, agree that all matters stated above are found to be true and correct and are incorporated herein by reference as if copied in their entirety and shall be adopted with the following:

1. Duration: This Agreement shall become effective on the date indicated above and shall remain in effect until satisfactory performance of all services is completed, unless terminated for breach or as provided in this Agreement.
2. Scope of Work:
 - A. Description of Artwork. [Artwork title and description pending] (hereinafter "Artwork") see Attachment "B".
 - B. Time of Performance. ARTIST shall coordinate commencement and installation of the Artwork with CITY Arts Manager and shall have the Artwork completed no later than September 30, 2024. ARTIST shall immediately notify CITY of any delay which occurs or which is anticipated to occur so that arrangements can be made to complete the Artwork for Project as close to the completion date of September 30, 2024 as reasonably possible. Date of delivery and installation may be extended, for a reasonable amount of time, due to circumstances and events beyond control of CITY and/or ARTIST, due to unforeseen circumstances, or upon written Agreement by the Parties.

- C. Consultation with CITY. If requested by CITY, ARTIST shall, prior to fabrication and/or installation of the Artwork, meet with CITY to review the proposed Artwork and ensure that it can be maintained over the period of its lifetime without extraordinary expense, and that it comports with the design as submitted to CITY.
- D. ARTIST shall only use Benjamin Moore or Miller brand paints that are a high quality, exterior grade latex paint specifically designed for residential and commercial applications. If ARTIST desires to use an alternate brand of paint, ARTIST shall get pre-approval for said paint from the Arts Manager.
- E. ARTIST shall complete a Commission Artwork Detailed Report provided by CITY once installation of the Artwork is complete.

3. Services:

- A. Quality of Services: ARTIST's standard of service under this Agreement shall be of the level of quality performed by professionals regularly rendering this type of service. Determination of acceptable quality shall be made solely by the CITY.
- B. CITY Review of Services: ARTIST's services shall, at all times, be subject to CITY's general review and approval. ARTIST shall confer with CITY periodically during the progress of ARTIST's services, and shall prepare and present such information and materials as may be pertinent, necessary or requested by CITY to determine the adequacy of the services of ARTIST's progress. Upon reasonable prior notice to ARTIST, CITY and its elected officials, officers, employees and agents shall have the right to make reasonable inspections and reviews of ARTIST's progress with respect to the services.

4. Compensation:

- A. ARTIST shall receive an amount not to exceed Twenty-Five Thousand Dollars (\$25,000). This amount may be used for travel expenses, food, any design fees, lodging, and all expenses related to the creation of ARTIST's Artwork, installation, and community engagement presentation. This amount shall constitute full compensation for all services, materials and fees to be performed or furnished by ARTIST pursuant to this Agreement.
- B. Payment shall be made in two (2) installments:
 - First Installment of Ten Thousand Dollars (\$10,000) shall be paid at the time of the execution of this Agreement.
 - Second and Final Installment of Fifteen Thousand Dollars (\$15,000) shall be paid after completion of the Project and CITY's receipt of the Commissioned Artwork Detailed Report.

5. Termination:

- A. Termination of Agreement. This Agreement may be terminated by ARTIST upon thirty (30) days' written notice, should CITY fail to substantially perform in accordance with its terms through no fault of ARTIST. CITY may terminate this Agreement upon thirty (30) days' written notice without cause and without further liability to ARTIST except as designated by this section.
- B. Termination of Project. If any portion of Project, covered by this Agreement, shall be suspended, abated, abandoned, or terminated by CITY, at no fault of ARTIST, CITY and ARTIST agree ARTIST will be compensated for the work completed in an amount to be agreed upon by the Parties. If any portion of the Project, covered by this Agreement, shall be suspended, abated, abandoned, or terminated by CITY due to ARTIST failure to perform under the terms of this Agreement, CITY will determine what, if any, additional compensation may be provided to ARTIST or any cost of reimbursement from ARTIST to CITY for payment made to ARTIST upon execution of this Agreement.

6. CITY Responsibilities:

- A. CITY's Responsibility for Special Costs and Rights-of-Way. CITY shall pay for all costs for obtaining licenses and permits that may be required by Federal, State, and local authorities; and shall be responsible for securing necessary land, easements, and rights-of-way where applicable.
- B. Data of Record. CITY shall make available to ARTIST all technical data of record in CITY's possession, including maps, surveys, architectural plans and drawings, and other information required by ARTIST relating to the Project.
- C. Prior to ARTIST beginning installation of the Artwork, CITY shall ensure that the surface preparation and a primer coat of paint are applied to the surface where the Artwork is to be installed. Once the Artwork is installed and accepted by CITY, CITY will apply an anti-graffiti clear coat of paint to the Artwork.

7. General Terms:

- A. Independent Contractor: The contracting Parties warrant by their signatures that no employer/employee relationship is established between ARTIST and CITY by the terms of this Agreement. It is understood by the Parties hereto that ARTIST is an independent contractor and as such neither ARTIST nor any of ARTIST's employees are employees of CITY for purposes of tax, retirement system, or social security (FICA) withholding.
- B. Conflict of Interest: ARTIST covenants that they presently have no interest and shall not acquire any interest, direct or indirect, in Project which would conflict in any manner or degree with the performance of their services hereunder. ARTIST further

covenants that, in performing this Agreement, they shall employ no person who has any such interest.

- C. Changes in Regulations: ARTIST is to perform their work under the current Federal, State, and local laws and regulations in full force and effect at the date of this Agreement.
- D. Non-discrimination: ARTIST shall not discriminate against any employee or applicant for employment on the basis of race, creed, color, religion, gender, gender expression or identity, pregnancy, national origin, ancestry, age, marital or familial status, veteran status, mental or physical disability, sex, sexual orientation, genetic information, or any other basis prohibited by local, state, or federal law.
- E. Modification and Assignability of Agreement: This Agreement contains the entire Agreement between the Parties, and no statements, promises, or inducements made by either Party, or agents of either Party, are valid or binding unless contained herein. This Agreement may not be enlarged, modified, or altered except upon written Agreement signed by the Parties hereto. ARTIST may not subcontract or assign rights (including the right to compensation) or duties arising hereunder without the prior written consent and express authorization of CITY. Any such consultant, subcontractor or assignee shall be bound by all of the terms and conditions of this Agreement as if named specifically herein.
- F. Special Warranty: ARTIST warrants that nothing of monetary value has been given, promised or implied as remuneration or inducement to enter into this Agreement. ARTIST declares that no improper personal, political or social activities have been used or attempted in an effort to influence the outcome of the competition, discussion, or negotiation leading to the award of this Agreement. Any such activity by ARTIST shall make this Agreement null and void. ARTIST further warrants that all materials and goods supplied under this Agreement shall be of good merchantable quality and that all services will be performed in a good workmanlike manner. ARTIST acknowledges that they will be liable for any breach of this warranty.
- G. Costs and Attorney Fees: In the event either Party incurs legal expenses to enforce the terms and conditions of this Agreement, the prevailing Party is entitled to recover reasonable attorney's fees and other costs and expenses, whether the same are incurred with or without suit.
- H. Jurisdiction and Venue: It is agreed that this Agreement shall be construed under and governed by the laws of the State of Idaho. In the event of litigation concerning it, it is agreed that proper venue shall be the District Court of the Second Judicial District of the State of Idaho, in and for the County of Latah.
- I. Binding on Agents, Subcontractors, and Successors: CITY and ARTIST each bind themselves, their partners, agents, subcontractors, successors, assigns, and legal representatives to the other Party to this Agreement and to the partners, agents,

subcontractors, successors, assigns, and legal representatives of such other Party with respect to all covenants of this Agreement.

- J. Severability of Provisions: Whenever possible, each provision of this Agreement will be interpreted in a manner as to be effective and valid under applicable law. However, if any provision of this Agreement or the application of any provision to any Party or circumstance will be prohibited by or invalid under applicable law, that provision will be ineffective to the extent of the prohibition or invalidity without invalidating the remainder of the provisions of this Agreement or the application of the provision to other parties or other circumstances.

K. Notice:

1. Communication with CITY shall be to City of Moscow Arts Manager, 206 East Third Street, Moscow, Idaho, 83843, email mcherry@ci.moscow.id.us. The Arts Manager or designee shall examine the documents of the work as necessary, and shall render decisions related thereto in a timely manner so as to avoid unreasonable delays.
2. Communication to ARTIST shall be to Artist TBD, Address TBD, [Email](#) TBD.

L. Insurance:

1. **Insurance Required.** ARTIST and any subcontractor or agent shall maintain automobile insurance and statutory workers compensation insurance, employer's liability and comprehensive general liability insurance coverage, all as required by law.
2. **General Liability.** ARTIST shall provide, at ARTIST's expense, general liability insurance with limits of not less than One Million Dollars (\$1,000,000) per occurrence, combined single limit bodily injury and property damage, covering ARTIST's work in fabricating, transporting, and installing the Artwork, which shall be in force for no less than fifteen (15) days prior to ARTIST's commencing work, until completion and final acceptance of the Artwork by CITY.
3. **Worker's Compensation and Employer Liability Insurance.** Worker's compensation insurance shall be provided to cover any employees involved in producing the Artwork in such amounts required by Idaho law for all work performed in Idaho or in such amounts as may be required by Idaho law.
4. **CITY as Additional Insured and Term of Insurance.** On all insurance policies required under this Agreement other than auto, CITY shall be named as an additional insured and the policy shall provide it may not be cancelled or reduced in coverage, except upon thirty (30) days prior written notice to CITY. Any cancellation of insurance, other than auto, without appropriate replacement in the amounts and terms set forth herein, shall constitute grounds for termination of

this Agreement. Each type of insurance required by this Agreement shall be in force for no less than fifteen (15) days prior to ARTIST's commencing the PROJECT until completion and final acceptance of the Artwork by CITY.

5. ARTIST to provide Certificates of Insurance to CITY. ARTIST shall insure that CITY is provided a Certificate of Insurance for each insurance policy required by this Agreement.
6. Contractors and Subcontractors. ARTIST shall insure that all contractors, subcontractors and agents of ARTIST provide the insurance required herein and that each such contractor, subcontractor and agent shall provide CITY a certificate of insurance and shall name CITY as an additional insured on PROJECT, and shall provide documentation of any agreement between ARTIST and contractor(s)/subcontractor(s) relative to PROJECT.

M. Hold Harmless:

1. Indemnification. ARTIST waives any and all claims and recourse against CITY, including the right of contribution for loss and damage to persons or property arising from, growing out of, or in any way connected with or incident to ARTIST's performance of this Agreement, except for liability arising out of the sole negligence of CITY or its officers, agents, or employees. Further, ARTIST shall indemnify, hold harmless, and defend CITY against any and all claims, demands, damages, costs, expenses, or liability arising out of ARTIST's performance of this Agreement.
In addition to other rights granted CITY by this Agreement, ARTIST shall defend, indemnify, and hold harmless CITY, its officers, agents, and employees, from and against any and all losses, lawsuits, actions, claims, judgments for damages, or any injuries or damages received or sustained by any person, persons, or property, and losses, expenses and other costs including litigation costs and attorney's fees arising out of, resulting from, or in connection with the acts and/or any performances, activities, errors or omissions by ARTIST or their subcontractors; or on account of or in consequence of any neglect in safeguarding the work; or because of any act or omission, neglect, or misconduct of ARTIST or their subcontractors; or because of any claims or amounts recovered from any infringements of patent, trademark or copyright; or from any claims or amounts arising or recovered under the Workmen's Compensation Act or any other law, ordinance, order, or decree.
2. Risk of Loss. ARTIST shall take such measures as are reasonably necessary to protect the Artwork and materials being used by ARTIST to create the Artwork from loss or damage until ARTIST has completed delivery to CITY of all materials specified herein and ownership is transferred to CITY, which shall occur when installation is complete.

N. Copyright:

1. Copyright and Publication of Materials. ARTIST shall retain the copyright and all other rights in and to the Artwork, provided that CITY is hereby granted an irrevocable license to graphically reproduce (through photography or otherwise) the image of the Artwork without CITY cost, expense or payment to ARTIST, including but not limited to, the Artwork proposal and all preliminary studies, models and maquettes thereof that have been delivered to and accepted by CITY, and to authorize third parties to graphically reproduce (through photography or otherwise) any and all of the same, as are desired by CITY, for municipal (e.g., education, public information, etc.) purposes. On each such reproduction, ARTIST shall be acknowledged, using designations provided by ARTIST, to be the creator of the original Artwork thereof, provided that reproductions of any preliminary studies, models and maquettes shall not be identified as or represented to be the finished Artwork. The rights granted by this provision shall survive the expiration or earlier termination of this Agreement.
2. Waiver of Rights Under Visual Artists Rights Act of 1990. ARTIST understands and agrees that, as to ARTIST's rights in the Artwork, the provisions of this Agreement shall supersede the provisions of the Visual Artists Rights Act of 1990 ("VARA"), 17 U.S.C. § 101 et. seq., as amended, including but not limited to § 106A(a) and § 113(d), as to the Artwork, and that execution of this Agreement by ARTIST shall constitute a waiver by ARTIST, as permitted in 17 U.S.C. § 106A(e), as amended, of any and all rights or protections in the Artwork, and any uses of the Artwork whatsoever, set out in or otherwise granted by 17 U.S.C. § 101, et. seq., as amended, including but not limited to § 106A(a) or § 113(d), or otherwise in the nature of "Droit Moral" under which artists claim an interest in their work. ARTIST understands that, despite the CITY's commitment not to intentionally damage, alter or modify the Artwork without the prior written approval of ARTIST, alterations to the site and/or removal of the Artwork from the site may subject the Artwork to destruction, distortion, mutilation or other modification, by reason of such site alterations or its removal.
3. Ownership. The Artwork shall be a limited edition of one (1), unique, artwork that is a two-dimensional mural [Artwork title pending] as described herein. ARTIST shall not reproduce the Artwork elsewhere or allow the Artwork to be reproduced elsewhere. ARTIST warrants that, unless otherwise set forth in writing, the Artwork will be an original, in that the Artwork owes its creation or origin to ARTIST and is not the product of copying another's work in any manner. Furthermore, ARTIST warrants and represents that ARTIST has not previously published the Artwork which is transferred by and the subject of this Agreement and that ARTIST is the sole owner of all rights therein. Except as provided in this Agreement, upon final acceptance and acceptance of Artwork, installation, and final payment to ARTIST, CITY shall own the Artwork. ARTIST hereby expressly waives any right, title or interest in the Artwork created for the Project. ARTIST understands that this waiver includes waiver of the exclusive rights of reproduction, adaptation, publication, performance and display.

- O. Notification of Use: CITY agrees to make a reasonable effort to notify ARTIST of CITY's intent, if any, to use or adapt materials developed for Project following completion of Project.
- P. Post-Installation Repairs, Maintenance, or Alterations:
1. ARTIST shall not be responsible or liable for any damage to the Artwork, its surfaces, or environment caused by personnel of CITY or its employees or agents, visitors, members of the general public or others beyond the control of ARTIST.
 2. ARTIST shall not be responsible or liable for any damages to the Artwork caused by extremely adverse weather conditions, acts of God, vandalism, or other acts abnormal to the site beyond the control of ARTIST.
 3. CITY may provide basic maintenance, restoration and repairs as it deems necessary. CITY will assume cost for repairs upon expiration of the one (1) year warranty period set forth in this Agreement through the end of the mural installation period which is anticipated to be between 5 – 8 years from time of installation. Whenever practical and fiscally possible, ARTIST shall be given an opportunity to perform and/or act as consultant for the repair or restoration of the Artwork, for which ARTIST shall be entitled to reasonable compensation, provided CITY directs the repair or restoration. In the event that the Artwork is damaged or destroyed, CITY, in its sole discretion, may restore the Artwork or choose not to restore the Artwork, subject to receipt of any insurance proceeds and other funds sufficient for the repair or restoration.
- Q. Warranty: Upon final acceptance of the Artwork, ARTIST warrants that the Artwork shall be free from defects in materials and workmanship, including inherent vice. ARTIST shall, for a period of one (1) year from final acceptance of the Artwork by CITY, correct any such defects at ARTIST's own expense. "Inherent vice" refers to a quality within the material or materials that comprise the Artwork, which, either alone or in combination with other materials used in the Artwork or reacting to the environment, results in the tendency of the Artwork to destroy itself. Upon written notification of a defect in materials or workmanship, ARTIST shall have sixty (60) days to commence repairs. ARTIST shall conclude the repairs within a reasonable time.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed as of the date indicated above.

I, Artist TBD, certify under penalty of perjury pursuant to the law of the State of Idaho, that the foregoing is true and correct.

ARTIST

CITY

City of Moscow, Idaho

By: _____
Artist TBD

Arthur D. Bettge, Mayor

ATTEST:

Laurie M. Hopkins, City Clerk

Attachment “A”
RFQ for mural at Jackson and A Streets

DRAFT

Attachment “B”
ARTIST Proposal

DRAFT

COMMITTEE / CITY COUNCIL STAFF REPORT

DATE: Monday, July 22, 2024



AGENDA ITEM TITLE

Phenix USH, LLC d/b/a Spin-License Agreement for Shared Mobility (ACTION ITEM) - Cody Riddle

RESPONSIBLE STAFF

Cody Riddle, Deputy City Supervisor - Community Development

ADDITIONAL PRESENTER(S)

DESCRIPTION

Staff will present a proposed one-year license agreement between the City and Spin, for the operation of shared-use scooters within the City. If approved, the agreement will allow deployment of up to 150 shared devices (scooters). The shared mobility program was established through an amendment to Title 11, Chapter 2, of Moscow City Code back in 2022. The current proposal is similar to an agreement previously entered into with Bird Rides. They never deployed their devices and that agreement expired.

As specified by the adopted ordinance, the newly proposed license agreement includes a downtown dismount zone, where riding electric assist devices is prohibited on the sidewalk. Devices can be operated safely on the streets in this area. The mobility provider will geo-fence the designated area to ensure compliance, and the City has installed signage to communicate this standard. This will be especially important for private users whose devices are not regulated by a shared provider. The agreement also includes a no parking zone around Friendship Square, and another adjacent to the Student Union Building on the University of Idaho Campus. Additional provisions applicable on campus include a speed limit of 9mph around the core, a limit to parking devices only within established racks, and a prohibition from riding in the arboretums or on the President's residential property. Finally, the document includes a provision for impounding devices not operated, stored, or maintained in compliance with the ordinance or other agreement standards. If approved, the agreement will be in effect for one year. This will allow for an annual review of the effectiveness of the shared mobility program and inform changes to future agreements if necessary.

REVIEWED BY

PROPOSED ACTIONS

PROPOSED ACTIONS: Recommend approval of the License Agreement with Spin, or provide staff with further direction.

STAFF RECOMMENDATION

Recommend approval of the license agreement with Spin.

OTHER RESOURCES

FISCAL IMPACT

PERSONNEL IMPACT

The deployment of shared mobility devices will impact Police Department staff, who are responsible for the enforcement of the agreement and associated ordinance provisions.

ATTACHMENTS

1. License Agreement-Spin_Final with attachments

**LICENSING AGREEMENT FOR SHARED MOBILITY PROGRAM
BETWEEN CITY OF MOSCOW, IDAHO AND
PHEENIX USH, LLC D/B/A SPIN**

THIS LICENSING AGREEMENT FOR SHARED MOBILITY PROGRAM (hereinafter “Agreement”) is made this ____ day of _____, 2024, between the City of Moscow, a municipal corporation of the State of Idaho, 206 East Third Street, Moscow, Idaho, 83843 (hereinafter “CITY”), and Pheenix USH, LLC d/b/a Spin, whose business address is 8605 Santa Monica Boulevard, #20388, West Hollywood, California, 90069 (hereinafter “COMPANY”).

INTRODUCTION

WHEREAS, CITY has enacted an ordinance regarding shared mobility programs for bicycles, E-bikes, E-scooters and E-boards, Moscow City Code Title 11, Chapter 2, included as Attachment “A”; and

WHEREAS, shared mobility programs provide a multimodal transportation option to the residents and visitors of the City of Moscow, reduces traffic and parking congestion, and maximizes carbon-free mobility; and

WHEREAS, COMPANY is willing to adhere to the ordinance regarding shared mobility programs for bicycles, E-bikes, E-scooters and E-boards;

NOW, THEREFORE, it is agreed that all matters stated above are found to be true and correct and are incorporated herein by reference as if copied in the entirety and, for and in consideration of the mutual promises, covenants, terms and conditions hereinafter contained, the Parties agree as follows:

TERMS AND CONDITIONS

1. **Scope:** This Agreement and its terms apply to any proposed deployment of bicycles, E-bikes, E-scooters and E-boards sharing systems within the City of Moscow’s jurisdictional boundaries. No person shall deploy a shared mobility program in the City of Moscow in violation of this Agreement. Violation of any terms of this agreement or of the Moscow City Code is grounds for immediate termination of this Agreement and shall require immediate removal of deployed devices.
2. **Duties:** COMPANY’s Shared Mobility Program shall be governed by Moscow City Code, Idaho Code, the approved documents attached to the application, and the following attachments herein made a part of this Agreement by this reference:

Attachment “A”. Moscow City Code Title 11, Chapter 2

Attachment “B”. Dismount Zone Map

Attachment “C”. No Parking Zone

Attachment “D”. Speed Restricted Zone (University of Idaho Campus)

Attachment “E”. Access Prohibited Zone (University of Idaho Camps)
Attachment “F”. Share Mobility Program Application with Attachments

- 2.1 COMPANY shall have a local agent who will manage the repairs and relocation of the devices.
- 2.2 COMPANY shall provide easily visible contact information, including its toll-free phone number and email address on each bicycle, E-bike, E-scooter or E-board for members of the public to make relocation requests or to report other issues with devices.
- 2.3 COMPANY shall maintain a 24-hour hotline to field complaints and requests for immediate removal of devices.
- 2.4 COMPANY shall provide materials, videos, signage and other appropriate communication methods to promote safe riding and educate riders on rider responsibilities and encourage safe and courteous riding and parking.
- 2.5 All devices in COMPANY’s fleet shall be maintained and demonstrate a minimum utilization rate of two (2) rides per day to remain in service. If a device fails to meet the minimum utilization requirement, CITY may require such device to be relocated or removed from COMPANY’s fleet. COMPANY shall provide utilization reports to CITY of its fleet on the 1st and 15th day of every month.
- 2.6 All of COMPANY’s devices shall be maintained, cleaned and repaired to function in a safe manner in accordance with specific manufacturer and customary industry standards.
- 2.7 All devices shall be safe for operation and each device type may be inspected by the Moscow Police Department prior to operational deployment. Any device deemed unsafe for operation by the Moscow Police Department may be removed from CITY public property and impounded pursuant to Section 2.34 of this Agreement.
- 2.8 COMPANY shall remove any device not safe for operation from the public right-of-way within twenty-four (24) hours of notice and such device shall be fully repaired before being returned to service. Failure to comply with this duty may result in the device being impounded pursuant to Section 2.34 of this Agreement.
- 2.9 COMPANY’s devices shall be able to stand upright when parked and shall only be parked in the upright position. COMPANY shall ensure the devices are parked in a legal manner and in a manner to not obstruct the public right of way. COMPANY shall ensure devices are not parked on private property absent permission from the private property owner. City may designate specific parking areas as delineated on the attached map in Attachment “C”.
- 2.10 COMPANY shall not allow devices to be relocated by remote control and must manage relocation by its local operator or agent.
- 2.11 COMPANY shall exercise its own due diligence in reviewing the safety of CITY’s public right of ways to determine its sufficiency for customer use of the COMPANY’s devices.
- 2.12 COMPANY’s devices shall be available at rates (based on duration of time, distance or combination thereof) that are clearly and understandably communicated to the customer prior to device use.

- 2.13 COMPANY's devices shall not be operated on sidewalks within the "Dismount Zone" identified in Attachment "B".
- 2.14 COMPANY's devices shall not allow users to disengage from the mobile app or park devices in designated geo-fenced areas identified in Attachment "C". In addition, COMPANY agrees to geo-fence specific areas (within which operation of the devices would be prohibited) that are requested by CITY during special events and programs to protect the community engaged in the special events or programs. CITY will provide COMPANY forty-eight (48) hours' notice of the special events and programs that require additional geo-fencing which shall include the date, time, duration and a map of the special event device prohibition area.
- 2.15 COMPANY's devices shall be parked only in established racks on the University of Idaho Campus.
- 2.16 COMPANY'S devices are prohibited from operation and parking in the arboretums and the President's residence on the University of Idaho Campus, as shown on Attachment "E".
- 2.17 COMPANY's devices shall be limited to no more than 9mph as shown on Attachment "D".
- 2.18 All devices shall be labeled with a unique identification number, that is clearly visible and readable from a distance of at least thirty (30) feet, which shall be regularly updated with the Moscow Police Department. Additionally, pursuant to MCC 11-2-10. D. all devices are required to have a label that contains the classification number, top assisted speed, motor wattage, and shall be printed in at least 9-point type.
- 2.19 Daily Rebalancing of Fleet. COMPANY shall remove all of its deployed devices from the public right-of-way every twenty-four (24) hour period prior to six o'clock (6:00) A.M. to ensure its fleet is properly rebalanced and deployed. Any failure of COMPANY to remove deployed devices from the public right-of-way in a timely manner may be removed by CITY and impounded pursuant to Section 2.34 of this Agreement.
- 2.20 COMPANY shall maintain an electronic payment system that is compliant with the payment card industry data security standards (PCI). Each transaction shall include the bicycle, E-bike, E-scooter or E-boards identification number that corresponds to the make and model of the device registered.
- 2.21 COMPANY shall provide a copy of its Privacy Policy for customer information. Such policy must not conflict with City Code and to the extent there are any conflicts between Moscow City Code and COMPANY's Privacy Policy (including, but not limited to, terms and conditions of use, terms of service, etc.) the City Code and this License Agreement control. COMPANY understands it must notify CITY of all changes to its Privacy Policy immediately upon adoption.
- 2.22 COMPANY shall inform its customers of local traffic laws.
- 2.23 COMPANY shall educate its customers on how to safely ride and operate the rented device in the City, including the use of helmets.
- 2.24 COMPANY shall have each rider agree to a waiver of liability, including indemnifying CITY prior to use.
- 2.25 COMPANY shall allow customers without a smart phone to use the shared mobile devices.

- 2.26 COMPANY shall allow customers without a credit card to use the shared mobile devices.
 - 2.27 COMPANY shall provide CITY anonymized data in real time regarding the number of customers and trips. This shall be provided via an API including, daily and weekly rides, daily and weekly unique riders, hourly rides, daily and weekly app users, and trip information in MDS format.
 - 2.28 COMPANY shall provide device availability data for oversight of parking compliance and device distribution by minutes. This information shall include GPS coordinates, availability duration, availability start date and availability start time.
 - 2.29 COMPANY shall provide a detailed report of all devices including unique ID number, trip record number, trip duration, trip distance, trip date, start time, start location, and end location.
 - 2.30 COMPANY shall submit maintenance activities, including but not limited to, device identification number and maintenance performed within forty-eight (48) hours of request by CITY.
 - 2.31 COMPANY shall submit upon request by CITY, a record of all reported collisions involving COMPANY's devices. The report shall include the following information: date and time of the incident; the unique identifying number for the device(s) involved in the collision; information describing the nature of the collision; whether a customer was using the device at the time of the collision; what maintenance, if any, was performed on the device as a result of the collision; and corrective measures COMPANY has made to avoid future such incidents.
 - 2.32 COMPANY shall seek CITY's written approval before adding any additional devices to its fleet. Upon written approval of additions to COMPANY's fleet, but before deploying these devices, COMPANY shall provide CITY the following information: the unique identifying number for each device being added to the fleet; and information regarding the make model and year of the device being added.
 - 2.33 COMPANY shall not deploy any additional devices if COMPANY's devices have been impounded and have not been retrieved by COMPANY.
 - 2.34 COMPANY's failure to adhere to COMPANY'S duties as provided in Section 2 of this Agreement, may result in the impoundment of COMPANY's devices if not corrected within the permitted time frame. A fee of twenty-five (\$25) dollars per device, for each day of impoundment will be assessed. If COMPANY fails to retrieve the devices from impoundment and pay the impound fee, the devices will be disposed of at CITY's discretion after thirty (30) days of storage.
3. **Consideration:** COMPANY agrees to pay the annual operator fee, annual device charge, and maintain the required security deposit as listed on the Shared Mobility Program Application, herein made a part of this Agreement (see Attachment "D"), each year COMPANY engages in a shared mobility program within CITY's jurisdiction.
4. **Time of Performance:** This Agreement shall become effective upon execution by both Parties, and shall be effective for one (1) year.
5. **Independent Contractor:** In all matters pertaining to this Agreement, COMPANY shall be acting as an independent entity, and neither COMPANY nor any officer, employee or agent

of COMPANY will be deemed an employee of CITY. COMPANY has no authority or responsibility to exercise any rights or power vested in CITY. The selection and designation of the personnel of CITY in the performance of this Agreement shall be made by CITY.

6. **No Joint Venture:** Nothing herein contained shall be in any way construed as expressing or implying that the Parties hereto have joined together in any joint venture or liability company or in any manner have agreed to or are contemplating the sharing of profits or losses among themselves in relation to any matter relating to this Agreement.

7. **Indemnification and Insurance:**

COMPANY agrees to defend, hold harmless, and indemnify CITY, and its officers, agents and employees against any and all losses, claims, actions, judgments for damages, injury to persons or property and losses and expenses and other costs, including litigation costs and attorney's fees, to the extent caused by the negligent acts and/or errors or omissions by COMPANY, its servants, agents, officers, employees, guests, and business invitees.

COMPANY shall provide CITY with proof of insurance coverage exclusively for the operation of shared mobility programs including (a) Commercial General Liability insurance coverage with a limit of no less than One Million Dollars (\$1,000,000) each occurrence and Five Million Dollars (\$5,000,000) aggregate; (b) Automobile Insurance coverage with a limit of no less than One Million Dollars (\$1,000,000) each occurrence and One Million Dollars (\$1,000,000) aggregate; (c) Workers' Compensation coverage of no less than the statutory requirement; and (d) Cyber Liability insurance shall have a minimum of Five Hundred Thousand Dollars (\$500,000) per claim with Social Engineering Sublimit of One Hundred Thousand Dollars (\$100,000) per claim.

8. **Notices:** Any and all notices required to be given by either of the Parties hereto, unless otherwise stated in this Agreement, shall be in writing and be deemed communicated when mailed in the United States mail, certified, return receipt requested, addressed as follows:

CITY

City of Moscow
Attn: City Clerk
206 East Third Street
P O Box 9203
Moscow, ID 83843
(208) 883-7015

COMPANY

Phenix USH, LLC d/b/a Spin
Attn: Garrett Gronowski
8605 Santa Monica Blvd, #20388
West Hollywood, CA 90069
(888) 249-9698
Garrett.gronowski@spin.pm

Either Party may change their address for the purpose of this paragraph by giving written notice of such change to the other in the manner herein provided.

9. **Assignment:** It is expressly agreed and understood by the Parties hereto, that COMPANY shall not have the right to assign, transfer, hypothecate or sell any of its rights under this Agreement except upon the prior express written consent of CITY.

10. Discrimination Prohibited: In performing the Services appurtenant to a shared mobility program, COMPANY shall not unlawfully discriminate in violation of any Federal, State or local law, rule or regulation against any person on the basis of race, color, religion, gender, pregnancy, national origin, ancestry, age, familial status, veteran status, disability, sexual orientation, and/or gender expression/identity, or any other basis prohibited by Federal, State or local law.

11. Data Collection:

At such times and in such forms as CITY may require, COMPANY shall furnish to CITY such statements, records, reports, data and information as CITY may request pertaining to matters covered by this Agreement.

COMPANY shall maintain all writings, documents and records prepared or compiled in connection with the performance of this Agreement for a minimum of five (5) years from execution of this Agreement and for a minimum of five (5) years upon the termination or completion of this Agreement. This includes any handwriting, typewriting, printing, photo static, photographic and every other means of recording upon any tangible thing, any form of communication or representation including letters, words, pictures, sounds or symbols or any combination thereof.

12. Audits and Inspections: At any time during normal business hours and as often as CITY may deem necessary, there shall be made available to CITY for examination, all of COMPANY's records with respect to all matters covered by this Agreement. COMPANY shall permit CITY to audit, examine, and make excerpts or transcripts from such records, and to make audits of all data relating to all matters covered by this Agreement.

13. Compliance with Laws: All applicable Federal, State and Local statutes and regulations are hereby made a part of this Agreement and shall be adhered to at all times. Violation of any of these statutes or regulations by COMPANY shall be deemed material and shall subject COMPANY to termination of this Agreement for cause. No pleas of misunderstanding or ignorance on the part of COMPANY will, in any way, serve to modify the provisions of this requirement. COMPANY and its surety shall indemnify, defend and hold harmless CITY and its employees, agents, engineers and representatives against any claim or liability arising from or based on the violation of any such laws, codes, ordinances, or regulations, whether by COMPANY, COMPANY's employees, or its subcontractors.

1. Pursuant to Idaho Code § 67-2359, COMPANY certifies that it is not currently owned or operated by the government of China and will not for the duration of this Agreement be owned or operated by the government of China. The terms in this section defined in Idaho Code § 67-2359 shall have the meaning defined therein.
2. COMPANY certifies it is not currently engaged in, and will not for the duration of the Agreement engage in, a boycott of goods and services from Israel or territories under its control. Failure to comply with Idaho Code § 67-2346 will result in this Agreement

being void as against public policy.

3. Pursuant to Idaho Code Title 18 Chapter 87, COMPANY certifies that it is not an abortion provider or an affiliate of any abortion providers and does not, and will not for the duration of this Agreement, authorize the use of state facilities or public funds for abortion related activity.
14. **Public Information:** Pursuant to Idaho Code Section 74-124, *et seq.*, information or documents received from COMPANY may be open to public inspection and copying unless exempt from disclosure. COMPANY shall clearly designate individual documents as "exempt" on each page of such documents and shall indicate the basis for such exemption. CITY will not accept the marking of an entire document as exempt. In addition, CITY will not accept a legend or statement on one (1) page that all, or substantially all, of the document is exempt from disclosure. COMPANY shall indemnify and defend the CITY against all liability, claims, damages, losses, expenses, actions, attorney fees and suits whatsoever for honoring such a designation or for COMPANY's failure to designate individual documents as exempt. COMPANY's failure to designate as exempt any document or portion of a document that is released by CITY, shall constitute a complete waiver of any and all claims for damages caused by any such release.
15. **Changes:** CITY may, from time to time, enact changes in the Shared Mobility Program License Policies and/or City Code pertaining to bicycles, E-bikes, E-scooters and E-boards. Such changes shall be incorporated in written amendments to this Agreement.
16. **Termination:**

If, through any cause, COMPANY, its officers, employees, or agents fails to fulfill in a timely and proper manner its obligations under this Agreement, violates any of the covenants, agreements, or stipulations of this Agreement, falsifies any record or document required to be prepared under this Agreement, engages in fraud, dishonesty, or any other act of misconduct in the performance of this Agreement, or if the City Council determines that termination of this Agreement is in the best interest of CITY, CITY shall thereupon have the right to terminate this Agreement by giving written notice to COMPANY of such termination and specifying the effective date thereof. COMPANY may terminate this Agreement at any time by giving at least sixty (60) days' notice to CITY.

In the event of any termination of this Agreement, all finished or unfinished documents, data, and reports prepared by COMPANY under this Agreement shall, at the option of CITY, become CITY's property.

Notwithstanding the above, COMPANY shall not be relieved of liability to CITY for damages sustained by CITY by virtue of any breach of this Agreement by COMPANY. This provision shall survive the termination of this Agreement and shall not relieve COMPANY of its liability to CITY for damages.

17. **Construction and Severability:** If any part of this Agreement is held to be invalid or unenforceable, such holding will not affect the validity or enforceability of any other part of this Agreement so long as the remainder of the Agreement is reasonably capable of completion.
18. **Advice of Attorney:** Each Party warrants and represents that in executing this Agreement, it has received independent legal advice from its attorneys or has had the opportunity to seek such advice.
19. **Entire Agreement:** This Agreement contains the entire agreement of the Parties and supersedes any and all other agreements or understandings, oral or written, whether previous to the execution hereof or contemporaneous herewith. This Agreement may be amended only by written instrument signed by the Parties hereto.
20. **Jurisdiction, Venue, and Non-Waiver.** It is agreed that this Agreement shall be construed under and governed by the laws of the State of Idaho. In the event of litigation concerning it, it is agreed that proper venue shall be the District Court of the Second Judicial District of the State of Idaho, in and for the County of Latah. Failure of CITY to exercise any of its rights under this Agreement, or breach thereof, shall not be deemed to be a waiver of such right or a waiver of any subsequent breach. Should any litigation be commenced between the Parties hereto concerning this Agreement, the prevailing Party shall be entitled, in addition to any other relief as may be granted, to court costs and reasonable attorneys' fees as determined by a Court.
21. **Approval Required:** This Agreement shall not become effective or binding until approved by the City of Moscow.
22. **Authority to Execute.** The persons executing this Agreement on behalf of their respective Parties, represent and warrant under penalty of perjury pursuant to the law of the State of Idaho, that they have the authority to do so under law and from their respective Parties.

PHEENIX USH, LLC

Dated: _____

CITY OF MOSCOW, IDAHO

Arthur D. Bettge, Mayor

Dated: _____

ATTEST:

Laurie M. Hopkins, City Clerk

Approved as to form

Mia Bautista, City Attorney

ACKNOWLEDGMENT

STATE OF IDAHO)
 : ss.
County of _____)

On the ____ day of _____, 2024, before me, the undersigned Notary Public, personally appeared _____, known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that they executed the same.

IN WITNESS WHEREOF, I have set my hand and seal the day and year as above written.

Notary Public for Idaho
Residing at _____
Commission Expires: _____

ATTACHMENT "A"-MOSCOW CITY CODE

Chapter 2

BICYCLES, E-BIKES, E-SCOOTERS, AND E-BOARDS

Sec. 2-1:	Purpose
Sec. 2-2:	Definitions
Sec. 2-3:	General Standards
Sec. 2-4:	Riding on Roadways
Sec. 2-5:	Riding on Sidewalks
Sec. 2-6:	Riding on Non-Motorized Pathways
Sec. 2-7:	Bicycle, E-Bike, E-Scooter, and E-Board Parking
Sec. 2-8:	Tampering Prohibited
Sec. 2-9:	Abandonment
Sec. 2-10:	Shared Mobility Programs
Sec. 2-11:	Enforcement Agency
Sec. 2-12:	Penalties

Sec. 2-1. Purpose.

The purpose of this Chapter is to promote public safety by regulating the use of motorized vehicles, bicycles, E-bikes, E-scooters, and E-boards on roadways, bike lanes, sidewalks and non-motorized pathways within the City.
(Ord. 2022-04, 02/07/2022)

Sec. 2-2. Definitions.

For the purposes of this chapter, the following terms, phrases, words, and derivations shall have the meaning given herein.

- A. *Abandonment*: A bicycle, E-bike, E-scooter, E-board, or any part thereof, that is left or remains unattended or unused in a public place for seventy-two (72) consecutive hours or longer after it is tagged with a notice of intention to abate.
- B. *Bicycle*: Every vehicle having two (2) tandem wheels, or two (2) parallel wheels and one forward wheel, any two (2) of which are not less than twelve inches (12") in diameter, that is designed to be operated from a seated position, propelled exclusively by human power upon which any person may ride, except scooters and similar devices.

- C. *Bike Lane*: A portion of a roadway designated for preferential or exclusive use by bicycles, E-bikes, E-scooters, or E-boards that is distinguished from that portion of the roadway to be used by motor vehicles by a painted strip and other pavement markings.
- D. *Non-Motorized Pathway*: A completely separate right-of-way posted and designated primarily for use by bicycles, E-bikes, E-scooters, E-boards, or pedestrians, including but not limited to the Paradise Path, Latah Trail, and Chipman Trail, University of Idaho Pedestrian Walkways and similar non-motorized pathways.
- E. *Electric Power-Assisted Bicycle (E-bike)*: A vehicle having two (2) tandem wheels or two (2) parallel wheels and one forward wheel, any two (2) of which are not less than twelve inches (12") in diameter, that is designed to be operated from a seated position, by human power with the assistance of an electric motor. The device may be designed to also be powered by human propulsion. An E-bike is not a motor vehicle for purposes of this chapter.
- F. *Electric Power-Assisted Boards (E-board)*: A wheeled device that has a floorboard, that is designed to be stood upon when riding, and is powered by an electric motor. The device may be designed to also be powered by human propulsion. An E-board is not a motor vehicle for purposes of this chapter.
- G. *Electric Power-Assisted Scooter (E-scooter)*: A wheeled device that has handlebars, has a floorboard that is designed to be stood upon when riding, and is powered by an electric motor. The device may be designed to also be powered by human propulsion. An E-scooter is not a motor vehicle for purposes of this chapter.
- H. *Obstructive Bicycle, E-bike, E-scooter, or E-board*: Any bicycle, E-bike, E-scooter, E-board, or any part thereof, left in a public place that obstructs or impedes vehicular or pedestrian traffic.

- I. *Operator*: A person in exclusive control of a bicycle, E-bike, E-scooter or E-board and using the device.
- J. *Station-based Shared Mobility Program*: A system of self-service bicycles, E-bikes, E-scooters, E-boards or any combination thereof, for hire, operated by a station-based shared mobility program operator, which requires a bicycle rack and/or a bicycle, E-bike, E-scooter, or E-board sharing station.
- K. *Stationless Shared Mobility Program*: A system of self-service bicycles, E-bikes, E-scooters, E-boards, or any combination thereof, for hire, operated by a stationless shared mobility program operator, which does not require a bicycle rack or a bicycle, E-bike, E-scooter, or E-board sharing station.
(Ord. 2022-04, 02/07/2022)

Sec. 2-3. General Standards.

- A. Every person, regardless of age, who operates a bicycle, E-bike, E-scooter, or E-board upon a roadway, public parking lot, sidewalk, bike path, bike lane or other public vehicular right-of-way in the City of Moscow ("City") shall be granted the same rights and shall be subject to the same responsibilities applicable to a motor vehicle operator by the laws of the State of Idaho, and the provisions of this title not in conflict with and as authorized under title 49 of the Idaho Code.
- B. All operators of bicycles, E-bikes, E-scooters and E-boards are expected to operate the devices in a safe manner as approved by the manufacturer.
- C. *Exemption*: Any peace officer as defined in Idaho Code, operating a bicycle, E-bike, E-scooter, or E-board in the course and scope of his/her official duties is exempt from the requirements of this chapter.
(Ord. 2022-04, 02/07/2022)

Sec. 2-4. Riding on Roadways.

- A. No person shall operate a bicycle, E-

bike, E-scooter, or E-board on a roadway against the flow of motorized vehicular traffic, except where permitted by official signs or pavement markings.

- B. Every person operating a bicycle, E-bike, E-scooter, or E-board upon a two-way roadway is entitled to use the lane appropriate for the intended destination, including the right-hand lane. The bicycle, E-bike, E-scooter, or E-board rider shall proceed in the same direction of travel as other vehicles authorized to use that lane. On one-way roadways a bicycle, E-bike, E-scooter, or E-board may be operated in any existing lane.
- C. Wherever a bike lane is present upon a roadway, the operator of a bicycle, E-bike, E-scooter, or E-board shall use that lane and shall not use the roadway; except that the operator shall not be required to use or remain in a bike lane:
 1. When the lane is of insufficient width to permit safe bicycle, E-bike, E-scooter, or E-board operation; or
 2. When the condition of the pavement, or the presence of water, dirt, glass or other foreign objects upon the pavement prevents safe bicycle, E-bike, E-scooter, or E-board operation in the lane; or
 3. When moving into position to make a right or left turn; or
 4. When an opening car door or other obstruction in an adjacent parking lane requires movement out of the lane.
- D. The operator of a bicycle, E-bike, E-scooter, or E-board traveling at a rate of speed that delays a vehicle or vehicles following in the same lane shall be required, when it is unlawful or unsafe for the following vehicle to pass, to move as far to the right of the traveled roadway, or to the left where the bicycle, E-bike, E-scooter, or E-board is in the left lane of a one-way roadway, as is safe under the conditions then existing; provided, however, that when the operator is within fifty feet (50') of an intersection, the operator shall not be

required to move to the right or left until he/she has moved through the intersection.

- E. No person operating a bicycle, E-bike, E-scooter, or E-board may attach themselves or such bicycle or device to a moving motorized vehicle.
- F. Reckless or Inattentive Operation. A person who operates a bicycle, E-bike, E-scooter, or E-board on any public property or private property open to public use in an inattentive, reckless or careless manner, in light of the circumstances then existing, or without due caution and circumspection, or at such speed or in any other manner as to endanger or be likely to endanger any person or property shall be guilty of reckless or inattentive operation, which shall be a misdemeanor.
(Ord. 2022-04, 02/07/2022)

Sec. 2-5. Riding on Sidewalks.

- A. A bicycle, E-bike, E-scooter, or E-board may be operated upon a sidewalk and upon and within a crosswalk, except where prohibited by official traffic control devices, or when the number of pedestrians using the sidewalk renders riding on the sidewalk unsafe because of the risk of colliding with pedestrians, in which case the operator of a bicycle, E-bike, E-scooter, or E-board must dismount and walk the bicycle or device to an area where safe riding may resume.
- B. Any operator of a bicycle, E-bike, E-scooter, or E-board riding upon a sidewalk, or across a roadway upon and within a crosswalk, shall not exceed a speed of ten miles per hour (10 MPH) and shall yield the right-of-way to any pedestrian.
- C. Any operator of a bicycle, E-bike, E-scooter, or E-board riding on the sidewalk shall not suddenly leave a curb or other place of safety and move into the path of a vehicle that is so close as to constitute an immediate hazard.
- D. E-bikes, E-scooters, and E-boards are prohibited from operating on sidewalks

within the downtown area, which is delineated on the “Dismount Zone” map as adopted by City Council by resolution, effective June 1, 2022. Copies of this map are available for viewing at the office of the City Clerk. The Council may, from time to time, adopt revisions of the Dismount Zone map by resolution.
(Ord. 2022-04, 02/07/2022)

Sec. 2-6. Riding on Non-Motorized Pathways.

- A. It is hereby declared to be unlawful for any person to operate or permit to be present a motorized vehicle upon any posted non-motorized pathway. A person is exempt from this restriction where the operator of a motorized vehicle has displayed in the vehicle a permit to allow such person to operate a motorized vehicle on the restricted bike path or pedestrian walkway, has written permission from the City, or has written permission from the owner of the property if the restricted bike path or pedestrian walkway is on property not owned by the City. Emergency police, fire, and EMS vehicles are exempted from restrictions in this Chapter. Motorized wheelchairs or similar conveyances operated by a disabled person shall also be exempted from this prohibition.
- B. Any operator of a bicycle, E-bike, E-scooter, or E-board riding upon a non-motorized pathway shall not exceed a speed of fifteen miles per hour (15 MPH) unless otherwise posted.
- C. Any operator of a bicycle, E-bike, E-scooter, or E-board riding upon a non-motorized pathway shall yield the right-of-way to any pedestrian.
(Ord. 2022-04, 02/07/2022)

Sec. 2-7. Bicycle, E-bike, E-scooter, and E-board Parking.

Bicycles, E-bikes, E-scooters, or E-boards shall not be parked in such a manner as to obstruct or impede the movement of pedestrians, motor vehicles or other

bicycles, E-bikes, E-scooters, or E-boards or to cause damage to trees, shrubs or other living plants.

(Ord. 2022-04, 02/07/2022)

Sec. 2-8. Tampering Prohibited.

It shall be unlawful for any person to tamper with, destroy, mutilate or alter any license receipt or license issued under the provisions of this Chapter. It shall be unlawful for any person to remove, destroy, mutilate or in any way alter or tamper with any license plate, sticker, or marking issued under the provisions of this Chapter.

(Ord. 2022-04, 02/07/2022)

Sec. 2-9. Abandonment and Right to Impound.

It shall be unlawful for any person to abandon a bicycle, E-bike, E-scooter, or E-board. The City shall have the right to impound and retain possession of any bicycle, E-bike, E-scooter, or E-board found to have been abandoned and dispose of the property pursuant to Idaho Code 55-403 and pursuant to the City's surplus policy. The City shall have the right to impound any bicycle, E-bike, E-scooter, or E-board that is found to be in violation of the provisions of this Chapter and may retain possession of such bicycle, E-bike, E-scooter or E-board until the provisions of this Chapter are complied with. A fee for impoundment and storage may be charged to the bicycle, E-bike, E-scooter, or E-board owner. The fee shall be set from time to time by resolution of the Council.

(Ord. 2022-04, 02/07/2022)

Sec. 2-10. Shared Mobility Programs.

A. Application and License Agreement Required. Businesses, corporations, organizations, or individuals that provide stationless and station-based shared mobility programs are required to have a business license, insurance, and submit an application with the City, which includes the execution of a license agreement prior to deployment of any devices. Any deployment of bicycles, E-bikes, E-scooters, or E-

boards prior to following the application, permitting and licensing process and receiving approval by the City to deploy such devices may result in misdemeanor charges and impoundment of devices deployed.

- B. Manufacturers and distributors of E-bikes, E-scooters and E-boards shall apply a label in legible type, that is permanently affixed in a prominent location, to each E-bike, E-scooter and E-board. The label shall contain the classification number, top assisted speed, motor wattage, and shall be printed in arial font in at least 9-point type.
- C. Every shared mobility program wishing to do business in the City shall obtain and retain a Shared Mobility business license prior to such program's operation in the City. Such license shall be issued annually. Failure to hold a current shared mobility program business license, or to renew an expired license within ten (10) days after its expiration, shall result in the immediate impounding of all shared mobility bicycles, E-bikes, E-scooters and E-boards until such license deficiency is remedied. The shared mobility program shall be liable for the daily expense of impounding the bicycles and devices until the license is renewed or the sale of the impounded bicycles and devices by the City.
- D. City may limit the maximum number of bicycles, E-bikes, E-scooters and E-boards that are deployed within City limits by a shared mobility program through a resolution.

(Ord. 2022-04, 02/07/2022)

Sec. 2-11. Enforcement Agency.

The Chief of Police or the Chief's designee shall be granted the authority to enforce and carry out the provisions of this Chapter.

(Ord. 2022-04, 02/07/2022)

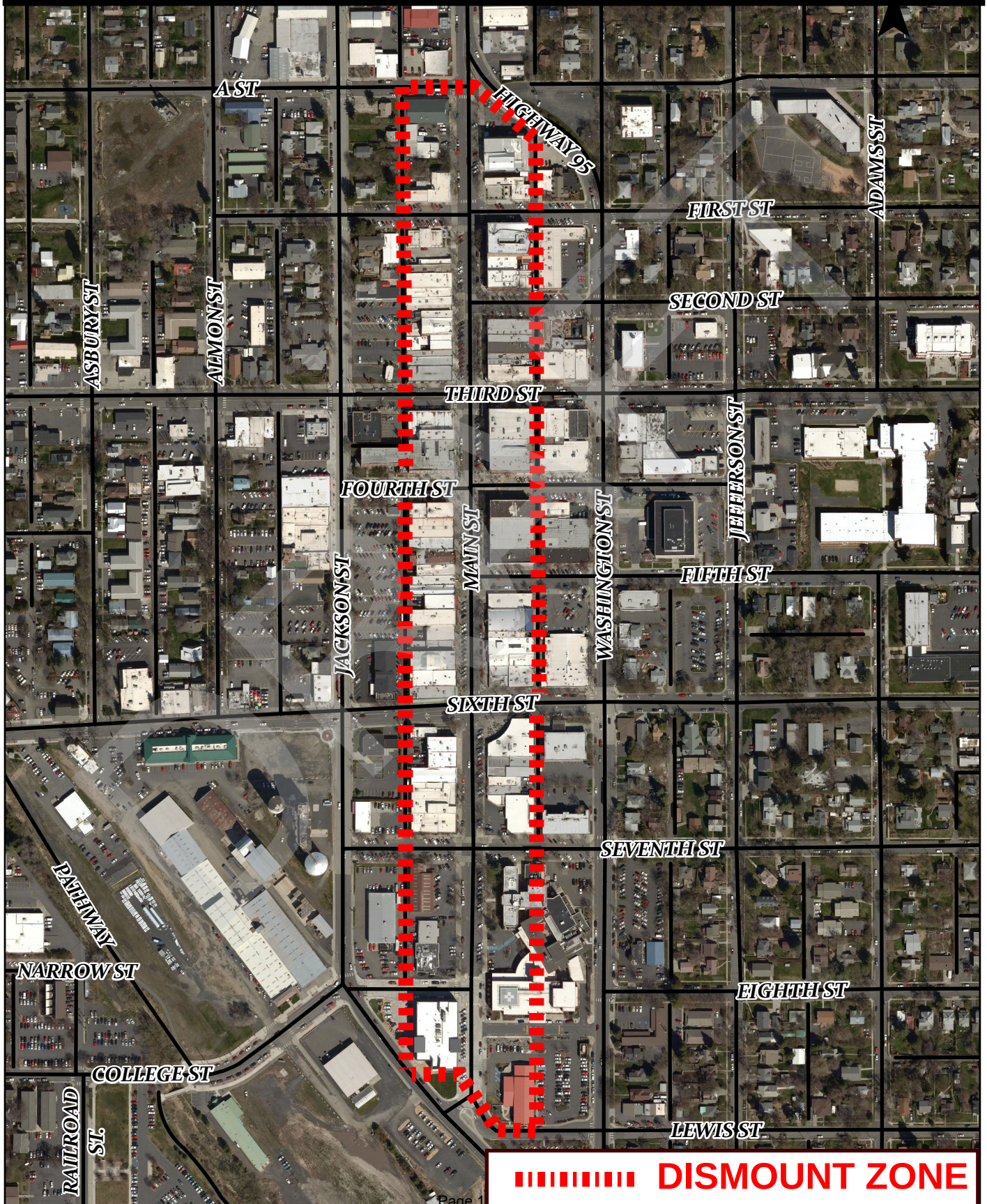
Sec. 2-12. Penalties.

Any person violating any of the provisions of this Chapter, unless a specific penalty is proscribed, shall be guilty of an infraction and, upon conviction thereof in a court of competent jurisdiction, shall be punished pursuant to this Code and the Idaho Code.

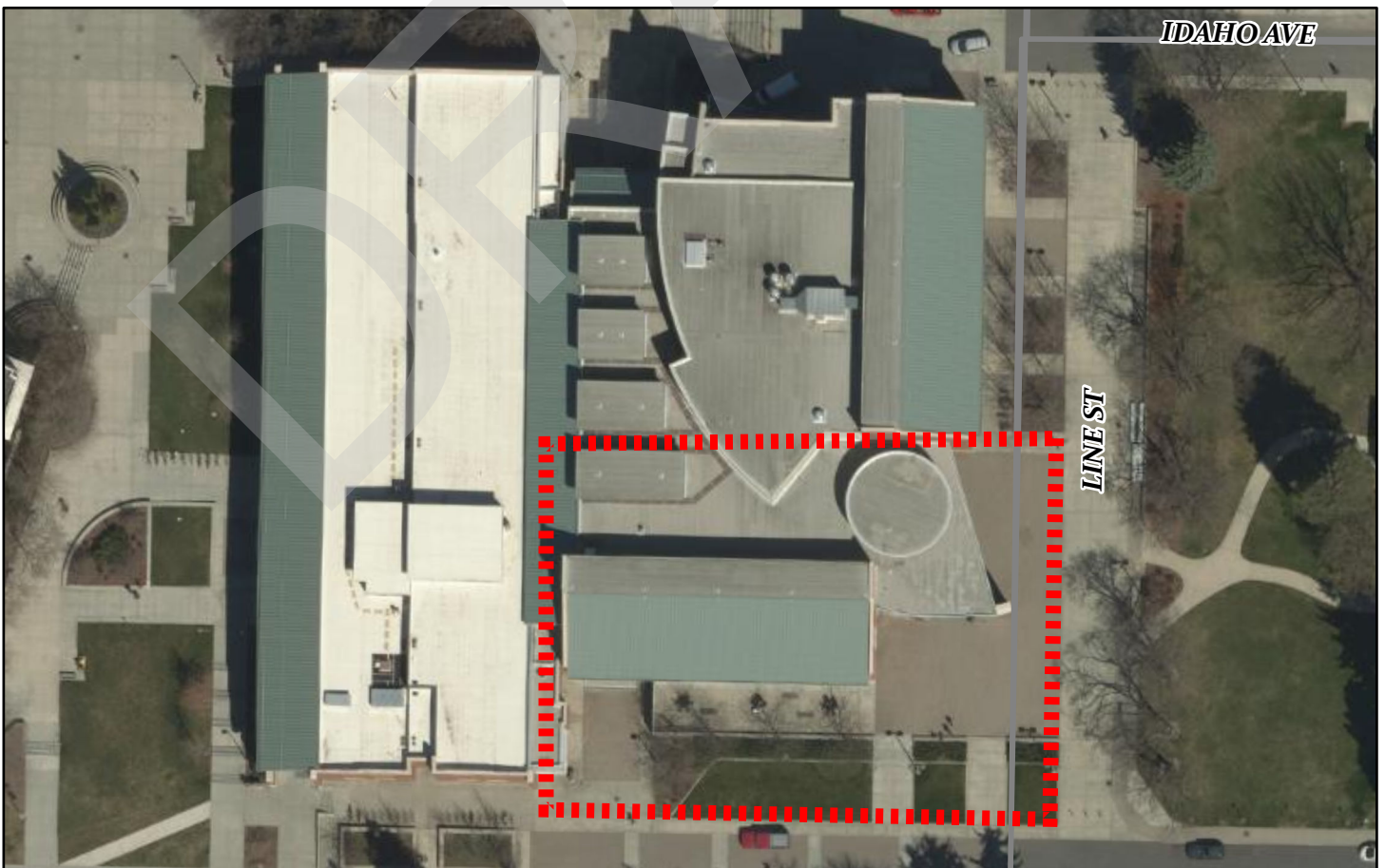
(Ord. 2022-04, 02/07/2022)

DRAFT

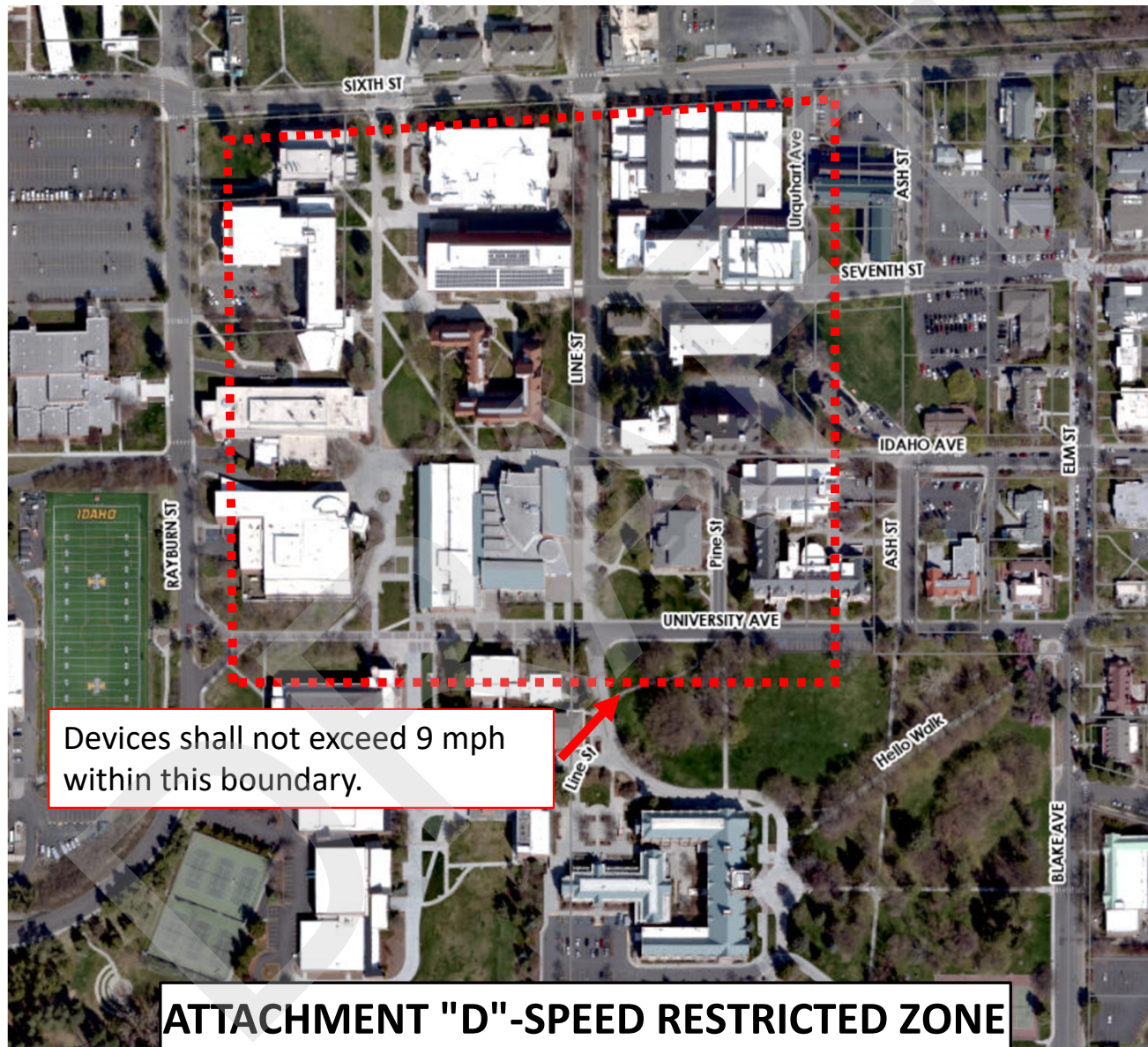
ATTACHMENT "B"-DISMOUNT ZONE



ATTACHMENT "C"- NO PARKING ZONES



ATTACHMENT "D"



ATTACHMENT "E"



ATTACHMENT "E"-DEVICES PROHIBITED

ATTACHMENT "F"



SHARED MOBILITY PROGRAM APPLICATION

FEES

ANNUAL OPERATOR FEE \$2,500.00
ANNUAL DEVICE CHARGE (PER DEVICE) \$100.00 x (150 # of Devices) \$ 15,000
SECURITY DEPOSIT FEE (PER DEVICE)* \$20.00 x (150 # of Devices) \$ N/A (Already Paid)
TOTAL FEES DUE \$ 17,500

*Security Deposit Fee per device is a one-time fee, if security deposit fee balance is maintained.

BUSINESS DETAILS

Applicant shall have a minimum of fifty (50) devices that may contain any combination of bicycles, E-bikes, E-scooters or E-boards and a maximum of two hundred (200) devices. Number of devices deployed will be in accordance with Moscow City Code.

NUMBER OF BIKES
NUMBER OF E-BIKES
150 NUMBER OF E-SCOOTERS
NUMBER OF E-BOARDS
TOTAL NUMBER OF DEVICES (FROM ABOVE)

Each device shall be labeled with current contact information of the licensee, including the make, model and unique identifying number of each device. Please refer to the License Agreement and Moscow City Code for all requirements.

BUSINESS INFORMATION

Business Name: Phoenix USH, LLC d/b/a Spin
Business Address: 8605 Santa Monica Blvd. #20388 West Hollywood CA 90069
Mailing Address: Same as above
Business Phone (888) 249.9698 Website Address spin.pm
Business Contact (must be different than onsite/local contact) Garrett Gronowski
Business Contact Address: Same as Above
Business Contact Phone (310) 569.2405 Email garrett.gronowski@spin.pm



SHARED MOBILITY PROGRAM APPLICATION

ONSITE/LOCAL CONTACT

Name: Kody Marion

Residence Address: 2880 Hwy 95 Unit 3 Moscow ID 83843

Mailing Address: Street City State Zip

Preferred Method of Contact: ☒ Phone ☒ Email ☐ Mail

Primary Phone (801) 557.3535 Mobile Phone ()

Email Address: kody.marlon@spin.pm

Note: If the onsite/local contact changes, the Moscow Police Department must be notified in writing within one business day.

ADDITIONAL DOCUMENTATION REQUIRED

The application will not be approved until all supporting documents have been submitted and approved by the Moscow Police Department.

Please attach the following with this application:

- Photo of each type of device (cannot be a rendering or stock photo)
- List of all devices, including make, model and identifying number of each device
- Copy of unique labels with unique identifying number
- Company's privacy policy
- A map of the proposed service area
- A map of the proposed placement plan and redistribution plan
- Proposed plan for relocation requests
- Certificate of insurance
- Maintenance, cleaning and repair schedule
- Proof of payment card industry data security standards compliance

The applicant hereby certifies that they have received, reviewed and agree to comply with all terms contained in the License Agreement, attached to this application as well as the requirements outlined in Moscow City Code.

Austin Marshburn

Print Name

Sr. Director, Government Partnerships

Title

[Signature]

Signature

03 / 22 / 2024

Date

CALIFORNIA ACKNOWLEDGMENT

CIVIL CODE § 1189

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California

County of Sonoma

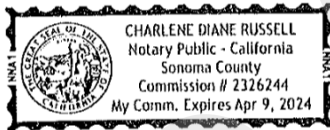
On March 22 2024 before me, Charlene Diane Russell, Notary Public
Date Here Insert Name and Title of the Officer

personally appeared Austin Marshburn
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.



Place Notary Seal and/or Stamp Above

Signature Charlene Diane Russell
Signature of Notary Public

OPTIONAL

Completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: Shared Mobility Program Application

Document Date: _____ Number of Pages: _____

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____

☐ Corporate Officer – Title(s): _____

☐ Partner -- ☐ Limited ☐ General

☐ Individual ☐ Attorney In Fact

☐ Trustee ☐ Guardian or Conservator

☐ Other: _____

Signer Is Representing: _____

Signer's Name: _____

☐ Corporate Officer – Title(s): _____

☐ Partner -- ☐ Limited ☐ General

☐ Individual ☐ Attorney In Fact

☐ Trustee ☐ Guardian or Conservator

☐ Other: _____

Signer Is Representing: _____



CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY)
07/16/2024

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Aon Risk Insurance Services West, Inc. San Francisco CA Office 425 Market Street Suite 2800 San Francisco CA 94105 USA	CONTACT NAME:	
	PHONE (A/C. No. Ext): (866) 283-7122	FAX (A/C. No.): (800) 363-0105
	E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	NAIC #
INSURED Blue Jay Transit, Inc. dba Blue Jay Transit USFM LLC 1209 Orange Street Wilmington, DE 19801 USA	INSURER A: Lloyd's Syndicate No. 1971	AA1120206
	INSURER B: Lloyd's Syndicate No. 2623	AA1128623
	INSURER C: Liberty Surplus Insurance Corporation	10725
	INSURER D: United States Fire Insurance Co.	21113
	INSURER E:	
	INSURER F:	

COVERAGES**CERTIFICATE NUMBER:** 570107267888**REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

Limits shown are as requested

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	☒ COMMERCIAL GENERAL LIABILITY ☐ CLAIMS-MADE ☒ OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: ☒ POLICY ☐ PROJECT ☐ LOC OTHER:			CSUSA2307650 SIR applies per policy terms & conditions	08/01/2023	08/01/2024	EACH OCCURRENCE \$5,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$100,000 MED EXP (Any one person) Excluded PERSONAL & ADV INJURY \$5,000,000 GENERAL AGGREGATE \$5,000,000 PRODUCTS - COMP/OP AGG \$5,000,000
C	AUTOMOBILE LIABILITY ☐ ANY AUTO ☐ OWNED AUTOS ONLY ☐ HIRED AUTOS ONLY ☐ SCHEDULED AUTOS ☐ NON-OWNED AUTOS ONLY			ASE-661-067334-054	03/22/2024	08/01/2024	COMBINED SINGLE LIMIT (Ea accident) \$2,000,000 BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)
A	☒ UMBRELLA LIAB ☒ OCCUR ☐ EXCESS LIAB ☐ CLAIMS-MADE ☐ DED ☐ RETENTION			CSUSA2307652	08/01/2023	08/01/2024	EACH OCCURRENCE \$5,000,000 AGGREGATE \$5,000,000
D	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	☒ Y ☐ N	N/A	4087466604	03/22/2024	08/21/2024	☒ PER STATUTE ☐ OTHER E.L. EACH ACCIDENT \$1,000,000 E.L. DISEASE-EA EMPLOYEE \$1,000,000 E.L. DISEASE-POLICY LIMIT \$1,000,000
B	Cyber Liability			W31A39230201 SIR applies per policy terms & conditions	06/01/2023	08/01/2024	Aggregate Limit \$5,000,000 SIR \$150,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

City of Moscow is included as Additional Insured in accordance with the policy provisions of the General Liability, Automobile Liability and Umbrella Liability policies.

CERTIFICATE HOLDER**CANCELLATION**

City of Moscow 206 E Third Street Moscow ID 83843 USA	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.
	AUTHORIZED REPRESENTATIVE <i>Aon Risk Insurance Services West, Inc.</i>

Holder Identifier :

Certificate No : 570107267888



THIS ADDITIONAL REMARKS FORM IS A SCHEDULE TO ACORD FORM,
FORM NUMBER: ACORD 25 **FORM TITLE:** Certificate of Liability Insurance

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER	
INSURER	
INSURER	
INSURER	

If a policy below does not include limit information, refer to the corresponding policy on the ACORD certificate form for policy limits.

[illegible]

U.S. Applicant Privacy Policy

Effective: March 5, 2021

This Applicant Privacy Policy (“**Policy**”) describes how Skinny Labs Inc. d/b/a Spin and its affiliates, including but not limited to, Spin Mobility GmbH, Spin Mobility Limited, Spin Mobility S.L., Spin Mobility SAS, and Spin Mobility Inc. (collectively, “**Spin**,” “**Company**,” “**we**,” “**us**,” and “**our**”) collects, uses, and discloses “personal information,” as defined under applicable law, from and about job applicants.

This Policy does not apply to our handling of data gathered about you in your role as a user of our consumer-facing services. When you interact with us in that role, the [Spin Privacy Policy](#) applies.

1. Types of Personal Information We Handle

We collect, store, and use various types of personal information through the application and recruitment process. We collect such information either directly from you or (where applicable) from another person or entity, such as an employment agency or consultancy, background check provider, or other referral sources. This information includes:

- **Identification and contact information, and related identifiers** such as full name, age, date of birth, citizenship and permanent residence, home and business addresses, telephone numbers, email addresses, and other information such as criminal history as part of a credit or background check.
- **Professional or employment-related information and identifiers**, including:
 - **Recruitment, employment, or engagement information** such as application forms and information included in a resume, cover letter, or otherwise provided through any application or engagement process; and copies of identification documents, such as driver’s licenses, passports, visas, and other government-issued documents (only where required by job responsibilities); and background screening results, credit history, motor vehicle records, and references.
 - **Career information** such as job titles; work history; work dates and work locations; information about skills, qualifications, experience, publications, speaking engagements, and preferences; and professional memberships.
- **Education information** such as institutions attended, degrees, certifications, training courses, publications, and transcript information.
- **Audio or visual information** such as CCTV footage as well as other information relating to the security of our premises; and photographs submitted.
- **Social network information** such as public profiles.
- **Potentially protected classification information** such as race, sex/gender, religious/philosophical beliefs, gender identity/expression, sexual orientation, marital status, military service, nationality, ethnicity, citizenship, health information (only if required by law), criminal history, and other information to help us monitor compliance with equal opportunity legislation.
- **Other information** such as any information you voluntarily choose to provide in connection with your job application.

2. How We Use Personal Information

We collect, use, share, and store personal information from job applicants for our and our service providers’ business and operational purposes in our recruitment and hiring process such as: processing

your application; tracking your application through the recruitment process; contacting references with your authorization; conducting background checks you authorize; evaluating you for current and future job opportunities, including matching your skills and interest to applicable job requirement; communicating with you throughout the hiring process; and making hiring decisions. We will also use job applicant information for internal analysis purposes to understand the applicants who apply and to improve our recruitment process, including improving our diversity and inclusion efforts. We may sometimes need to use applicant information for legal purposes, such as in connection with any challenges made to our hiring decisions.

3. With Whom We Share Personal Information

We will disclose job applicant personal information to the following types of entities or in the following circumstances (where applicable):

- **Internally** to other Spin personnel involved in the recruiting and hiring process.
- **Service Providers** in order to administer services during the Spin hiring process and to Spin affiliates such as Ford Mobility Inc. These service providers also include technology service providers, travel management providers, human resources suppliers, group benefit plan carriers, background check companies, and employment agencies or recruiters, where applicable.
- **Legal Compliance** when required to do so by law, regulation, or court order or in response to a request for assistance by the police or other law enforcement agency.
- **Litigation Purposes** to seek legal advice from our external lawyers or in connection with litigation with a third party.
- **Business Transaction Purposes:** in connection with the sale, purchase, or merger.

4. Retention of Personal Information

Residents of the United States

- **Application Processing:** We will retain your personal information and data related to an application process for a period of 3 years from the date that you provide us with such data, unless legal retention obligations prevent deletion or anonymization. If data is rendered anonymous, no personal references can be deduced.
- **Applying through Third Party:** If you have applied for a job through a third-party personnel service provider, such as a staffing agency or talent agency, we will retain your application related data for a period of 3 years from the date such information was provided to us.

5. How We Protect Personal Information

We take technical, administrative, physical, and procedural security measures to reduce the risk that personal information in our possession and control will undergo accidental or unlawful destruction, loss, alteration, or unauthorized disclosure or access.

6. Your Rights and Choices

Your local laws may entitle you to additional information or permit you to exercise certain rights with respect to the information we hold about you. Please note that your rights vary depending upon your location, and that we may request you provide us with information necessary to confirm your identity before responding to your request as required or permitted by applicable law.

If you have any questions or concerns relating to our handling of personal information, please contact us as described in this Policy. Your privacy is important to us, and we will do our very best to address your concerns.

7. Changes to this Policy

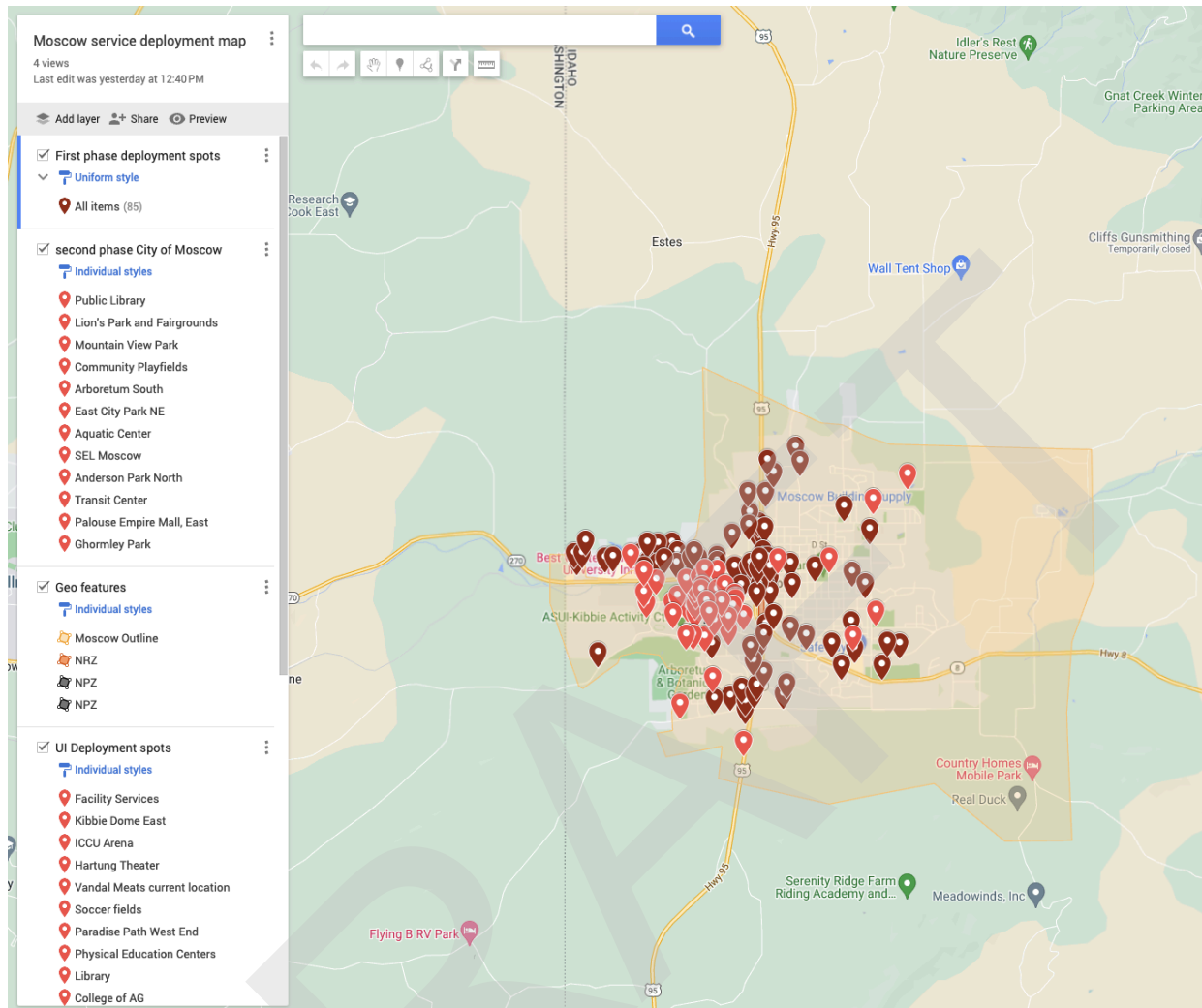
We reserve the right to amend this Policy at any time. We will make the revised Policy accessible through our website, so you should review this Policy periodically. You can know if the Policy has changed since the last time you reviewed it by checking the “Effective Date” at the beginning of this Policy. If we make a material change to this Policy, we will provide you with notice in accordance with legal requirements. By continuing to submit your job application, you are confirming that you have read and understood the latest version of this Policy.

8. How to Contact Us

If you wish to contact us regarding our information practices or in relation to this Policy, please email us at privacyhelp@spin.pm from any region.

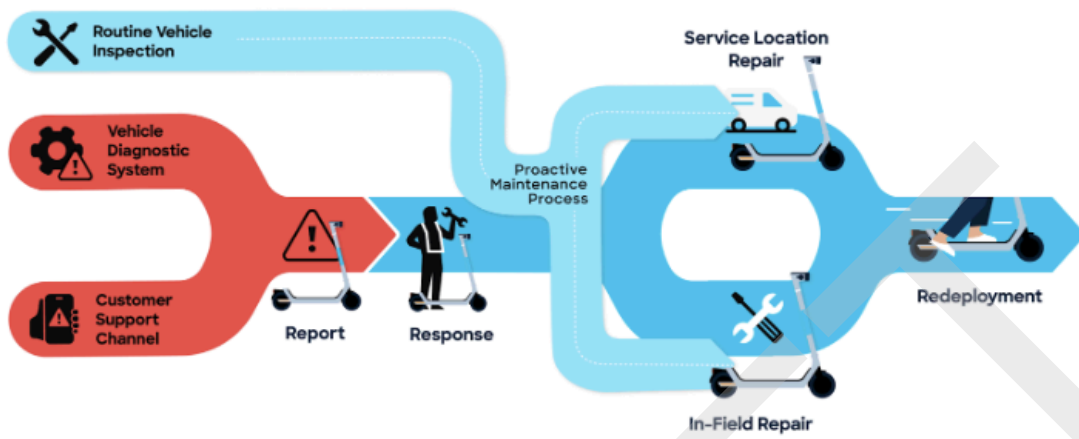






The Maintenance Life Cycle

Repair and Maintenance Cycle



In-Field Inspections and Maintenance

Bird conducts at least one safety inspection daily on every vehicle in the field. This frequency increases if a device is flagged for review via one of the channels detailed above. Our highly qualified teams conduct minor repairs in the field to reduce our operational VMT and minimize service disruption.

Local team scans Bird and puts it in "test ride" mode, allowing them to validate key vehicle functions, including: "brain" communication; QR code/Bird ID legibility; throttle; brake; headlight and taillight; neck tightness and turning range; motor; and, overall vehicle hygiene and markings.	If in good working order:	Bird is sanitized with CDC-approved disinfectant and parked out of the public right-of-way in compliance with local rules and regulations.
	If in need of a minor repair:	Local team performs basic maintenance, including part tightening and brake adjustment, before sanitizing and reparking the e-scooter.
	If in need of substantial repairs:	Local team marks the device as damaged, removes it from the rider map, and transports it to a Bird service location for repair.

Service Location Inspections and Maintenance

Any repairs that cannot be completed in the field, such as brake pad replacement, take place at our local service locations. In addition, every vehicle that arrives at a service location undergoes a full inspection, even if it is just there for charging. On average, vehicles visit a service location every three days and undergo the rigorous inspection and sanitization process detailed below before being redeployed to the field.

Local team scans the device and conducts a multi-point inspection covering all parts, organized by handlebar; chassis - external components; chassis - internal components; functional inspection; and, other individual parts.	If in good working order:	Vehicle proceeds through the service location charging flow and undergoes a deep cleaning before redeployment.
	If in need of a repair:	1. Local team marks the specific issue and places the vehicle in the repair queue. 2. Devices are repaired by our trained Fleet Managers, with each service logged in detail. 3. The device is retested with a multi-point checklist. 4. The supervising mechanic gives a final inspection before redeployment. 5. All vehicles are cleaned and sanitized before returning to the field.

SPOTLIGHT: The Bird Difference - High-Quality Parts

Bird uses high-quality, reusable component parts in our vehicles to prolong lifespan. By continuing to raise the bar in durable equipment, our vehicles also require less frequent repairs. For example, Bird Two (our first smart e-scooter) and Bird Three (our latest smart e-scooter) require 29% fewer repairs than their predecessors. We also intentionally designed Bird Three to share many of its service parts with Bird Two, cutting back on the need for additional carbon-intensive manufacturing.

Cleaning Protocols

Bird maintains the highest standards of vehicle cleanliness. Traditionally, we have utilized two classes of device cleaning: daily field cleanings and more in-depth, weekly "Bird Baths" at our local service centers. In response to COVID-19, Bird updated both of these processes to ensure our vehicles are not just cleaned but are also thoroughly sanitized.

Our multi-point sanitization protocol ensures the entire device is disinfected using a Centers for Disease Control and Prevention approved disinfectant spray that forms an antimicrobial coating that bonds to surfaces and kills 99.99% of germs, keeping surfaces hygienic for up to 30 days. Our process is based on CDC guidelines and features a number of best practices designed to protect the safety of both our team and our riders, including disinfecting all workstation surfaces before and after sanitizing each vehicle, and the use of safety glasses and nitrile gloves.

Proposed Relocation Plan for Spin Scooters E-Scooter Program

Objective:

To ensure efficient and responsive management of e-scooter relocation requests within the city to maintain public safety, accessibility, and compliance with city regulations.

1. Establishment of Dedicated Communication Channel:

- City Email Setup:
 - Spin will establish a dedicated city email address specifically for relocation requests. This email will serve as the primary contact point for all stakeholders, including city officials, businesses, and residents.

2. Real-Time Alert System:

- Integration with Spin's Operational Dashboard:
 - The dedicated email will be integrated with Spin's operational dashboard, which allows for real-time notifications and alerts.
 - When a relocation request is received via email, the system will automatically alert the local Spin operations team.

3. Local Team Response:

- Team Responsibilities:
 - The local Spin team will be responsible for assessing and actioning all relocation requests.
 - The team will evaluate the urgency and relevance of each request, prioritizing based on public safety and compliance needs.
- Response Time:
 - The local team will initiate action on all relocation requests within 2 hours of receipt during business hours. For after-hours requests, action will begin no later than 2 hours after the start of the next business day.

4. Training and Protocols:

- Training:
 - Prior to program launch, all local team members will undergo training on the relocation process, focusing on rapid response and effective resolution strategies.
- Protocols:
 - Detailed protocols will be developed and disseminated to the team, outlining steps for relocation, communication with stakeholders, and documentation of actions taken.

5. Reporting and Evaluation:

- Monthly Reports:
 - Spin will generate monthly reports detailing all relocation requests received, actions taken, and resolution outcomes. These reports will be shared with city officials to ensure transparency and ongoing evaluation of the program's effectiveness.
- Annual Review:

- Spin will participate in an annual review with city officials to discuss the impact of the relocation process and explore potential improvements based on feedback and data collected.

6. Stakeholder Engagement:

- Community Feedback:
 - Spin will establish a quarterly feedback session with community stakeholders to gather insights and suggestions for improving the relocation process.

DRAFT

COMMITTEE / CITY COUNCIL STAFF REPORT

DATE: Monday, July 22, 2024



AGENDA ITEM TITLE

Proposed Sidewalk Café Standard Amendments (ACTION ITEM) - Bill Belknap

RESPONSIBLE STAFF

ADDITIONAL PRESENTER(S)

DESCRIPTION

Currently, the City's Sidewalk Café regulations prohibit the service and consumption of liquor within licensed sidewalk cafés unless the establishment is a full-service restaurant. Drinking establishments (such as bars) that are not full-service restaurants are technically allowed to have a sidewalk café so long as liquor is not served or consumed within the sidewalk café area. Due to the challenge presented by policing the consumption of liquor in the sidewalk café areas, the City has historically denied licensing sidewalk cafés to drinking establishments that serve liquor. This has led to a disparity in the allowance of sidewalk cafés downtown. Staff have prepared a proposed ordinance to eliminate the full-service restaurant requirement for liquor service and consumption within the licensed area. The proposed ordinance also includes several other minor amendments to clarify allowed uses within the sidewalk café area and the application and license procedure, specify permitted physical barrier elements, and change violation of the ordinance from a misdemeanor to an infraction for the Council's consideration.

REVIEWED BY

PROPOSED ACTIONS

PROPOSED ACTIONS: Recommend approval of the ordinance; or provide staff further direction.

STAFF RECOMMENDATION

Recommend approval of the Ordinance.

OTHER RESOURCES

FISCAL IMPACT

PERSONNEL IMPACT

ATTACHMENTS

1. Ordinance 2024 - Amend T9 CH12_DRAFT

ORDINANCE NO. 2024-__

AN ORDINANCE OF THE CITY OF MOSCOW, IDAHO, A MUNICIPAL CORPORATION OF THE STATE OF IDAHO; PROVIDING FOR THE AMENDMENT OF MOSCOW CITY CODE TITLE 9, CHAPTER 12; PROVIDING FOR THE AMENDMENT OF SIDEWALK CAFÉ REGULATIONS; PROVIDING FOR THE AMENDMENT OF THE DEFINITIONS, ALLOWED USES, AND REPEAL OF THE REQUIREMENT OF AN ESTABLISHMENT TO BE A FULL SERVICE RESTAURANT TO ALLOW LIQUOR TO BE SERVED IN THE LICENSED AREAS; PROVIDING THAT THE PROVISIONS OF THIS ORDINANCE BE DEEMED SEVERABLE; AND PROVIDING FOR THIS ORDINANCE TO BE IN FULL FORCE AND EFFECT FROM THE DATE OF ITS PASSAGE, APPROVAL, AND PUBLICATION ACCORDING TO LAW.

WHEREAS, Moscow City Code currently limits the service of liquor in Sidewalk Cafés to only full service restaurants; and

WHEREAS, Moscow City Code does not currently prohibit the service and consumption of beer and wine by non-full service restaurant establishments within Sidewalk Cafés; and

WHEREAS, the City wishes to amend Moscow City Code to provide greater consistency in the regulation of the consumption of alcohol of all types within licensed Sidewalk Cafés; and

WHEREAS, the City wishes to provide a greater opportunity for Sidewalk Cafés to enhance the vibrancy and vitality in the Central Business Zoning District; and

WHEREAS, the City also desires to clarify the intent and allowed uses of the licensed area of Sidewalk Cafés;

NOW, THEREFORE, BE IT ORDAINED BY THE MAYOR AND CITY COUNCIL OF THE CITY OF MOSCOW AS FOLLOWS:

SECTION 1: All matters stated above are found to be true and correct and are incorporated herein by reference as if copied in their entirety and shall be adopted with the following sections of this Ordinance.

SECTION 2: That Title 9, Chapter 12 of the Moscow City Code be, and the same is hereby amended to read as follows:

SIDEWALK CAFÉ REGULATIONS

- Sec. 12-1:** Definitions
- Sec. 12-2:** Permit Required
- Sec. 12-3:** Application for Sidewalk Café License
- Sec. 12-4:** Standards for Issuance of License
- Sec. 12-5:** Liability and Hold Harmless Agreement
- Sec. 12-6:** Conditions of License
- Sec. 12-7:** Denial, Revocation, or Suspension of License

Sec. 12-8: Appeals

Sec. 12-9: Penalties

Sec. 12-1. Definitions.

~~A. Full Service Restaurant. An establishment maintained, advertised and held out to the public as primarily a food eating establishment, where individually priced meals are prepared and regularly served to the public primarily for on-premises consumption, or an establishment where not less than forty percent (40%) of its consumable purchases are derived from the sale of food and/or non-alcoholic beverages. The full service restaurant shall also have a dining room or rooms, kitchen, and cooking facilities for preparation of food (including stoves, ovens, and/or refrigeration equipment).~~

B.A. *Licensed Area.* The area or location upon public property and/or public right-of-way and abutting an eating and/or drinking establishment within which a licensed Sidewalk Café may operate.

B. *Sidewalk.* Sidewalk means that portion of a street between the curb or lateral lines of a roadway or other public right-of-way and the abutting property lines intended for use by pedestrians.

C. *Sidewalk Café.* An eating and/or drinking establishment which serves food and/or beverages on public property or within a public right-of-way as part of its business as an eating and/or drinking establishment, pursuant to City license.
(Ord. 2007-09, 08/20/2007; 2010-12, 6/07/2010)

Sec. 12-2. Permit Required.

It shall be unlawful for any person to operate a Sidewalk Café without a Sidewalk Café license as provided by this Chapter. A Sidewalk Café license shall not grant any person a property right or property interest in the Licensed Area, any public property, or right-of-way.
(Ord. 2007-09, 08/20/2007)

Sec. 12-3. Application for Sidewalk Café License.

A. A person desiring to operate a Sidewalk Café shall make written application to the Clerk upon forms supplied by the City.

B. A Sidewalk Café license shall be issued for not more than one (1) year, commencing on the date of license issuance and ending at midnight on December 31st of the year of issuance.

C. ~~An Applicant shall pay the annual license fee and the applicable inspection fee to be paid upon~~ prior to issuance of a Sidewalk Café license, which said fees shall be set from time to time by Resolution duly passed and adopted by the Council.
(Ord. 2007-09, 08/20/2007)

Sec. 12-4. Standards for Issuance of License.

The Clerk shall issue a permit upon a finding that:

A. The proposed Sidewalk Café will not unreasonably interfere with pedestrian traffic and ~~or~~ other authorized uses of the Licensed Area and ~~or~~ public rights-of-way.

B. The proposed Sidewalk Café shall maintain an unobstructed pedestrian access on the sidewalk of not less than four contiguous feet (4').

C. The applicant has met all other applicable provisions of this Code as well as the laws of the United States of America, the State of Idaho, and Latah County, Idaho, including, where applicable, licenses to serve alcohol.

- D. A risk assessment has been performed by the North Central District Health Department on the applicant's business and the applicant has a current State license authorizing the applicant to serve food and/or beverages, where such license is required.
- E. The ~~licensee-applicant~~ shall demonstrate that current, paid up, general liability insurance has been obtained for each Licensed Area in an amount not less than Five Hundred Thousand Dollars (\$500,000) combined single limits. Such general liability insurance policy shall be primary to any other insurance related to the operation of the Sidewalk Café and to that of any potential party subject to a claim related to these events. The City shall be named as an additional insured on any insurance policy of the licensee relating to the operation of the Sidewalk Café. All policies of insurance shall require ten (10) days notice to City by certified mail of any cancellation or change affecting any interest of coverage. A current certificate of insurance shall be kept on file with the Clerk at all times.
- F. ~~A licensee~~An applicant who intends to serve alcoholic beverages or allow such to be consumed in the Sidewalk Café shall meet the following additional requirements:
1. ~~The licensee shall have~~Have a valid State, County, and City alcohol license for lawful service of beer, ~~and/or~~ wine, and/or liquor.
 2. Service and/or consumption of alcohol shall only occur in the Licensed Area.
 3. No taps, kegs, coolers, or other alcoholic beverage storage and/or service devices or containers related to the Sidewalk Café are allowed to be stored in the public right-of-way. ~~;~~
~~and~~
 4. ~~The licensee-s~~Shall amend its existing State, County, and City alcohol license information to include the Licensed Area.
 5. Delineation of the Licensed Area shall consist of a non-permanent physical barrier such as a railing, potted plants, decorative chain, fence, rope or other physical barrier, as required and approved by the City. Kegs shall not be permitted for use as a component of the physical barrier.
 6. ~~The licensee-s~~Shall demonstrate that the ~~licensee-applicant~~ has current, paid up, Alcohol and Liquor Liability Insurance for each Sidewalk Café in an amount not less than One Million Dollars (\$1,000,000) combined single limits. Such insurance shall be primary to any other insurance related to the alcohol service by the Sidewalk Café and to that of any potential party subject to a claim related to these events. City shall be named as an additional insured on any such insurance policy ~~of the licensed vendor or~~ for the events described herein. All policies of insurance shall require ten (10) days prior written notice to City ~~by certified mail~~ of any cancellation or change affecting any interest of coverage. A current certificate of insurance shall be kept on file with the Clerk at all times.
- (Ord. 2007-09, 08/20/2007; 2010-12, 6/07/2010)

Sec. 12-5. Liability and Hold Harmless Agreement.

Every licensee shall hold City, its agents, servants, employees, officers, and/or contractors harmless, and shall indemnify and defend any claim filed against City, its agents, servants, employees, officers and/or contractors for any activities associated with the Sidewalk Café, including the actions and/or inactions of every person, licensee, owner, director, employee, ~~or~~ and agent.

(Ord. 2007-09, 08/20/2007)

Sec. 12-6. Conditions of License.

- A. A Sidewalk Café license shall not be issued in any zoning district other than the Central Business (CB) Zoning District.
 - B. A Sidewalk Café license shall not be assigned to any other person or place and shall only be used for the service of food and/or drink provided by the licensed establishment. The licensed area shall not be utilized by outside vendors or music performances.
 - ~~C. If liquor is served or allowed to be consumed in a Licensed Area, the establishment shall be a “full-service restaurant”, as that term is defined in this Chapter.~~
 - ~~DC.~~ The Sidewalk Café shall be specifically limited to the Licensed Area shown in the Sidewalk Café license and accompanying ~~diagram~~site plan. ~~Licensed Area shall not be modified without prior written approval of City. Such approval will be based on the standards provided herein and City approval of the modified site plan, and shall take up no more than fifty percent (50%) of the unobstructed portion of the abutting Sidewalk, except in accordance with specific regulations adopted by the Council by Resolution or as otherwise authorized or permitted by City.~~
 - ~~ED.~~ The proposed Sidewalk Café shall maintain an unobstructed pedestrian access on the sidewalk of not less than four contiguous feet (4’).
 - ~~FE.~~ The Sidewalk Café may operate only between the hours of 6:00 a.m. and midnight local time, and only during hours the abutting eating and/or drinking establishment is in operation.
 - ~~GF.~~ No Sidewalk Café located within Friendship Square shall operate during Farmer’s Market hours of operation.
 - ~~HG.~~ The Licensed Area, and all items placed within it, shall at all times be maintained in a clean and orderly condition.
 - ~~IH.~~ Only those items authorized by the Sidewalk Café license and shown on the ~~diagram~~site plan may be stored in the Licensed Area when the Sidewalk Café is not in operation.
 - ~~J.~~ The Licensed Area shall be returned to the condition it was prior to the Sidewalk Café license agreement permitting operation of the Sidewalk Café.
 - ~~KJ.~~ The Sidewalk Café shall conform to any additional requirement established from time to time by Resolution duly passed and adopted by the Council.
- (Ord. 2007-09, 08/20/2007; 2010-12, 06/07/2010; 2014-15, 09/15/2014)

Sec. 12-7. Denial, Revocation or Suspension of License.

- A. In the event that a licensee or applicant has violated or cannot meet a condition of approval or a provision of this Chapter, the Clerk may seek the denial, revocation, or suspension of the license.
 - B. Prior to the denial, revocation, or suspension of a license as required herein, the Clerk shall provide written notice of such denial, revocation, or suspension to the licensee or applicant, as the case may be. Such written notice shall state the reason(s) for such denial, revocation, or suspension, and shall state that such licensee or applicant may request an appeal hearing as provided herein. Notice of denial, revocation, or suspension is effective on the date such notice is placed in a mailbox controlled by the United States Postal Service. Failure by the City to give notice as provided herein shall not establish a right to a license under this Chapter.
- (Ord. 2007-09, 08/20/2007)

Sec. 12-8. Appeals.

- A. Any person aggrieved by the action of denial, suspension or revocation of the license by the Clerk shall have the right of appeal to the Council.

- B. Such appeal shall be taken by filing with the Clerk written notice thereof within ten (10) business days after the denial or the entry of the order of suspension or revocation. The notice of appeal shall specify an address at which the person appealing may be given notice of hearing on the appeal.
- C. At the appeal hearing before the Council, the applicant or person appealing shall be entitled to appear in person and offer evidence pertinent to the denial, suspension or revocation or may appear through legal counsel. The Clerk, Chief of Police, and/or legal counsel for the City shall likewise be entitled to appear at the hearing and offer evidence in support of the denial, order of suspension or revocation. Failure by applicant, person appealing, or their representative to appear before Council at the time scheduled to hear such an appeal shall result in the automatic denial of such appeal.
- D. The Council shall determine whether the denial, suspension or revocation shall be sustained and shall make a final reasoned statement in writing within fifteen (15) business days following the close of the hearing.
(Ord. 2007-09, 08/20/2007)

Sec. 12-9. Penalties.

Any person violating any of the provisions of this Chapter shall be deemed guilty of an misdemeanor infraction, and upon conviction thereof, shall be punished pursuant to this Code and the Idaho Code pay the general city code infraction fee as set by Resolution by City Council.
(Ord. 2007-09, 08/20/2007)

SECTION 3: SEVERABILITY. Provisions of this Ordinance shall be deemed severable and the invalidity of any provision of this Ordinance shall not affect the validity of the remaining provisions. The remaining chapters and sections of Title 9 shall be in full force and effect.

SECTION 4: EFFECTIVE DATE. After its passage and adoption, a summary of this Ordinance, under the provisions of the Idaho Code, shall be published once in the official newspaper of the City of Moscow. This Ordinance shall be in full force and effect from and after the date of its passage, approval and publication according to law.

PASSED on Motion by the Following Vote:

	Aye	Nay	Abstain	Absent
Hailey Lewis	_____	_____	_____	_____
Drew Davis	_____	_____	_____	_____
Sandra Kelly	_____	_____	_____	_____
Gina Taruscio	_____	_____	_____	_____
Julia Parker	_____	_____	_____	_____

Bryce Blankenship _____

ADOPTED by the City Council of the City of Moscow, Idaho and **APPROVED** by the Mayor of the City of Moscow, this ____ day of _____, 2024.

Arthur D. Bettge, Mayor

CERTIFICATION and ATTESTATION. I hereby certify that the above is a true copy of an Ordinance passed at a regular meeting of the City Council, City of Moscow, held on _____, 2024.

Laurie M. Hopkins, City Clerk

COMMITTEE / CITY COUNCIL STAFF REPORT

DATE: Monday, July 22, 2024



AGENDA ITEM TITLE

Emergency Radio Equipment Purchase Approval (ACTION ITEM) - Bill Belknap

RESPONSIBLE STAFF

Bill Belknap, City Supervisor

ADDITIONAL PRESENTER(S)

DESCRIPTION

The City's emergency radio equipment is at its end of life and many of the portable radios can no longer be serviced, and replacement parts are no longer available. The City's Emergency Radio Project will replace all existing portable (hand-held) and mobile (vehicle-mounted) radios as well as replace the existing radio repeater system with a new simulcast system with enhanced radio coverage, as well as encryption for two police channels to protect officer safety during emergency events. The replacement of the City's emergency radio system has been identified as a Tier 1 Strategic Priority for the City and \$2.3 Million was budgeted in the current fiscal year for the project. The City has received a quote from Motorola for the purchase of replacement portable and mobile radio systems under the Idaho Statewide contract which utilizes the National Association of State Procurement Officials (NASPO) cooperative purchasing program. The total cost for all radios and accessories is \$1,046,977.55. Per the City's adopted purchasing policy, budgeted purchases over \$150,000 must be approved by the Council. Staff is requesting the Council's approval to move forward with this purchase. Legal is currently preparing a purchase agreement that will be prepared in advance of the Council's August 5th meeting.

REVIEWED BY

PROPOSED ACTIONS

PROPOSED ACTIONS: Recommend approval of the radio purchase, or provide staff further direction.

STAFF RECOMMENDATION

Recommend approval of the radio purchase.

OTHER RESOURCES

FISCAL IMPACT

\$1,046,977.55 from Line Item# 295-130-770-74 (\$2,307,798 is budgeted for total project costs)

PERSONNEL IMPACT

ATTACHMENTS

1. Cooperative Purchase Agreement_Motorola_final with attachments

PURCHASE AGREEMENT
BETWEEN CITY OF MOSCOW, IDAHO
AND MOTOROLA SOLUTIONS, INC.

THIS PURCHASE AGREEMENT BETWEEN CITY OF MOSCOW, IDAHO AND MOTOROLA SOLUTIONS, INC. (hereinafter “Agreement”) is made and entered into between City of Moscow, Idaho, a municipal corporation of the State of Idaho, 206 East Third Street, Moscow, Idaho, 83843 (hereinafter “CITY”), and Motorola Solutions, Inc., a Delaware Corporation, 500 West Monroe Street, Suite 4400, Chicago, Illinois, 60661-3781 (hereinafter “SELLER”).

WHEREAS, Idaho Code § 67-2807 allows for cooperative purchasing to promote the efficient and cost-effective procurement of goods, services, and public works construction among political subdivisions, other government entities, or associations that offers its goods or services as a result of competitive solicitation process; and

WHEREAS, the State of Washington entered into a Cooperative Purchasing Master Agreement with Motorola Solutions, Inc., No. 00318 (hereinafter “Master Agreement”) for Public Safety Communications, Products, Services and Solutions for use by eligible purchasing entities on January 1, 2022, included as Attachment “A” and incorporated herein by this reference; and

WHEREAS, the State of Idaho entered into a cooperative purchasing agreement with SELLER pursuant to the Master Agreement (hereinafter “Participating Addendum”) on behalf of State of Idaho agencies, institutions, departments, and eligible public agencies as defined by Idaho Code § 67-2327 with an expiration date of December 31, 2026, as provided in the Participating Addendum, included as Attachment “B” and incorporated herein by this reference; and

WHEREAS, CITY is considered an eligible public agency pursuant to Idaho Code § 67-2327 and desires to purchase public safety communications products, services and solutions as a Participating Entity pursuant to the Master Agreement and the Participating Addendum; and

WHEREAS, Moscow City Council authorized the purchase of the public safety communications products, services, and solutions described herein utilizing the Cooperative Purchasing Master Agreement with Motorola Solutions, Inc. and the State of Idaho’s Participating Addendum as described herein;

NOW THEREFORE, it is agreed, for and in consideration of the mutual covenants and promises between the Parties hereto, that all matters stated above are found to be true and correct and are incorporated herein by reference as if copied in their entirety and shall be adopted with the following:

SECTION I: Purchase

1. SELLER agrees to sell and CITY agrees to buy public safety communications products and services as detailed in the quotes provided by SELLER, (hereinafter “Goods”) detailed in Attachment “C” and incorporated herein by this reference, for a total amount not to exceed One Million, Forty-Six Thousand, Nine Hundred Seventy-Seven Dollars, and Fifty-Five

Cents (\$1,046,977.55) to be paid within thirty (30) days after receipt of the goods and invoice. The quotes included in Attachment "C" are itemized as follows:

- A. Quote 2711430 in the amount of \$4,123.20
- B. Quote 2552362 in the amount of \$673,517.17
- C. Quote 2552356 in the amount of \$345,182.38
- D. Quote 2606397 in the amount of 18,539.80
- E. Quote Q053524 in the amount of \$5,615.00

- 2. Goods are being purchased pursuant to the Cooperative Purchasing Master Agreement No. 00318, Attachment "A", the Participating Addendum executed by the State of Idaho, Attachment "B", and this Agreement. The terms, rights and responsibilities included in Attachment "A" and "B" apply to this Agreement, in addition to the following terms.

SECTION II: Shipment and Delivery

- 1. SELLER shall, at its cost, package the Goods in accordance with industry approved commercial practice to prevent damage to the Goods and secure the lowest transportation costs consistent with requirements of the common carrier and with the applicable specifications. Each shipping container shall be marked as follows:
 - A. SELLER's name and address;
 - B. CITY's name and address; and
 - C. Purchase Order number.CITY's count or weight shall be conclusive on shipments not accompanied by a packing list.
- 2. Title and risk of loss of the Goods shall not pass to CITY until CITY actually receives and takes possession of the Goods at the place of delivery, verified by signed delivery receipt, subject to SELLER's warranties for the Goods. CITY shall have the right to inspect and reject the Goods at delivery if specifications are not met. If the damage is not readily apparent at the time of delivery, SELLER shall permit the Goods be returned within a reasonable time at no cost to CITY. In the event of the delivery of nonconforming Goods, CITY will notify SELLER as soon as possible and SELLER agrees to replace the nonconforming Goods with conforming Goods as soon as possible, at no additional cost to CITY, which are subject to CITY's right to inspect and reject nonconforming Goods as provided herein.
- 3. Shipping is included in the quoted price reflected in Attachment "C". In the event the Goods are rejected due to damage, defectiveness or nonconformance, SELLER shall arrange for and pay for the return shipment of the Goods.
- 4. The place of delivery shall be set forth on the purchase order under "Ship To". Any change thereto shall be effected by modification as provided in Section V.1.

SECTION III: Default/Termination

- 1. The performance of work under this Agreement may be terminated in whole or in part by CITY by a written "Notice of Termination" specifying the extent to which performance of

work under the Agreement is terminated and the date upon which such termination becomes effective. CITY shall not be liable to SELLER for any work done or materials purchased after such termination or for lost profits or other damages. Such right of termination is in addition to and not in lieu of rights of CITY otherwise set forth in this Agreement. SELLER's failure to effect delivery by date specified will entitle CITY to cancel this order on twenty-four (24) hours' notice at CITY's option.

2. If either Party hereto is delayed in carrying out its obligation under this Agreement because of a force majeure event, such as flood, fire, earthquake, other weather related events, war or riot or labor stoppages, the Party shall give notice and full particulars of such delay supported by sufficient evidence, in writing, to the other Party within a reasonable time after occurrence of the delay and the time for performance by the Party shall be extended by the number of days of the delay, except as herein provided.
3. Whenever CITY has reason to question SELLER's intent to perform, CITY may demand that SELLER give assurance of its intent to perform. In the event that a demand is made and no assurance is given with five (5) days, CITY may treat this failure as an anticipatory repudiation of this Agreement.

SECTION IV: Notice

Such communications as are required by this Agreement shall be satisfied by mailing or by personal delivery to the Parties at the following address:

SELLER:

Motorola Manufactures Rep.
Attn: Steve Fontaine
PO Box 41411
Olympia, WA 98504-1411
Tel: (509) 939-6676

CITY:

City Clerk
City of Moscow
206 East Third Street
PO Box 9203
Moscow, ID 83843

SECTION V: General Provisions

1. Entire Agreement, Modification and Assignability: This Agreement and the attachments hereto contain the entire agreement between the Parties, and no statements, promises, or inducements made by either Party, or agents of either Party are valid or binding unless contained herein. This Agreement may not be enlarged, modified or altered except upon written agreement signed by the Parties hereto. SELLER may not subcontract or assign its rights (including the right to compensation) or duties arising hereunder, without the prior written consent and express authorization of CITY.
2. Adherence to Law Required: All applicable Federal, State, and local statutes and regulations are hereby made a part of this Agreement and shall be adhered to at all times. Violation of any of these statutes or regulations by SELLER shall be deemed material and shall subject SELLER to termination of this Agreement for cause. No pleas of misunderstanding or

ignorance on the part of SELLER will in any way serve to modify the provisions of this requirement.

- A. Ownership or Operation by China. Pursuant to Idaho Code § 67-2359, SELLER certifies that it is not currently owned or operated by the government of China and will not for the duration of this Agreement be owned or operated by the government of China. The terms in this section defined in Idaho Code § 67-2359 shall have the meaning defined therein.
 - B. Anti-Boycott Against Israel Act. SELLER certifies it is not currently engaged in, and will not for the duration of this Agreement engage in, a boycott of goods and services from Israel or territories under its control. Failure to comply with Idaho Code § 67-2346 will result in this Agreement being void as against public policy.
 - C. Public Funds for Abortion Act. Pursuant to Idaho Code Title 18 Chapter 87, SELLER certifies that it is not an abortion provider or an affiliate of any abortion providers and does not, and will not for the duration of the Agreement, authorize the use of state facilities or public funds for abortion related activity.
 - D. Anti-Boycott of Certain Sectors. Pursuant to Idaho Code § 67-2347A, SELLER certifies that it is not engaged in, and will not for the duration of this Agreement engage in, a boycott of any individual or company because the individual or company 1) engages in or supports the exploration, production, utilization, transportation, sale or manufacture of fossil fuel-based energy, timber, minerals, hydroelectric power, nuclear power, or agriculture or 2) engages in or supports the manufacture, distribution, sale, or use of firearms, as defined in Idaho Code § 18-3302 (2)(d).
3. Non-Appropriations. This Agreement is contingent upon CITY receiving the necessary funding to cover the obligations of CITY. In the event that such funding is not received or appropriated, then, and in that event, CITY's obligations under this Agreement shall cease and each Party shall be released from further performance under this Agreement without any liability to the other Party, and SELLER shall be entitled to receive just and equitable compensation for any work satisfactorily completed hereunder.
4. Severability. If any provision in this Agreement is found by a court of competent jurisdiction to be illegal, unenforceable, or void then both Parties will be relieved from all obligations arising from that provision. If the remainder of the Agreement is capable of being performed, it will not be affected by such determination or finding and must be fully informed.

IN WITNESS WHEREOF, said SELLER and CITY have caused this Agreement to be executed on the day and year of the last signature.

I, Neil Thomas, certify under penalty of perjury, pursuant to the law of the State of Idaho, the foregoing is true and correct and that I am the authorized agent to bind Motorola Solutions Inc. to this Agreement.

SELLER:

CITY:

Neil Thomas
Regional Vice President and Director
of Sales

Arthur D. Bettge, Mayor

DATE: _____

DATE: _____

ATTEST:

Laurie M. Hopkins, City Clerk

ACKNOWLEDGMENT

STATE OF _____)
County of _____) ss:

On this _____ day of _____, 2024, before me, a Notary Public in and for said State, appeared Neil Thomas, known to me to be the person named above and acknowledged that they executed the foregoing as the duly authorized representative of Motorola Solutions, Inc.

Notary Public for the State of _____
Residing at _____
My commission expires _____

Attachment "A"



COOPERATIVE PURCHASING MASTER AGREEMENT

No. 00318

PUBLIC SAFETY COMMUNICATIONS PRODUCTS, SERVICES AND SOLUTIONS

For Use by Eligible Purchasing Entities

By and Between

**STATE OF WASHINGTON
DEPARTMENT OF ENTERPRISE SERVICES**

and

MOTOROLA SOLUTIONS, INC.

Dated January 1, 2022

COOPERATIVE PURCHASING MASTER AGREEMENT

No. 00318

PUBLIC SAFETY COMMUNICATIONS PRODUCTS, SERVICES AND SOLUTIONS

FOR

SUB-CATEGORY 1.1 RADIO SINGLE-BAND PORTABLE RADIO (P25)

SUB-CATEGORY 1.2 RADIO SINGLE-BAND MOBILE RADIO (P25)

SUB-CATEGORY 1.3 RADIO: SINGLE-BAND DESKTOP RADIO (P25)

SUB-CATEGORY 1.4 RADIO MULTI-BAND PORTABLE RADIO (P25)

SUB-CATEGORY 1.5 RADIO MULTI-BAND MOBILE RADIO (P25)

SUB-CATEGORY 1.6 RADIO MULTI-BAND DESKTOP RADIO (P25)

SUB-CATEGORY 1.7 RADIO BASE STATION/REPEATER (P25)

SUB-CATEGORY 2.1 RADIO CONVENTIONAL ANALOG PORTABLE (NON-P25)

SUB-CATEGORY 2.2 RADIO CONVENTIONAL ANALOG MOBILE (NON-P25)

SUB-CATEGORY 2.3 RADIO CONVENTIONAL ANALOG DESKTOP (NON-P25)

SUB-CATEGORY 2.4 RADIO CONVENTIONAL ANALOG BASE STATION/REPEATER (NON-P25)

CATEGORY 4 DISPATCH CONSOLES

COMPLETE TURNKEY RADIO SOLUTION

This Cooperative Purchasing Master Agreement ("Cooperative Purchasing Master Agreement") is made and entered into by and between Enterprise Services acting by and through the State of Washington ("Enterprise Services") and Motorola Solutions, Inc., an Delaware corporation ("Contractor") and is dated and effective as of January 1, 2022.

RECITALS

- A. Pursuant to Legislative authorization, Enterprise Services, on behalf of the State of Washington, is authorized to develop, solicit, and establish Cooperative Purchasing Master Agreements for goods and services to support Washington state agencies. See RCW 39.26.050(1). The Washington State Legislature has authorized Enterprise Services to make these Cooperative Purchasing Master Agreements available, pursuant to agreement in which Enterprise Services ensures full cost recovery, to other local or federal government agency or entity, public benefit nonprofit organizations, or any tribes located in the State of Washington. See RCW 39.26.050(1) & (2).
- B. The Washington State Legislature also has authorized Enterprise Services to participate in, sponsor, conduct, or administer certain cooperative purchasing agreements for the procurement of goods or services. See RCW 39.26.060(1). One of the approaches that Enterprise Services utilizes to participate in cooperative purchasing agreements with other states is NASPO ValuePoint.
- C. NASPO Cooperative Purchasing Organization LLC, doing business as NASPO ValuePoint, is a nonprofit subsidiary of the National Association of State Procurement Officials (NASPO). The NASPO ValuePoint purchasing cooperative program is led by state procurement officers from member states. NASPO ValuePoint does not award contracts; rather, it assists states, for an administrative fee, in their collaboration pertaining to solicitations and the resulting master agreements.

- D. Pursuant to the NASPO ValuePoint cooperative purchasing model, a state serves as the 'lead state' to conduct a competitive procurement in compliance with that state's procurement laws and award a cooperative purchasing master agreement with a contractor for the specified goods or services. States (including the District of Columbia and the organized territories of the United States), including the lead state, then may participate in that cooperative purchasing master agreement by executing a Participating Addendum. Until a Participating Addendum is executed by the applicable state (a 'participating entity'), no agency or other eligible organization (a 'purchasing entity') may purchase pursuant to the cooperative purchasing master agreement. Under Washington law, at the time of solicitation, states may provide supplemental substantive terms and conditions to inform the competitive procurement. In addition, pursuant to their Participating Addendum, states may require certain administrative terms and conditions (e.g., a vendor management fee for sales within the state, state registration and reporting). Contractor, however, has no obligation to condition execution of a Participating Addendum on substantive terms and conditions that were not competitively procured.
- E. Enterprise Services, as part of a cooperative purchasing competitive governmental procurement, with administrative support from NASPO ValuePoint, issued Competitive Solicitation No. 00318 dated November 16, 2020 regarding Public Safety Communications Products, Services and Solutions ("Public Safety Radio"). Sixteen (16) states indicated an intent to utilize the resulting Cooperative Purchasing Master Agreement.
- F. Enterprise Services and a stakeholder team consisting of representatives from Washington, California, Alaska, Oregon, Montana, Tennessee, Colorado and Nevada evaluated all responsive bids to the Competitive Solicitation and identified Contractor as an Apparent Successful Bidder for the Category identified above.
- G. Enterprise Services determined that entering into this Cooperative Purchasing Master Agreement will meet the cooperative purchasing needs and be in the best interest of the State of Washington.
- H. The purpose of this Cooperative Purchasing Master Agreement is to enable Participating or Purchasing Entities to purchase Public Safety Radio products and services, in the awarded Category as set forth herein.

AGREEMENT

NOW THEREFORE, in consideration of the mutual promises, covenants, and conditions set forth herein, the parties hereto hereby agree as follows:

1. **TERM.** The term of this Master Agreement begins January 1, 2022 and ends on December 31, 2026; provided, however that, the contract term shall be extended for twenty-four (24) months if, in Enterprise Services' sole, reasonable judgement, which shall occur no later than June 30, 2025, Contractor meets the following performance metrics:

- **Reports:** Contractor provides timely and accurate reports as detailed in this Master Agreement and Participating Addendums; and
- **Administrative Fee Payments:** Contractor provides timely and accurate Administrative Fee payments as detailed in this Master Agreement and Participating Addendums.

Notwithstanding any provision to the contrary, to effectuate a smooth transition for Participating States and Purchasing Entities for Public Safety Communications Products, Services and Solutions to begin on January 1, 2022, Contractor shall provide implementation and transition support to Participating States who wish to utilize the Master Agreement, beginning upon the date such Participating State and Contractor executes a Participating Addendum. For the avoidance of doubt, no orders for products or services shall be made under this Agreement prior to January 1, 2022.

2. PARTICIPANTS AND SCOPE. This Cooperative Purchasing Master Agreement may be utilized under the following conditions:

- 2.1. **PARTICIPATING ENTITIES.** Contractor may not sell Public Safety Radio products and services under this Cooperative Purchasing Master Agreement until a Participating Addendum acceptable to the Participating Entity and Contractor is executed. The terms and conditions set forth in the Cooperative Purchasing Master Agreement are applicable to any Order by a Participating Entity (and other Purchasing Entities covered by their Participating Addendum), except to the extent altered, modified, supplemented, or amended by a Participating Addendum; *Provided*, however, that no Participating Addendum shall operate to alter or modify any substantive terms of this Cooperative Purchasing Master Agreement which were solicited and procured pursuant to a competitive procurement. By way of illustration and not limitation, Participating Entities may include unique administrative, delivery, and invoicing requirements, as well as entity-specific confidentiality requirements and similar entity-specific administrative requirements in purchase Orders utilizing this Cooperative Purchasing Master Agreement.
- 2.2. **PURCHASING ENTITIES.** Purchasing Entity means a state (as well as the District of Columbia and U.S territories), city, county, district, other political subdivision of a State, and a nonprofit organization under the laws of some states if authorized by a Participating Addendum, that issues a Purchase Order or other commitment document against the Cooperative Purchasing Master Agreement and becomes financially committed to the purchase.
- 2.3. **PARTICIPATING ADDENDUM.** Obligations under this Cooperative Purchasing Master Agreement are limited to those Participating Entities who have signed a Participating Addendum and Purchasing Entities within the scope of those Participating Addenda. States or other entities permitted to participate may use an informal competitive or other process to determine which Cooperative Purchasing Master Agreements to participate in through execution of a Participating Addendum. Financial obligations of Participating Entities who are states are limited to the orders placed by the departments or other state agencies and institutions having available funds. Participating Entities who are states incur no financial obligations on behalf of other Purchasing Entities. Contractor shall email a fully executed PDF copy of each Participating Addendum as instructed by the Lead State to support documentation of participation and posting in appropriate databases.
- 2.4. **PURCHASING ENTITY RIGHTS.** Except to the extent modified by a Participating Addendum, each Purchasing Entity shall follow the terms and conditions of the Cooperative Purchasing Master Agreement and applicable Participating Addendum and will have the same rights

and responsibilities for their purchases as the Lead State has in the Cooperative Purchasing Master Agreement, including but not limited to, any indemnity or right to recover any costs as such right is defined in the Cooperative Purchasing Master Agreement and applicable Participating Addendum for their purchases. Each Purchasing Entity will be responsible for its own charges, fees, and liabilities. Contractor will apply the charges and invoice each Participating Entity individually.

- 2.5. PARTICIPATING ADDENDUM APPROVAL. Participating Entities who are not states may under some circumstances sign their own Participating Addendum, subject to the approval of participation by the Chief Procurement Official of the state where the Participating Entity is located. Coordinate requests for such participation through NASPO ValuePoint. Any permission to participate through execution of a Participating Addendum is not a determination that procurement authority exists in the Participating Entity; they must ensure that they have the requisite procurement authority to execute a Participating Addendum.

3. SCOPE – INCLUDED GOODS/SERVICES AND PRICE.

- 3.1. CONTRACT SCOPE. Pursuant to this Cooperative Purchasing Master Agreement, Contractor is authorized to sell only those Public Safety Radio Products and Services in the category above posted on the NASPO ValuePoint website. Contractor shall not represent to any Participating or Purchasing Entity under this Cooperative Purchasing Master Agreement that Contractor has contractual authority to sell any Public Safety Radio Products beyond those approved and posted on the NASPO ValuePoint website.
- 3.2. MINIMUM WARRANTY FOR INCLUDED GOODS/SERVICES. Notwithstanding any provision to the contrary, Contractor agrees to and is providing a minimum warranty of no less than one (1) year for any goods/services included in this Cooperative Purchasing Master Agreement. Such minimum warranty begins when the goods/services are accepted by Purchasing Entity or as agreed by Purchasing Entity in its ordering documentation. Such minimum warranty includes all firmware and software updates within warranty period. Parts and related software will be free from defects in material and workmanship for one (1) year. If a product fails because of a defect in workmanship or materials within one (1) year from the date of acceptance by Purchasing Entity, manufacture shall repair or replace the product or part with a new product or part without charge to Purchasing Entity.
- 3.3. ADDITIONAL WARRANTY OPTIONS – See Motorola Solutions Pricing Document on the NASPO ValuePoint website for descriptions and pricing for all available warranty options.
- 3.4. AVAILABLE SERVICES – See Motorola Solutions Pricing Document on the NASPO ValuePoint website for descriptions and pricing for all available services.
- 3.5. ABILITY TO MODIFY SCOPE OF COOPERATIVE PURCHASING MASTER AGREEMENT. Subject to mutual agreement between the parties, Enterprise Services, acting as the lead state, reserves the right to modify the Public Safety Radio Products included in this Cooperative Purchasing Master Agreement; *Provided*, however, that any such modification shall be effective only upon thirty (30) days advance written notice; and *Provided further*, that any such modification must be within the scope of this competitively procured Cooperative Purchasing Master Agreement. In no event shall such modification, if authorized by Enterprise Services, limit the requirement for cooperative purchasing agreements to be subject to competitive procurement.

- 3.6. **PRODUCT UPDATES.** Upon approval, Contractor may update their products/pricelist on a semi-annual basis. Contractor must submit to the Lead Contract Administrator a revised product/pricelist highlighting changes and include an effective date of the change. At no time during the contract term shall products be deleted from the products/pricelist. Discontinued products/services must be struck-through and highlighted for ease of review process. Product/pricelist updates must be submitted for review and approval to the Lead Contract Administrator thirty (30) days prior to the effective date of the change. All products/pricelist will be posted on the NASPO ValuePoint website.

Product updates for January 1st through June 30th must be submitted to Lead State Contract Administrator by June 1st to be eligible for product updates effective July 1st. Product updates for July 1st through December 31st must be submitted to the Lead State Contract Administrator by December 1st to be eligible for product updates effective January 1st. Additional product updates may be considered for approval with proper 30 day notice at the discretion of the Lead State.

Semi-Annual	Submitted By	Effective Date
January 1-June 30	June 1 st	July 1 st
July 1-December 31	December 1 st	January 1 st

System Solution providers may update their list of available products quarterly. Quarterly means the last day of each calendar quarter, see below.

Quarter	Submitted By	Effective Date
January 1 March 30	March 1 st	April 1 st
April 1-June 30	June 1 st	July 1 st
July 1- September 30	September 1 st	October 1 st
October 1-December 31	December 1 st	January 1 st

All System Solution available product options will be posted on the NASPO ValuePoint website. A minimum of thirty-three percent (33%) of the components offered in a complete Radio or Microwave System Solution must be indexed on the Awarded Contractor's Price List. Enterprise Services reserves the right to audit System Solution orders for compliance. Updates to System Solution available products must be submitted to the Lead Contract Administrator 30 days prior to the effective date of the change. Additional product options may be considered for approval with proper 30 day notice at the discretion of the Lead State.

- 3.7. **ECONOMIC ADJUSTMENTS.** All pricing must be guaranteed for the first year of the Cooperative Purchasing Master Agreement. Following the guarantee period, any request for price increases must be for an equal guarantee period (1 year), and must be submitted to the Lead State at least thirty (30) calendar days prior to the effective date. The Lead State will review a documented request for an MSRP price list increase only after the Price Guarantee Period.

Requests for price increases must include sufficient documentation supporting the request and demonstrating the reasonableness of the adjustment when comparing the current price

list to the proposed price list. Documentation may include: the manufacturer's national price increase announcement letter, a complete and detailed description of what products are increasing and by what percentage, a complete and detailed description of what raw materials and/or other costs have increased and provide proof of increase, index data and other information to support and justify the increase. The price increase must not produce a higher profit margin than the original contract, and must be accompanied by sufficient documentation and nationwide notice of price adjustment to the published manufacturer's price list. No retroactive price increases will be allowed.

Price Reductions. In the event of a price decrease in any category of product at any time during the contract in an OEM's published manufacturer's price list, including renewal options, the Lead State shall be notified immediately. All published manufacturer's price list price reductions shall be effective upon the notification provided to the Lead State.

Enterprise Services reserves the right to request clarification and justification for requested Economic Adjustments.

Economic Price Adjustment requests for January 1st through June 30th must be submitted to Lead State Contract Administrator by June 1st to be eligible for product updates effective July 1st. Product updates for July 1st through December 31st must be submitted to the Lead State Contract Administrator by December 1st to be eligible for product updates effective January 1st.

Semi-Annual	Submitted By	Effective Date
January 1-June 30	June 1 st	July 1 st
July 1-December 31	December 1 st	January 1 st

- 3.8. **PRICE CEILING.** Although Contractor may offer lower prices, including volume discounts, to Purchasing Entity, during the term of this Cooperative Purchasing Master Agreement, Contractor guarantees to provide the Goods/Services at no greater than the prices set forth approved and posted on the NASPO ValuePoint website.
- 3.9. **COOPERATIVE PURCHASING MASTER AGREEMENT INFORMATION.** Enterprise Services shall maintain and provide information regarding this Cooperative Purchasing Master Agreement, including scope and pricing, to eligible Purchasing Entity.
- 3.10. **CONTRACTOR RESPONSIBILITIES.** Contractor shall be responsible for successful performance of the Cooperative Purchasing Master Agreement and also for the successful performance of any and all of their partners. Contractor is to be the sole point of contact as applicable by Cooperative Purchasing Master Agreement with regard to contractual matters, payment of any and all charges resulting from the purchase of the products and maintenance of the product for the term of the Cooperative Purchasing Master Agreement unless otherwise specified by a Participating State in a Participating Addendum and/or the Cooperative Purchasing Master Agreement. Contractor must be able to receive, process, and invoice orders unless the Participating State has agreed to assign these functions to a partner. Contractor will be responsible for compliance with requirements under the Cooperative Purchasing Master Agreement, even if requirements are delegated to partners. Contractor and partners must not in any way represent themselves in the name of the Lead State, NASPO ValuePoint or Participating States.

4. **CONTRACTOR REPRESENTATIONS AND WARRANTIES.** Contractor makes each of the following representations and warranties as of the effective date of this Cooperative Purchasing Master Agreement and at the time any order is placed pursuant to this Cooperative Purchasing Master Agreement. If, at the time of any such order, Contractor cannot make such representations and warranties, Contractor shall not process any orders and shall, within three (3) business days notify Enterprise Services, in writing, of such breach.
- 4.1. **QUALIFIED TO DO BUSINESS.** Contractor represents and warrants that it is in good standing and qualified to do business in the State of Washington, that it is registered with the Washington State Department of Revenue and the Washington Secretary of State, that it possesses and shall keep current all required licenses and/or approvals, and that it is current, in full compliance, and has paid all applicable taxes owed to the State of Washington. Contractor further represents and warrants that, within fifteen (15) days of executing any Participating Addendum and prior to making any sales pursuant to such Participating Addendum, Contractor shall be in good standing and qualified to do business in such state and that Contractor properly shall have registered to do business in such state, shall possess and shall keep current all required licenses and/or approvals, and that it shall be current, in full compliance, and have paid all applicable taxes owed to such state.
- 4.2. **SUSPENSION & DEBARMENT.** Contractor represents and warrants that neither it nor its principals or affiliates presently are debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in any governmental contract by any governmental department or agency within the United States.
- 4.3. **QUALITY OF GOODS OR SERVICES.** Contractor represents and warrants that any goods and/or services sold pursuant to this Cooperative Purchasing Master Agreement shall be merchantable, shall conform to this Cooperative Purchasing Master Agreement and Purchasing Entity's Purchase Order, shall be fit and safe for the intended purposes as specified in this Agreement, shall be free from defects in materials and workmanship, and shall be produced and delivered in full compliance with applicable law. Contractor further represents and warrants it has clear title to the goods and that the same shall be delivered and the services provided free of liens and encumbrances. Upon breach of warranty, Contractor will repair or replace (at no charge to Purchasing Entity) any goods and/or services whose nonconformance is discovered and made known to the Contractor. If, in Purchasing Entity's judgment, repair or replacement is inadequate, or fails of its essential purpose, Contractor will refund the full amount of any payments that have been made. The rights and remedies of the parties under this warranty are in addition to any other rights and remedies of the parties provided by law or equity, including, without limitation, actual damages, and, as applicable and awarded under the law, to a prevailing party, reasonable attorneys' fees and costs. These warranties do not apply to: (i) defects or damage resulting from: use of the equipment or software in other than its normal, customary, and authorized manner; accident, liquids, neglect, or acts of God; testing, maintenance, disassembly, repair, installation, alteration, modification, or adjustment not provided or authorized in writing by Contractor; Purchasing Entity's failure to comply with all applicable Industry and OSHA standards; (ii) breakage of or damage to antennas unless caused directly by defects in material or workmanship; (iii) equipment that has had the serial number removed or made illegible; (iv) batteries (because they carry their own separate limited warranty) or consumables; (v) freight costs to ship equipment to the repair depot; (vi) scratches or other

cosmetic damage to equipment surfaces that does not affect the operation of the equipment; and (vii) normal or customary wear and tear.

THESE WARRANTIES ARE THE COMPLETE WARRANTIES FOR THE EQUIPMENT AND CONTRACTOR SOFTWARE PROVIDED UNDER THIS AGREEMENT AND ARE GIVEN IN LIEU OF ALL OTHER WARRANTIES. CONTRACTOR DISCLAIMS ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE.

- 4.4. **WAGE VIOLATIONS.** Contractor represents and warrants that, during the term of this Cooperative Purchasing Master Agreement and the three (3) year period immediately preceding the award of the Cooperative Purchasing Master Agreement, it is not determined, by a final and binding citation and notice of assessment issued by the Washington Department of Labor and Industries or through a civil judgment entered by a court of limited or general jurisdiction, to be in willful violation of any provision of Washington state wage laws set forth in RCW chapters 49.46, 49.48, or 49.52.
- 4.5. **PAY EQUALITY.** Contractor represents and warrants that, among its workers, similarly employed individuals are compensated as equals. For purposes of this provision, employees are similarly employed if the individuals work for the same employer, the performance of the job requires comparable skill, effort, and responsibility, and the jobs are performed under similar working conditions. Job titles alone are not determinative of whether employees are similarly employed. Contractor may allow differentials in compensation for its workers based in good faith on any of the following: a seniority system; a merit system; a system that measures earnings by quantity or quality of production; a bona fide job-related factor or factors; or a bona fide regional difference in compensation levels. A bona fide job-related factor or factors may include, but not be limited to, education, training, or experience that is: consistent with business necessity; not based on or derived from a gender-based differential; and accounts for the entire differential. A bona fide regional difference in compensation level must be consistent with business necessity; not based on or derived from a gender-based differential; and account for the entire differential. Notwithstanding any provision to the contrary, upon breach of warranty and Contractor's failure to provide satisfactory evidence of compliance within thirty (30) days, Enterprise Services may suspend or terminate this Cooperative Purchasing Master Agreement and any Purchasing Entity hereunder similarly may suspend or terminate its use of the Cooperative Purchasing Master Agreement and/or any agreement entered into pursuant to this Cooperative Purchasing Master Agreement.
- 4.6. **EXECUTIVE ORDER 18-03 – WORKERS' RIGHTS.** Contractor represents and warrants, as previously certified in Contractor's Bidder's Certification, that Contractor does NOT require its employees, as a condition of employment, to sign or agree to mandatory individual arbitration clauses or class or collective action waivers. Contractor further represents and warrants that, during the term of this Cooperative Purchasing Master Agreement, Contractor shall not, as a condition of employment, require its employees to sign or agree to mandatory individual arbitration clauses or class or collective action waivers.
- 4.7. **PROCUREMENT ETHICS & PROHIBITION ON GIFTS.** Contractor represents and warrants that it complies fully with all applicable procurement ethics restrictions including, but not limited

to, restrictions against Contractor providing gifts or anything of economic value, directly or indirectly, to Purchasing Entity's employees.

- 4.8. WASHINGTON'S ELECTRONIC BUSINESS SOLUTION (WEBS). Contractor represents and warrants that it is registered in Washington's Electronic Business Solution (WEBS), Washington's contract registration system and that, all of its information therein is current and accurate and that throughout the term of this Cooperative Purchasing Master Agreement, Contractor shall maintain an accurate profile in WEBS.
- 4.9. STATEWIDE PAYEE DESK. Contractor represents and warrants that it is registered with the Statewide Payee Desk, which registration is a condition to payment.
- 4.10. COOPERATIVE PURCHASING MASTER AGREEMENT PROMOTION; ADVERTISING AND ENDORSEMENT. Contractor represents and warrants that it shall use commercially reasonable efforts both to promote and market the use of this Cooperative Purchasing Master Agreement with eligible Purchasing Entity and to ensure that those entities that utilize this Cooperative Purchasing Master Agreement are eligible Purchasing Entity. Contractor understands and acknowledges that neither Enterprise Services nor Purchasing Entity are endorsing Contractor's goods and/or services or suggesting that such goods and/or services are the best or only solution to their needs. Accordingly, Contractor represents and warrants that it shall make no reference to Enterprise Services, any Purchasing Entity, or the State of Washington in any promotional material without the prior written consent of Enterprise Services.
- 4.11. COOPERATIVE PURCHASING MASTER AGREEMENT TRANSITION. Contractor represents and warrants that, in the event this Cooperative Purchasing Master Agreement or a similar contract, is transitioned to another contractor (e.g., Cooperative Purchasing Master Agreement expiration or termination), Contractor shall use commercially reasonable efforts to assist Enterprise Services for a period of sixty (60) days to effectuate a smooth transition to another contractor to minimize disruption of service and/or costs to the State of Washington.
- 4.12. SUB-CONTRACTORS, AUTHORIZED RESELLERS/DEALERS. MANUFACTURER'S REPRESENTATIVE (PARTNERS). If utilizing partners, Contractor is responsible for such partners providing products and services, as well as warranty and maintenance services for any product or solution such partners provide pursuant to this Cooperative Purchasing Master Agreement. Pursuant to their applicable Participating Addendum, each Participating Entity may allow or disallow Contractor to utilize Partners. Only partners approved by the Participating Entity may be utilized. The Participating Entity will define the process to add and remove partners in their Participating Addendum.

5. USING THE COOPERATIVE PURCHASING MASTER AGREEMENT – PURCHASES.

- 5.1. ORDERING REQUIREMENTS. Eligible Purchasing Entity shall order goods and/or services from this Cooperative Purchasing Master Agreement, consistent with the terms hereof and by using any ordering mechanism agreeable both to Contractor and Purchasing Entity but, at a minimum, including the use of a purchase order. When practicable, Contractor and Purchasing Entity also shall use telephone orders, email orders, web-based orders, and similar procurement methods (collectively "Purchasing Entity Order"). All order documents must reference the Cooperative Purchasing Master Agreement number. The terms of this Cooperative Purchasing Master Agreement shall apply to any Purchase Order and, in the

event of any conflict, the terms of this Cooperative Purchasing Master Agreement shall prevail. Notwithstanding any provision to the contrary, in no event shall any 'click-agreement,' software or web-based application terms and conditions, or other agreement modify the terms and conditions of this Cooperative Purchasing Master Agreement.

A minimum of thirty-three percent (33%) of the solution components must be indexed on the Contractor's Price List. Prior to executing an order for a "Solution", Contractor shall provide Purchasing Entity a detailed Cost Proposal itemizing all proposed costs (including labor costs, employee benefits, travel, overhead and other direct costs) Contractor estimates it will incur in the performance of the work.

- (a) All order documents must, at a minimum, reference
 - the Cooperative Purchasing Master Agreement number;
 - The place and requested time of delivery;
 - A billing address;
 - The name, phone number, and address of the Participating Entity representative;
- (b) All communications concerning administration of Orders placed shall be furnished solely to the authorized purchasing agent within the Participating Entity's purchasing office, or to such other individual identified in writing in the Order.
- (c) Orders must be placed pursuant to this Cooperative Purchasing Master Agreement prior to the termination date thereof, but may have a delivery date or performance period up to 120 days thereafter.
- (d) Notwithstanding the expiration, cancellation or termination of this Cooperative Purchasing Master Agreement, Contractor agrees to perform in accordance with the terms of any Orders then outstanding at the time of such expiration or termination. Contractor shall not honor any Orders placed after the expiration, cancellation, or termination of this Cooperative Purchasing Master Agreement, or otherwise inconsistent with its terms. Orders from any separate indefinite quantity, task orders, or other form of indefinite delivery order arrangement priced against this Cooperative Purchasing Master Agreement may not be placed after the expiration or termination of this Cooperative Purchasing Master Agreement, notwithstanding the term of any such indefinite delivery order agreement.

5.2. DELIVERY REQUIREMENTS. Contractor must ensure that delivery of goods and/or services will be made as required by this Cooperative Purchasing Master Agreement, the Purchase Order used by Purchasing Entity, or as otherwise mutually agreed in writing between the Purchasing Entity and Contractor. The following apply to all deliveries:

- (a) Contractor shall make all deliveries to the applicable delivery location specified in the Purchase Order. Such deliveries shall occur during Purchasing Entity's normal work hours and within the time period mutually agreed in writing between Purchasing Entity and Contractor at the time of order placement. Deliveries to be off-loaded at Purchasing Entity's receiving dock or designated job site by Contractor.

- (b) Contractor shall ship all goods purchased pursuant to this Master Agreement Purchasing Entity's specified destination. Shipping charges must be mutually agreed to between Purchasing Entity and Contractor. Contractor shall bear all risk of loss, damage, or destruction of the goods ordered hereunder that occurs prior to delivery, except loss or damage attributable to Purchasing Entity's fault or negligence.
- (c) All products must be delivered in the manufacturer's standard package. Costs shall include all packing and/or crating charges. Cases shall be of durable construction, good condition, properly labeled and suitable in every respect for storage and handling of contents. Each shipping carton shall be marked with the commodity, brand, quantity, item code number and the Purchasing Entity's Purchase Order number.
- (d) All packing lists, packages, instruction manuals, correspondence, shipping notices, shipping containers, and other written materials associated with this Cooperative Purchasing Master Agreement shall be identified by the Cooperative Purchasing Master Agreement number set forth on the cover of this Cooperative Purchasing Master Agreement and the applicable Purchase Order number. Packing lists shall be enclosed with each shipment and clearly identify all contents and any backorders.
- (e) Purchasing Entities may return unopened or unused (non-specialty) Public Safety Radio products within ten (10) business days of receipt for full credit, minus any freight or restocking fee. In such event, Contractor is responsible for shipping costs pertaining to any defective Public Safety Radio Products that are returned.

5.3. RECEIPT AND INSPECTION OF GOODS AND/OR SERVICES. Goods and/or services purchased under this Cooperative Purchasing Master Agreement are subject to Purchasing Entity's reasonable inspection, testing, and approval at Purchasing Entity's destination. Such inspection and approval shall be determined within thirty (30) days of delivery. Purchasing Entity reserves the right to reject and refuse acceptance of goods and/or services that are not in accordance with this Cooperative Purchasing Master Agreement and Purchasing Entity's Purchase Order. Purchasing Entity may charge Contractor for the cost of inspecting rejected goods. If there are any apparent defects in the goods and/or services at the time of delivery, Purchasing Entity will notify Contractor within five (5) business days. At Purchasing Entity's option, and without limiting any other rights, Purchasing Entity may require Contractor to, consistent with the warranty terms, repair or replace, at Contractor's expense, any or all of the damaged goods and/or services or, at Purchasing Entity's option, Purchasing Entity may note any damage to the goods and/or services on the receiving report, decline acceptance, and deduct the cost of rejected goods and/or services from final payment. Payment for any goods under such Purchase Order shall not be deemed acceptance of the goods.

- (a) All Products are subject to inspection at reasonable times and places before Acceptance. Contractor shall provide right of access to the Lead State, or to any other authorized agent or official of the Lead State or other Participating or Purchasing Entity, at reasonable times, in order to monitor and evaluate performance, compliance, and/or quality assurance requirements under this Cooperative Purchasing Master Agreement. Products that do not meet

specifications may be rejected. Failure to reject upon receipt, however, does not relieve Contractor of liability for material (nonconformity that substantially impairs value) latent or hidden defects subsequently revealed when the Public Safety Radio Products are put to use. Acceptance of such Public Safety Radio Products may be revoked in accordance with the provisions of the applicable commercial code, and Contractor shall be liable for any resulting expense incurred by the Purchasing Entity related to the preparation and shipping of any Public Safety Radio Products rejected and returned, or for which Acceptance is revoked.

- (b) If any Public Safety Radio Products do not conform to the specifications, the Purchasing Entity may require the Contractor to repair or replace the Public Safety Radio Product in conformity with the specifications.

- 5.4. ON SITE REQUIREMENTS. While on Purchasing Entity's premises, Contractor, its agents, employees, or subcontractors shall comply, in all respects, with Purchasing Entity's physical, fire, access, safety, and other security requirements.
- 5.5. INSTALLATION. Installation shall be performed by Contractor or Sub-Contractor, in a professional manner in accordance with industry standard best practices. The premises shall be left in a neat, clean, and undamaged condition. Purchasing Entity reserves the right to require Contractor or Sub-Contractor to repair any damage caused during installation or provide full compensation as determined by Purchasing Entity.
- 5.6. CONFIDENTIALITY; SAFEGUARDING OF INFORMATION. Contractor shall not use or disclose any information concerning Enterprise Services/the State of Washington or Purchasing Entity's information which may be classified as confidential, for any purpose not directly connected with the administration of this Cooperative Purchasing Master Agreement, except with prior written consent of Enterprise Services (or the applicable Purchasing Entity), or as may be required by law.
- 5.7. TREATMENT OF ASSETS. Title to all property furnished by any Participating State and/or Purchasing Entity shall remain with such Participating State and/or Purchasing Entity, as applicable. Any property of any Participating State and/or Purchasing Entity furnished to Contractor shall, unless otherwise provided herein or approved by such Participating State and/or Purchasing Entity, be used only for the performance of this Cooperative Purchasing Master Agreement. Contractor shall be responsible for damages as a result of any loss or damage to property of any Participating State and/or Purchasing Entity to the extent it results from the negligence of Contractor or to the extent it results from the failure on the part of Contractor to maintain, administer and protect that property in a reasonable manner and to the extent practicable in all instances. If any such Participating State and/or Purchasing Entity property is lost, destroyed, or damaged, Contractor immediately shall notify such Participating State and/or Purchasing Entity and shall take all reasonable steps to protect the property from further damage. Contractor shall surrender to such Participating State and/or Purchasing Entity all property of such Participating State and/or Purchasing Entity prior to settlement upon completion, termination, or cancellation of this Cooperative Purchasing Master Agreement. Title to all property furnished by Contractor, the cost for which the Contractor is entitled to be reimbursed as a direct item of cost under this Contract, shall pass to and vest in the Purchasing Entity upon delivery of such property by Contractor and acceptance by the Purchasing Entity. Title to other property, the cost of which is reimbursable to Contractor under this Contract, shall pass to and vest in the

Purchasing Entity upon (i) issuance for use of such property in the performance of this Contract, or (ii) commencement of use of such property in the performance of this Contract, or (iii) reimbursement of the cost thereof by the Purchasing Entity in whole or in part, whichever first occurs. All reference to Contractor under this clause shall also include Contractor's employees, agents or subcontractors. Title to software shall not pass to Purchasing Entity but shall be licensed. All reference to Contractor under this clause shall also include Contractor's employees, agents or subcontractors.

- 5.8. **SOFTWARE LICENSE AGREEMENT.** If the public safety communications equipment ordered and delivered under the terms and conditions of this Cooperative Purchasing Master Agreement requires software or firmware to operate, Purchasing Entity and Contractor will mutually agree to Contractor's Software License Agreement that will apply to such transactions. Contractor's current version of the Software License Agreement is located on the NASPO ValuePoint website. Contractor's software license agreement shall not conflict with the terms and conditions of this Cooperative Purchasing Master Agreement. If there are any conflicts between the Cooperative Purchasing Master Agreement and Contractor's Software License Agreement, the Cooperative Purchasing Master Agreement shall prevail.
- 5.9. **SUBSCRIPTION SERVICES AGREEMENT.** If the public safety communications equipment ordered and delivered under the terms and conditions of this Contract requires subscription services to operate, Purchasing Entity and Contractor will mutually agree to Contractor's Subscription Services Agreement that will apply to such transactions. Contractor's current version of the Subscription Services Agreement is located on the NASPO ValuePoint website. Contractor's Subscription Services Agreement shall not conflict with the terms and conditions of this Master Agreement. If there are any conflicts between the Cooperative Purchasing Master Agreement and Contractor's Subscription Services Agreement, the Cooperative Purchasing Master Agreement shall prevail.

6. INVOICING & PAYMENT.

- 6.1. **CONTRACTOR INVOICE.** Contractor shall submit to Purchasing Entity's designated invoicing contact properly itemized invoices. Such invoices shall itemize the following:

- Cooperative Purchasing Master Agreement No. 00318
- Contractor name, address, telephone number, and email address for billing issues (i.e., Contractor Customer Service Representative)
- Contractor's Federal Tax Identification Number
- Date(s) of delivery
- Applicable goods/services
- Invoice amount; and
- Payment terms, including any available prompt payment discounts.

Contractor's invoices for payment shall reflect accurate Cooperative Purchasing Master Agreement prices, less discounts or lower negotiated costs. Invoices will not be processed for payment until receipt of a complete invoice as specified herein.

- 6.2. **PAYMENT.** Payment is the sole responsibility of, and will be made by, the Purchasing Entity. Payment is due within thirty (30) days of invoice. If Purchasing Entity fails to make timely payment(s), Contractor may invoice Purchasing Entity in the amount of one percent (1%) per

month on the amount overdue or a minimum of \$1. Payment will not be considered late if a check or warrant is mailed within the time specified.

- 6.3. **OVERPAYMENTS.** Contractor promptly shall refund to Purchasing Entity the full amount of any erroneous payment or overpayment. Such refunds shall occur within thirty (30) days of written notice to Contractor; *Provided*, however, that Purchasing Entity shall have the right to elect to have either direct payments or written credit memos issued. If Contractor fails to make timely payment(s) or issuance of such credit memos, Purchasing Entity may impose a one percent (1%) per month on the amount overdue thirty (30) days after notice to the Contractor.
- 6.4. **NO ADVANCE PAYMENT.** No advance payment shall be made for the products and services furnished by Contractor pursuant to this Cooperative Purchasing Master Agreement; *Provided*, however, that the parties agree that maintenance payments, if any, may be made on a quarterly basis at the beginning of each quarter.
- 6.5. **NO ADDITIONAL CHARGES.** Unless otherwise specified herein, Contractor shall not include or impose any additional charges including, but not limited to, charges for shipping, handling, or payment processing.
- 6.6. **TAXES/FEES.** Contractor promptly shall pay all applicable taxes on its operations and activities pertaining to this Cooperative Purchasing Master Agreement. Failure to do so shall constitute breach of this Cooperative Purchasing Master Agreement. Unless otherwise agreed, Purchasing Entity shall pay applicable sales tax imposed by the State of Washington on purchased goods and/or services. In regard to federal excise taxes, Contractor shall include federal excise taxes only if, after thirty (30) calendar days written notice to Purchasing Entity, Purchase has not provided Contractor with a valid exemption certificate from such federal excise taxes.

7. CONTRACT MANAGEMENT.

- 7.1. **CONTRACT ADMINISTRATION & NOTICES.** Except for legal notices, the parties hereby designate the following contract administrators as the respective single points of contact for purposes of this Cooperative Purchasing Master Agreement. Enterprise Services' contract administrator shall provide Cooperative Purchasing Master Agreement oversight. Contractor's contract administrator shall be Contractor's principal contact for business activities under this Cooperative Purchasing Master Agreement. The parties may change contractor administrators by written notice as set forth below.

Any notices required or desired shall be in writing and sent by U.S. mail, postage prepaid, or sent via email, and shall be sent to the respective addressee at the respective address or email address set forth below or to such other address or email address as the parties may specify in writing:

Enterprise Services

Attn: Contract Administrator 00318
Washington Dept. of Enterprise Services
PO Box 41411
Olympia, WA 98504-1411
Tel: (360) 407-2218

Motorola Solutions, Inc.

Attn: Andrew Chyterbok
500 W Monroe Street
Suite 4400
Chicago, IL 6661-3781

Email: DESContractsTeamCypress@des.wa.gov

Tel: (360) 409-3223

Email: andrew.chyterbok@motorolasolutions.com

Notices shall be deemed effective upon the earlier of receipt, if mailed, or, if emailed, upon transmission to the designated email address of said addressee.

- 7.2. **CONTRACTOR CUSTOMER SERVICE REPRESENTATIVE.** Contractor shall designate a customer service representative (and inform Enterprise Services of the same) who shall be responsible for addressing Purchasing Entity issues pertaining to this Cooperative Purchasing Master Agreement.
- 7.3. **LEGAL NOTICES.** Any legal notices required or desired shall be in writing and delivered by U.S. certified mail, return receipt requested, postage prepaid, or sent via email, and shall be sent to the respective addressee at the respective address or email address set forth below or to such other address or email address as the parties may specify in writing:

Enterprise Services

Attn: Legal Services Manager
Washington Dept. of Enterprise
Services
PO Box 41411
Olympia, WA 98504-1411
Email: greg.tolbert@des.wa.gov

Motorola Solutions, Inc.

Attn: Andrew Chyterbok
500 W Monroe Street
Suite 4400
Chicago, IL 6661-3781
Email:
andrew.chyterbok@motorolasolutions.com

Notices shall be deemed effective upon the earlier of receipt when delivered, or, if mailed, upon return receipt, or, if emailed, upon transmission to the designated email address of said addressee.

8. NASPO VALUEPOINT SUMMARY AND DETAILED USAGE REPORTS.

- 8.1. **SUMMARY SALES DATA.** Contractor shall submit quarterly sales reports directly to NASPO ValuePoint using the NASPO ValuePoint Quarterly Sales/Administrative Fee Reporting Tool found at <http://www.naspo.org/WNCPO/Calculator.aspx>. Any/all sales made under this Cooperative Purchasing Master Agreement shall be reported as cumulative totals by state. Even if Contractor experiences zero sales during a calendar quarter, a report is still required. Reports shall be due no later than thirty (30) days following the end of the calendar quarter (as specified in the reporting tool).
- 8.2. **DETAILED SALES DATA.** Contractor also shall report detailed sales data by: (1) state; (2) entity/customer type, e.g. local government, higher education, K12, non-profit; (3) Participating Entity name; (4) Participating Entity bill-to and ship-to locations; (4) Participating Entity and Contractor Purchase Order identifier/number(s); (5) Purchase Order Type (e.g. sales order, credit, return, upgrade, determined by industry practices); (6) Purchase Order date; (7) Ship Date; and (8) line item description, including product number if used. Reports are due on a quarterly basis and must be received by the Enterprise Services and NASPO ValuePoint Cooperative Development Team no later than thirty (30) days after the end of the reporting period. Reports shall be delivered to Enterprise Services and to the NASPO ValuePoint Cooperative Development Team electronically through a designated portal, email, CD-ROM, flash drive or other method as determined by Enterprise Services and NASPO ValuePoint. Detailed sales data reports shall

include sales information for all sales under Participating Addenda executed under this Cooperative Purchasing Master Agreement.

- 8.3. **NASPO VALUEPOINT EXECUTIVE SUMMARY.** Contractor shall provide the NASPO ValuePoint Cooperative Development Coordinator with an executive summary each quarter that includes, at a minimum, a list of states with an active Participating Addendum, states that Contractor is in negotiations with and any Participating Addendum roll out or implementation activities and issues. NASPO ValuePoint Cooperative Development Coordinator and Contractor will determine the format and content of the executive summary. The executive summary is due thirty (30) days after the conclusion of each calendar quarter.
- 8.4. **REPORT OWNERSHIP.** Timely submission of these reports is a material requirement of the Cooperative Purchasing Master Agreement. Enterprise Services and NASPO ValuePoint shall have a perpetual, irrevocable, non-exclusive, royalty free, transferable right to display, modify, copy, and otherwise use reports, data and information provided under this section.
- 8.5. **CONFIDENTIALITY OF DETAILED SALES DATA AND PARTICIPATING ADDENDA.** Participating Addenda, as well as Orders or transaction data relating to Orders under this Cooperative Purchasing Master Agreement that identify the entity/customer, Order dates, line item descriptions and volumes, and prices/rates, shall be Confidential Information. Contractor shall hold Confidential Information in confidence and shall not transfer or otherwise disclose Confidential Information to third parties or use Confidential Information for any purposes whatsoever other than what is necessary to the performance of Orders placed under this Cooperative Purchasing Master Agreement. Contractor shall advise each of its employees and agents of their obligations to keep Confidential Information confidential. This provision does not apply to disclosure to the Lead State, a Participating State, or any governmental entity exercising an audit, inspection, or examination pursuant to this Cooperative Purchasing Master Agreement. To the extent permitted by law, Contractor shall notify the Lead State of the identity of any entity seeking access to the Confidential Information described in this subsection.

9. NASPO VALUEPOINT COOPERATIVE PROGRAM MARKETING AND PERFORMANCE REVIEW

- 9.1. **NASPO VALUEPOINT COOPERATIVE PROGRAM.** Contractor agrees to work cooperatively with NASPO ValuePoint personnel. Contractor agrees to present plans to NASPO ValuePoint for the education of Contractor's contract administrator(s) and sales/marketing workforce regarding the Cooperative Purchasing Master Agreement, including the competitive nature of NASPO ValuePoint procurements, the Cooperative Purchasing Master Agreement and Participating Addendum process, and the manner in which qualifying entities can participate in the Cooperative Purchasing Master Agreement.
- 9.2. **LOGOS.** NASPO VALUEPOINT logos may not be used by Contractor in sales and marketing until a logo use agreement is executed with NASPO ValuePoint.
- 9.3. **ANNUAL SUPPLIER BUSINESS REVIEW.** Contractor agrees to participate in an annual supplier performance review at a location (virtual or in-person) selected by Enterprise Services and NASPO ValuePoint, which may include a discussion of marketing action plans, target strategies, marketing materials, as well as Contractor reporting and timeliness of payment of administration fees. The 2022 Annual Supplier Business Review requires in-person

attendance. Any subsequent Annual Supplier Business Review meetings may be attended virtually or in-person.

10. ADMINISTRATIVE FEES.

- 10.1. CONTRACTOR shall pay to NASPO ValuePoint, or its assignee, a NASPO ValuePoint ADMINISTRATIVE Fee of one-quarter of one percent (0.25%) of the quarterly sales by participating state. The NASPO ValuePoint administrative fee is not negotiable. This fee may not be adjusted in any Participating Addendum. This fee is to be included as part of the pricing submitted with the bid.
- 10.2. Some states may require an additional fee be paid directly to the state only on purchases made by Purchasing Entities within that state. The fee level, payment method and schedule for such reports and payments will be incorporated into the Participating Addendum that is made a part of the Cooperative Purchasing Master Agreement. The Contractor may adjust the Cooperative Purchasing Master Agreement pricing accordingly for purchases made by Purchasing Entities within the jurisdiction of the state. All such agreements shall not affect the NASPO ValuePoint Administrative Fee percentage or the prices paid by the Purchasing Entities outside the jurisdiction of the state requesting the additional fee. The NASPO ValuePoint Administrative Fee set forth above shall be based on the gross amount of all sales (less any charges for taxes or shipping) at the adjusted prices (if any) in Participating Addenda.

11. RECORDS RETENTION & AUDITS.

- 11.1. RECORDS RETENTION. Contractor shall maintain books, records, documents, and other evidence pertaining to this Cooperative Purchasing Master Agreement and orders placed by Purchasing Entity under it to the extent and in such detail as shall adequately reflect performance and administration of payments and fees. Contractor shall retain such records for a period of six (6) years following expiration or termination of this Cooperative Purchasing Master Agreement or final payment for any order placed by a Purchasing Entity against this Cooperative Purchasing Master Agreement, whichever is later; *Provided*, however, that if any litigation, claim, or audit is commenced prior to the expiration of this period, such period shall extend until all such litigation, claims, or audits have been resolved.
- 11.2. AUDIT. Upon reasonable advance written notice, Enterprise Services reserves the right to audit, or have a designated third party audit, applicable records to ensure that Contractor has properly invoiced Purchasing Entity and that Contractor has paid all applicable vendor management fees. Accordingly, Contractor shall permit Enterprise Services, any Purchasing Entity, and any other duly authorized agent of a governmental agency, to audit, inspect examine, copy and/or transcribe Contractor's books, documents, papers and records directly pertinent to this Cooperative Purchasing Master Agreement or orders placed by a Purchasing Entity under it for the purpose of making audits, examinations, excerpts, and transcriptions. This right shall survive for a period of six (6) years following expiration or termination of this Cooperative Purchasing Master Agreement or final payment for any order placed by a Purchasing Entity against this Cooperative Purchasing Master Agreement, whichever is later; *Provided*, however, that if any litigation, claim, or audit is commenced prior to the expiration of this period, such period shall extend until all such litigation, claims, or audits have been resolved.

- 11.3. OVERPAYMENT OF PURCHASES OR UNDERPAYMENT OF FEES. Without limiting any other remedy available to any Purchasing Entity, Contractor shall reimburse Purchasing Entity for any overpayments inconsistent with the terms of this Cooperative Purchasing Master Agreement or orders, at a rate of 100% of such overpayments, found as a result of the examination of the Contractor's records.

12. INSURANCE.

- 12.1. REQUIRED INSURANCE. During the Term of this Cooperative Purchasing Master Agreement, Contractor, at its expense, shall maintain in full force and effect the insurance coverages set forth in *Exhibit A – Insurance Requirements*. All costs for insurance, including any payments of deductible amounts, shall be considered incidental to and included in the prices for goods/services and no additional payment shall be made.
- 12.2. WORKERS COMPENSATION. Contractor shall comply with applicable workers compensation statutes and regulations (e.g., RCW Title 51, Industrial Insurance). If Contractor fails to provide industrial insurance coverage or fails to pay premiums or penalties on behalf of its employees as may be required by law, Enterprise Services may terminate this Cooperative Purchasing Master Agreement. This provision does not waive any of the Washington State Department of Labor and Industries (L&I) rights to collect from Contractor. In addition, Contractor waives its immunity under RCW Title 51 to the extent it is required to indemnify, defend, and hold harmless the State of Washington and its agencies, officials, agents, or employees.
- 12.3. INSURANCE CERTIFICATE. Prior to commencement of performance, Contractor shall provide to Enterprise Services a Certificate of Insurance acceptable to Enterprise Services that (1) includes the State of Washington and Enterprise Services as additional insureds, (2) provides for written notice of cancellation delivered in accordance with the policy provisions, and (3) provides that the Contractor's liability insurance policy shall be primary, with any liability insurance of any Participating State as secondary and noncontributory. Unless otherwise agreed in any Participating Addendum, other state Participating Entities' rights and Contractor's obligations are the same as those specified in the first sentence of this subsection except the endorsement is provided to the applicable state.

13. PUBLIC INFORMATION. This Cooperative Purchasing Master Agreement, all related documents, and all records created as a result of the Cooperative Purchasing Master Agreement are subject to public disclosure as required by Washington's Public Records Act, RCW chapter 42.56. In addition, Participating Addendums and related records shall be subject to public disclosure as required by applicable law pertaining to such Purchasing Entity. Consistent with the Public Records Act, to the extent that any such Contractor document or record – in whole or in part – includes information exempted or protected from disclosure by the Public Records Act, Contractor may mark such document or record – the exempted or protected portions only – with the specific basis for protection under the Public Records Act. In the event that Enterprise Services receives a public records disclosure request that pertains to such properly marked documents or records, Enterprise Services shall notify Contractor of such disclosure request and of the date that the records will be released to the requester unless Contractor, at Contractor's sole expense, timely obtains a court order enjoining such disclosure. In the event Contractor fails to file a motion for a court order enjoining such disclosure, Enterprise Services shall release the requested documents on the date specified. Contractor's failure properly to identify exempted or protected information or timely

respond after notice of request for public disclosure has been given shall be deemed a waiver by Contractor of any claim that such materials are protected or exempt from disclosure.

14. DEFAULTS AND REMEDIES

14.1. **SUSPENSION & TERMINATION FOR DEFAULT.** Enterprise Services may suspend Contractor's operations under this Cooperative Purchasing Master Agreement immediately by written cure notice of any default. Contractor may be required to submit a written cure plan within five (5) business days of Suspension notification. Suspension shall continue until the default is remedied to Enterprise Services' reasonable satisfaction; *Provided*, however, that, if after thirty (30) days from such a suspension notice, Contractor remains in default, Enterprise Services may terminate Contractor's rights under this Cooperative Purchasing Master Agreement. All of Contractor's obligations to Enterprise Services and Purchasing Entity survive termination of Contractor's rights under this Cooperative Purchasing Master Agreement, until such obligations have been fulfilled.

14.2. **DEFAULT.** Each of the following events shall constitute default of this Cooperative Purchasing Master Agreement by Contractor:

- (a) Contractor fails to perform or comply with any of the terms or conditions of this Cooperative Purchasing Master Agreement;
- (b) Contractor breaches any representation or warranty provided herein; or
- (c) Contractor enters into proceedings relating to bankruptcy, whether voluntary or involuntary.

14.3. **REMEDIES for DEFAULT.**

- (a) Enterprise Services' rights to suspend and terminate Contractor's rights under this Cooperative Purchasing Master Agreement are in addition to all other available remedies.
- (b) In the event of termination for default, Enterprise Services may exercise any remedy provided by law including, without limitation, the right to procure for all Purchasing Entity replacement goods and/or services. In such event, Contractor shall be liable to Enterprise Services for damages as authorized by law including, but not limited to, any price difference between the Cooperative Purchasing Master Agreement price and the replacement or cover price for identical equipment or services, as well as any administrative and/or transaction costs directly related to such replacement procurement – e.g., the cost of the competitive procurement. Enterprise Services or Purchasing Entity will mitigate damages and provide Contractor with detailed invoices substantiating the charges.
- (c) Unless otherwise specified in the Participating Addendum, in the event of a default under a Participating Addendum, a Participating Entity shall provide a written notice of default as described in this section and have all of the rights and remedies under this paragraph regarding its participation in the Cooperative Purchasing Master Agreement, in addition to those set forth in its Participating Addendum. Unless otherwise specified in a Purchase Order, either Party shall provide written notice of default as described in this section and have all of the rights and remedies under this paragraph and any applicable Participating Addendum with respect to an Order. Nothing in this Cooperative Purchasing Master Agreement shall be

construed to limit the rights and remedies available to either Party under the applicable commercial code.

- 14.4. LIMITATION ON DAMAGES. Notwithstanding any provision to the contrary, the parties agree that in no event shall any party or Purchasing Entity be liable to the other for exemplary or punitive damages. Contractor's total liability, whether for breach of contract, strict liability in tort, or otherwise, will be limited to the direct damages recoverable under law, but not to exceed the \$2,000,000 per claim or \$30,000,000 aggregate liability; *provided*, however, that nothing contained in this Section will in any way exclude or limit Contractor's liability for all damages arising out of gross negligence, personal injury or death.

ALTHOUGH THE PARTIES ACKNOWLEDGE THE POSSIBILITY OF SUCH LOSSES OR DAMAGES, THEY AGREE THAT CONTRACTOR WILL NOT BE LIABLE FOR ANY COMMERCIAL LOSS, INCONVENIENCE, LOSS OF USE, LOSS TIME, DATA, GOODWILL, REVENUES, PROFITS OR SAVINGS; OR OTHER SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES IN ANY WAY RELATED TO OR ARISING FROM THIS AGREEMENT, THE SALE OR USE OF THE EQUIPMENT OR SOFTWARE, OR THE PERFORMANCE OF SERVICES BY CONTRACTOR PURSUANT TO THIS AGREEMENT.

This limitation of liability provision survives the expiration or termination of this Cooperative Purchasing Master Agreement and applies notwithstanding any contrary provision. No action for contract breach or otherwise relating to the transactions contemplated by this Cooperative Purchasing Master Agreement may be brought later than the limitations period specified by statute.

- 14.5. GOVERNMENTAL TERMINATION.

- (a) Termination for Withdrawal of Authority. Enterprise Services may suspend or terminate this Cooperative Purchasing Master Agreement if, during the term hereof, Enterprise Services' procurement authority is withdrawn, reduced, or limited such that Enterprise Services, in its judgment, would lack authority to enter into this Cooperative Purchasing Master Agreement; *Provided*, however, that such suspension or termination for withdrawal of authority shall only be effective upon twenty (20) days prior written notice; and *Provided further*, that such suspension or termination for withdrawal of authority shall not relieve any Participating Entity or Purchasing Entity from payment for goods and/or services already ordered as of the effective date of such notice. Except as stated in this provision, in the event of such suspension or termination for withdrawal of authority, neither Enterprise Services nor any Participating Entity or Purchasing Entity shall have any obligation or liability to Contractor. Contractor will be entitled to seek a change order to the extent Contractor provides documentary evidence that Contractor has incurred additional costs as a result of the suspension including costs to demobilize and remobilize the project.
- (b) Termination for Convenience. Enterprise Services, for convenience, may terminate this Cooperative Purchasing Master Agreement; *Provided*, however, that such termination for convenience must, in Enterprise Services' judgment, be in the best interest of the State of Washington; and *Provided further*, that such termination for convenience shall only be effective upon sixty (60) days prior written notice; and *Provided further*, that such termination for convenience shall not relieve any Participating Entity or Purchasing Entity from payment for goods and/or services

already ordered as of the effective date of such notice. Except as stated in this provision, in the event of such termination for convenience, neither Enterprise Services nor any Participating Entity or Purchasing Entity shall have any obligation or liability to Contractor.

15. CLAIMS.

- 15.1. ASSUMPTION OF RISKS; CLAIMS BETWEEN THE PARTIES. Contractor assumes sole responsibility and all risks of personal injury or property damage to itself and its employees and agents to the extent caused by its operations under this Cooperative Purchasing Master Agreement. Enterprise Services has made no representations regarding any factor affecting Contractor's risks. Contractor shall pay for all damage to any Purchasing Entity's property resulting directly or indirectly from its acts or omissions under this Cooperative Purchasing Master Agreement, to the extent attributable to negligence by Contractor or its agents.
- 15.2. THIRD-PARTY CLAIMS; INDEMNITY. To the fullest extent permitted by law, Contractor shall defend, indemnify, and hold harmless Enterprise Services, any Purchasing Entity, and NASPO Cooperative Purchasing Organization LLC (doing business as NASPO ValuePoint) (NASPO) and their respective employees and agents from and against all claims, demands, judgments, assessments, damages, penalties, fines, costs, liabilities or losses including, without limitation, sums paid in settlement of claims, attorneys' fees, consultant fees, and expert fees (collectively "claims") to the extent arising from any negligent act or omission of Contractor or its successors, agents, and subcontractors under this Cooperative Purchasing Master Agreement, except to the extent such claims are caused by Enterprise Services, any Purchasing Entity, or NASPO's negligence. Contractor shall take all steps needed to keep Purchasing Entity's property free of liens arising from Contractor's activities, and promptly obtain or bond the release of any such liens that may be filed. Unless otherwise agreed in writing, this section is not subject to any limitations of liability in this Cooperative Purchasing Master Agreement or in any other document executed in conjunction with this Cooperative Purchasing Master Agreement.
- 15.3. INDEMNIFICATION – Intellectual Property. The Contractor will defend at its expense any suit brought against NASPO, NASPO ValuePoint, Participating State or Purchasing Entity, ("Customer") to the extent it is based on a third party claim alleging Contractor manufactured equipment or Contractor software ("Contractor Product") directly infringes a United States patent or copyright ("Intellectual Property Claim") if Contractor receives reasonably prompt written notice of such claim or suit. If the Contractor promptly and reasonably investigates and defends any Intellectual Property Claim, it shall have control over the defense and settlement of it. However, the Indemnified Party must consent in writing for any money damages or obligations for which it may be responsible. The Indemnified Party shall furnish, at the Contractor's reasonable request and expense, information and assistance necessary for such defense.

If an Intellectual Property Claim occurs, or in Contractor's opinion is likely to occur, Contractor may at its option and expense: (a) procure for Customer the right to continue using the Contractor Product; (b) replace or modify the Contractor Product so that it becomes non-infringing while providing functionally equivalent performance; or (c) accept the return of the Contractor Product and grant Customer a credit for the Contractor Product, less a reasonable charge for depreciation. The depreciation amount will be calculated based upon generally accepted accounting standards.

- (1) The Contractor's obligations under this section shall not extend to any combination of the Product with any other product, system or method, unless the Product, system or method is:
 - (a) provided by the Contractor or the Contractor's subsidiaries or affiliates;
 - (b) modified by a third party other than Contractor
 - (c) specified by the Contractor to work with the Product; or
 - (d) reasonably required, in order to use the Product in its intended manner, and the infringement could not have been avoided by substituting another reasonably available product, system or method capable of performing the same function; or
 - (e) it would be reasonably expected to use the Product in combination with such product, system or method.

This Section 15 provides Customer's sole and exclusive remedies and Contractor's entire liability in the event of an Infringement Claim. Customer has no right to recover and Contractor has no obligation to provide any other or further remedies, whether under another provision of this Agreement or any other legal theory or principle, in connection with an Infringement Claim. In addition, the rights and remedies provided in this Section 15 are subject to and limited by the restrictions set forth in Section 14.4.

16. DISPUTE RESOLUTION. The parties shall cooperate to resolve any dispute pertaining to this Cooperative Purchasing Master Agreement efficiently, as timely as practicable, and at the lowest possible level with authority to resolve such dispute. If, however, a dispute persists and cannot be resolved, it may be escalated within each organization. In such situation, upon notice by either party, each party, within five (5) business days shall reduce its description of the dispute to writing and deliver it to the other party. The receiving party then shall have three (3) business days to review and respond in writing. In the event that the parties cannot then agree on a resolution of the dispute, the parties shall schedule a conference between the respective senior managers of each organization to attempt to resolve the dispute. In the event the parties cannot agree, either party may resort to court to resolve the dispute.

17. GENERAL PROVISIONS.

- 17.1. **TIME IS OF THE ESSENCE.** Time is of the essence for each and every provision of this Cooperative Purchasing Master Agreement.
- 17.2. **COMPLIANCE WITH LAW.** Contractor shall comply with all applicable law.
- 17.3. **INTEGRATED AGREEMENT.** This Cooperative Purchasing Master Agreement constitutes the entire agreement and understanding of the parties with respect to the subject matter and supersedes all prior negotiations, representations, and understandings between them. There are no representations or understandings of any kind not set forth herein.
- 17.4. **AMENDMENT OR MODIFICATION.** Except as set forth herein, this Cooperative Purchasing Master Agreement may not be amended or modified except in writing and signed by a duly authorized representative of each party.
- 17.5. **AUTHORITY.** Each party to this Cooperative Purchasing Master Agreement, and each individual signing on behalf of each party, hereby represents and warrants to the other that

it has full power and authority to enter into this Cooperative Purchasing Master Agreement and that its execution, delivery, and performance of this Cooperative Purchasing Master Agreement has been fully authorized and approved, and that no further approvals or consents are required to bind such party.

- 17.6. NO AGENCY. The parties agree that no agency, partnership, or joint venture of any kind shall be or is intended to be created by or under this Cooperative Purchasing Master Agreement. Neither party is an agent of the other party nor authorized to obligate it.
- 17.7. ASSIGNMENT. Contractor may not assign its rights under this Cooperative Purchasing Master Agreement without Enterprise Services' prior written consent and Enterprise Services may consider any attempted assignment without such consent to be void; *Provided*, however, that, if Contractor provides written notice to Enterprise Services within thirty (30) days, Contractor may assign its rights under this Cooperative Purchasing Master Agreement in full to any parent, subsidiary, or affiliate of Contractor that controls or is controlled by or under common control with Contractor, is merged or consolidated with Contractor, or purchases a majority or controlling interest in the ownership or assets of Contractor. Unless otherwise agreed, Contractor guarantees prompt performance of all obligations under this Cooperative Purchasing Master Agreement notwithstanding any prior assignment of its rights.
- 17.8. BINDING EFFECT; SUCCESSORS & ASSIGNS. This Cooperative Purchasing Master Agreement shall be binding upon and shall inure to the benefit of the parties hereto and their respective successors and assigns.
- 17.9. ASSIGNMENT OF ANTITRUST RIGHTS REGARDING PURCHASED GOODS/SERVICES. Contractor irrevocably assigns to Enterprise Services, on behalf of the State of Washington, any claim for relief or cause of action which the Contractor now has or which may accrue to the Contractor in the future by reason of any violation of state or federal antitrust laws in connection with any goods and/or services provided in Washington for the purpose of carrying out the Contractor's obligations under this Cooperative Purchasing Master Agreement, including, at Enterprise Services' option, the right to control any such litigation on such claim for relief or cause of action.
- 17.10. FEDERAL FUNDS. To the extent that any Purchasing Entity uses federal funds to purchase goods and/or services pursuant to this Cooperative Purchasing Master Agreement, such Purchasing Entity shall specify, with its order, any applicable requirement or certification that must be satisfied by Contractor at the time the order is placed or upon delivery. Contractor shall have reasonable opportunity to review, and if required, clarify such requirement or certification prior to accepting any such order.
- 17.11. SEVERABILITY. If any provision of this Cooperative Purchasing Master Agreement is held to be invalid or unenforceable, such provision shall not affect or invalidate the remainder of this Cooperative Purchasing Master Agreement, and to this end the provisions of this Cooperative Purchasing Master Agreement are declared to be severable. If such invalidity becomes known or apparent to the parties, the parties agree to negotiate promptly in good faith in an attempt to amend such provision as nearly as possible to be consistent with the intent of this Cooperative Purchasing Master Agreement.
- 17.12. WAIVER. Failure of either party to insist upon the strict performance of any of the terms and conditions hereof, or failure to exercise any rights or remedies provided herein or by law, or to notify the other party in the event of breach, shall not release the other party of any of its

obligations under this Cooperative Purchasing Master Agreement, nor shall any purported oral modification or rescission of this Cooperative Purchasing Master Agreement by either party operate as a waiver of any of the terms hereof. No waiver by either party of any breach, default, or violation of any term, warranty, representation, contract, covenant, right, condition, or provision hereof shall constitute waiver of any subsequent breach, default, or violation of the same or other term, warranty, representation, contract, covenant, right, condition, or provision.

- 17.13. **SURVIVAL.** All representations, warranties, covenants, agreements, and indemnities set forth in or otherwise made pursuant to this Cooperative Purchasing Master Agreement shall survive and remain in effect following the expiration or termination of this Cooperative Purchasing Master Agreement, *Provided*, however, that nothing herein is intended to extend the survival beyond any applicable statute of limitations periods.
- 17.14. **GOVERNING LAW.** The validity, construction, performance, and enforcement of this Cooperative Purchasing Master Agreement shall be governed by and construed in accordance with the laws of the State of Washington, without regard to its choice of law rules. The validity, construction, and effect of any Participating Addendum pertaining to the Cooperative Purchasing Master Agreement or Order placed pursuant to such Participating Addendum shall be governed by and construed in accordance with the laws of the Participating Entity's or Purchasing Entity's State.
- 17.15. **JURISDICTION & VENUE.** In the event that any action is brought to enforce any provision of this Cooperative Purchasing Master Agreement, the parties agree to exclusive jurisdiction in Thurston County Superior Court for the State of Washington and agree that in any such action venue shall lie exclusively at Olympia, Washington; *Provided*, however, that venue for any claim, dispute, or action concerning any Order placed against the Cooperative Purchasing Master Agreement or the effect of a Participating Addendum shall be in the Purchasing Entity's State.
- 17.16. **SOVEREIGN IMMUNITY.** In no event shall this Cooperative Purchasing Master Agreement, any Participating Addendum or any Purchase Order issued thereunder, or any act of the Lead State, a Participating Entity, or a Purchasing Entity be a waiver of any form of defense or immunity, whether sovereign immunity, governmental immunity, immunity based on the Eleventh Amendment to the Constitution of the United States or otherwise, from any claim or from the jurisdiction of any court. This section applies to a claim brought against the Participating Entities who are states only to the extent Congress has appropriately abrogated the state's sovereign immunity and is not consent by the state to be sued in federal court.
- 17.17. **ATTORNEYS' FEES.** Should any legal action or proceeding be commenced by either party in order to enforce this Cooperative Purchasing Master Agreement or any provision hereof, or in connection with any alleged dispute, breach, default, or misrepresentation in connection with any provision herein contained, the prevailing party shall be entitled to recover reasonable attorneys' fees and costs incurred in connection with such action or proceeding, including costs of pursuing or defending any legal action, including, without limitation, any appeal, discovery, or negotiation and preparation of settlement arrangements, in addition to such other relief as may be granted.
- 17.18. **FAIR CONSTRUCTION & INTERPRETATION.** The provisions of this Cooperative Purchasing Master Agreement shall be construed as a whole according to their common meaning and not

strictly for or against any party and consistent with the provisions contained herein in order to achieve the objectives and purposes of this Cooperative Purchasing Master Agreement. Each party hereto and its counsel has reviewed and revised this Cooperative Purchasing Master Agreement and agrees that the normal rules of construction to the effect that any ambiguities are to be resolved against the drafting party shall not be construed in the interpretation of this Cooperative Purchasing Master Agreement. Each term and provision of this Cooperative Purchasing Master Agreement to be performed by either party shall be construed to be both a covenant and a condition.

- 17.19. FURTHER ASSURANCES. In addition to the actions specifically mentioned in this Cooperative Purchasing Master Agreement, the parties shall each do whatever may reasonably be necessary to accomplish the transactions contemplated in this Cooperative Purchasing Master Agreement including, without limitation, executing any additional documents reasonably necessary to effectuate the provisions and purposes of this Cooperative Purchasing Master Agreement.
- 17.20. EXHIBITS. All exhibits referred to herein are deemed to be incorporated in this Cooperative Purchasing Master Agreement in their entirety.
- 17.21. CAPTIONS & HEADINGS. The captions and headings in this Cooperative Purchasing Master Agreement are for convenience only and are not intended to, and shall not be construed to, limit, enlarge, or affect the scope or intent of this Cooperative Purchasing Master Agreement nor the meaning of any provisions hereof.
- 17.22. ELECTRONIC SIGNATURES. An electronic signature of this Cooperative Purchasing Master Agreement or any other ancillary agreement shall be deemed to have the same legal effect as delivery of an original executed copy of this Cooperative Purchasing Master Agreement or such other ancillary agreement for all purposes.
- 17.23. COUNTERPARTS. This Cooperative Purchasing Master Agreement may be executed in any number of counterparts, each of which shall be deemed an original and all of which counterparts together shall constitute the same instrument which may be sufficiently evidenced by one counterpart. Execution of this Cooperative Purchasing Master Agreement at different times and places by the parties shall not affect the validity thereof so long as all the parties hereto execute a counterpart of this Cooperative Purchasing Master Agreement.

EXECUTED as of the date and year first above written.

STATE OF WASHINGTON
DEPARTMENT OF ENTERPRISE SERVICES

MOTOROLA SOLUTIONS, INC.
A DELAWARE CORPORATION

By: Elena McGrew
Elena McGrew
Its: Acting Statewide Enterprise Procurement
Manager

By: Neil Thomas
Neil Thomas
Its: Regional Vice President and Director of
Sales

INSURANCE REQUIREMENTS

1. **INSURANCE OBLIGATION.** During the Term of this Cooperative Purchasing Master Agreement, Contractor shall possess and maintain in full force and effect, at Contractor's sole expense, the following insurance coverages:
 - a. **COMMERCIAL GENERAL LIABILITY INSURANCE.** Commercial general liability insurance (and, if necessary, commercial umbrella liability insurance) covering bodily injury, property damage, products/completed operations, personal injury, and advertising injury liability on an 'occurrence form' that shall be no less comprehensive and no more restrictive than the coverage provided by Insurance Services Office (ISO) under the most recent version of form CG 00 01 in the amount of not less than \$2,000,000 per occurrence and \$4,000,000 general aggregate. This coverage shall include blanket contractual liability coverage. This coverage shall include a cross-liability clause or separation of insured condition.
 - b. **WORKERS' COMPENSATION INSURANCE.** Contractor shall comply with applicable Workers' Compensation or Industrial Accident insurance providing benefits as required by law.
 - c. **EMPLOYERS' LIABILITY (STOP GAP) INSURANCE.** Employers' liability insurance (and, if necessary, commercial umbrella liability insurance) with limits not less than \$1,000,000 each accident for bodily injury by accident, \$1,000,000 each employee for bodily injury by disease, and \$1,000,000 bodily injury by disease policy limit.

The insurance coverage limits set forth herein are required. Contractor's insurance coverage shall be the amounts specified. Coverage in the amounts of these limits, however, shall not be construed to relieve Contractor from liability in excess of such limits. Contractor waives all rights against the State of Washington for the recovery of damages to the extent such damages are covered by any insurance required herein.

2. **INSURANCE CARRIER RATING.** Coverages provided by the Contractor must be underwritten by an insurance company deemed acceptable to the State of Washington's Office of Risk Management. Insurance coverage shall be provided by companies authorized to do business within the State of Washington and rated A- Class VII or better in the most recently published edition of Best's Insurance Rating. Enterprise Services reserves the right to reject all or any insurance carrier(s) with an unacceptable financial rating.
3. **ADDITIONAL INSURED.** Commercial General Liability and, Commercial Automobile Liability, Insurance shall include the State of Washington and all authorized Purchasing Entity (and their agents, officers, and employees) as Additional Insureds evidenced by copy of the Additional Insured Endorsement attached to the Certificate of Insurance on such insurance policies.
4. **CERTIFICATE OF INSURANCE.** Prior to execution of the Cooperative Purchasing Master Agreement, Contractor shall furnish to Enterprise Services, as evidence of the insurance coverage required by this Cooperative Purchasing Master Agreement, a certificate of insurance satisfactory to Enterprise Services that insurance, in the above-stated kinds and amounts, have been secured. In addition, no less than five (5) days prior to coverage expiration, Contractor shall furnish to

Enterprise Services an updated or renewed certificate of insurance, satisfactory to Enterprise Services, that insurance, in the above-stated kinds and amounts, has been secured. Failure to maintain or provide proof of insurance, as required, will result in contract cancellation. **All certificates of insurance shall include the Cooperative Purchasing Master Agreement number stated on the cover of this Cooperative Purchasing Master Agreement.** All certificates of Insurance and any related insurance documents shall be delivered to Enterprise Services by U.S. mail, postage prepaid, or sent via email, and shall be sent to the address or email address set forth below or to such other address or email address as Enterprise Services may specify in writing:

US Mail: Contracts & Procurement – Cooperative Purchasing Master Agreement Insurance Certificate
**Cooperative Purchasing Master Agreement
No. 00318 – Public Safety Communications Products, Services and Solutions**
Attn: Team Cypress
Washington Dept. of Enterprise Services
PO Box 41411
Olympia, WA 98504-1411

Email: DESContractsTeamCypress@des.wa.gov

Note: For Email notice, the Email Subject line must state:
**Cooperative Purchasing Master Agreement Insurance Certificate –
No. 00318 – Public Safety Communications Products, Services and Solutions**

5. **PRIMARY COVERAGE.** Contractor's insurance shall apply as primary and shall not seek contribution from any insurance or self-insurance maintained by, or provided to, the additional insureds listed above including, at a minimum, the State of Washington and/or any Purchasing Entity. All insurance or self-insurance of the State of Washington and/or Purchasing Entity shall be excess of any insurance provided by Contractor or subcontractors.
6. **SUBCONTRACTORS.** Prior to utilizing any subcontractor, Contractor shall require any such subcontractor to provide insurance that complies with all applicable requirements of the insurance set forth herein and shall furnish separate Certificates of Insurance and endorsements for each subcontractor. Each subcontractor must comply fully with all insurance requirements stated herein. Failure of any subcontractor to comply with insurance requirements does not limit Contractor's liability or responsibility.
7. **WAIVER OF SUBROGATION.** Contractor waives all rights of subrogation against the State of Washington and any Purchasing Entity for the recovery of damages to the extent such damages are or would be covered by the insurance specified herein.
8. **NOTICE OF CHANGE OR CANCELLATION.** There shall be no cancellation without at least thirty (30) days prior written Legal Notice by Contractor to Enterprise Services. Failure to provide such notice, as required, shall constitute default by Contractor. Any such written notice shall include the Cooperative Purchasing Master Agreement number stated on the cover of this Cooperative Purchasing Master Agreement.

9. **EXTENDED REPORTING PERIOD.** If any required insurance coverage is on a claims-made basis (rather than occurrence), Contractor shall maintain such coverage for a period of no less than three (3) years following expiration or termination of the Cooperative Purchasing Master Agreement.

00318 NVP-MA Motorola Clean-20211221_MSI_signed

Final Audit Report

2022-01-04

Created:	2022-01-04
By:	Neva Peckham (neva.peckham@des.wa.gov)
Status:	Signed
Transaction ID:	CBJCHBCAABAATm9nOYpuw4mH_AHN_ril9XZfWe7EIZrX

"00318 NVP-MA Motorola Clean-20211221_MSI_signed" History

-  Document created by Neva Peckham (neva.peckham@des.wa.gov)
2022-01-04 - 3:00:02 PM GMT- IP address: 198.238.242.30
-  Document emailed to Elena McGrew (elena.mcgreg@des.wa.gov) for signature
2022-01-04 - 3:01:00 PM GMT
-  Email viewed by Elena McGrew (elena.mcgreg@des.wa.gov)
2022-01-04 - 4:25:28 PM GMT- IP address: 104.47.64.254
-  Document e-signed by Elena McGrew (elena.mcgreg@des.wa.gov)
Signature Date: 2022-01-04 - 10:19:39 PM GMT - Time Source: server- IP address: 198.238.242.30
-  Agreement completed.
2022-01-04 - 10:19:39 PM GMT

Attachment "B"

NASPO ValuePoint

PARTICIPATING ADDENDUM



PUBLIC SAFETY COMMUNICATIONS PRODUCTS, SERVICE AND SOLUTIONS

Lead by the State of Washington

Master Agreement #: 00318

Contractor: **Motorola Solutions, Inc.**

Participating Entity: **STATE OF IDAHO**

The following products or services are included in this contract portfolio:

Motorola Solutions, Inc. has been awarded the following categories/sub-category/solutions. Detail regarding available services, warranty, software options along with products and pricing are available on the NASPO ValuePoint webpage.

- 1.1 Radio: Single-Band Portable Radio (P25)
- 1.2 Radio: Single-Band Mobile Radio (P25)
- 1.3 Radio: Single-Band Desktop Radio (P25)
- 1.4 Radio: Multi-Band Portable Radio (P25)
- 1.5 Radio: Multi-Band Mobile Radio (P25)
- 1.6 Radio: Multi-Band Desktop Radio (P25)
- 1.7 Radio: Base Station/Repeater (P25)
- 2.1 Radio: Conventional Analog Portable (Non-P25)
- 2.2 Radio: Conventional Analog Mobile (Non-P25)
- 2.3 Radio: Conventional Analog Desktop (Non-P25)
- 2.4 Radio: Conventional Analogy Base Station/Repeater (Non-P25)
- 4 Dispatch Consoles
- Radio Solution

Master Agreement Terms and Conditions:

1. Scope: This addendum covers the *Public Safety Communications Products, Services and Solutions* led by the State of Washington for use by state agencies and other entities located in the Participating State Idaho authorized by that State's statutes to utilize State contracts with the prior approval of the State's Chief Procurement Official.
2. Participation: This NASPO ValuePoint Master Agreement may be used by all state agencies, institutions of higher institution, political subdivisions and other entities authorized to use statewide contracts in the State of Idaho. Issues of interpretation and eligibility for participation are solely within the authority of the State Chief Procurement Official.
3. Primary Contacts: The primary contact individuals for this Participating Addendum are as follows (or their named successors):



**PUBLIC SAFETY COMMUNICATIONS
PRODUCTS, SERVICE AND SOLUTIONS**

Lead by the State of Washington

Contractor

Name:	Andrew Chyterbok
Address:	500 W Monroe Street, Ste 4400, Chicago, IL 60661-3781
Telephone:	(360) 409-3223
Fax:	
Email:	andrew.chyterbok@motorolasolutions.com

Participating Entity

Name:	State of Idaho
Address:	650 West State St, Room 100
Telephone:	208-332-1610
Fax:	208-327-7320
Email:	contractadmin@adm.idaho.gov

**4. PARTICIPATING ENTITY MODIFICATIONS OR ADDITIONS TO THE MASTER
AGREEMENT**

These modifications or additions apply only to actions and relationships within the Participating Entity.

Participating Entity must check one of the boxes below.

☐ No changes to the terms and conditions of the Master Agreement are required.

☒ The following changes are modifying or supplementing the Master Agreement terms and conditions.

4.1 Term: This PA will be effective on the date of the last signature, below, and continue through December 31, 2026, unless extended, renewed, or terminated earlier.

4.2 Amendments: Amendments to the Master Agreement, including but not limited to extensions, renewals, and modifications to the terms, conditions, and pricing, will automatically be incorporated in this PA unless the Participating Entity elects not to incorporate an amendment by providing written notification to the Contractor, which notice must be provided within ten (10) working days of the date of the amendment to the Master Agreement, in order to be effective. Failure to provide notice in accordance with this Section will result in the Master Agreement amendment automatically being incorporated in this PA.



**PUBLIC SAFETY COMMUNICATIONS
PRODUCTS, SERVICE AND SOLUTIONS**

Lead by the State of Washington

4.3 Governing Law: Notwithstanding any provision to the contrary, the state of Idaho's PA and all orders issued under the PA by Ordering Entities within the state of Idaho, shall be construed in accordance with and governed by the laws of the state of Idaho. Any action to enforce the provisions of this PA shall be brought in state district court in Ada County, Boise, Idaho. In the event any term of this PA is held to be invalid or unenforceable by a court, the remaining terms of this PA will remain in full force and effect. Except to the extent the provisions of the PA are clearly inconsistent therewith, the PA shall also be governed by the applicable provisions of the Idaho Uniform Commercial Code (IUCC).

4.4 Certification Concerning Boycott of Israel: On April 26, 2021, Governor Little signed Senate Bill 1086. The bill creates a new section of code requiring all public entities in Idaho to insert a certification regarding boycotts of Israel in contracts and renewals of contracts that are effective on or after July 1, 2021. Contractor must agree to the following certification: failure to do so will result in the state of Idaho not being able to award this PA. Do you certify as follows?

Certification Concerning Boycott of Israel. Pursuant to Idaho Code section 67-2346, if payments under the Contract exceed one hundred thousand dollars (\$100,000) and Contractor employs ten (10) or more persons, Contractor certifies that it is not currently engaged in, and will not for the duration of the Contract engage in, a boycott of goods or services from Israel or territories under its control. The terms in this section defined in Idaho Code section 67-2346 shall have the meaning defined therein.

4.5 Idaho Administrative Fee and Quarterly Usage Report: A one and one-quarter percent (1.25%) Administrative Fee will apply to all purchases made under the resulting PADD by any state or public agency in Idaho, the State of Idaho understands and agrees that Contractor will raise the Master Agreement prices by this amount. On a quarterly basis, the Contractor must remit to the State of Idaho an amount equal to one and one-quarter percent (1.25%) of the Contractor's net (sales minus credits) quarterly sales made under the PADD. Administrative Fee payments and reports to the State of Idaho are due no later than thirty (30) calendar days after the end of each calendar quarter. Notwithstanding the adjustment, all pricing updates and other terms and conditions of pricing shall be as set forth in the Washington Master Agreement No. 00318).

Reporting Timeline (Fiscal Year Quarters):

1st Quarter: July 1 – September 30
2nd Quarter: October 1 – December 31
3rd Quarter: January 1 – March 31
4th Quarter: April 1 – June 30

Fee and Report Due:

October 31st
January 31st
April 30th
July 31st

Contractor must furnish detailed usage reports as designated by the State. In addition to any required detailed usage reports, Contractor must also submit a summary quarterly report of purchases made from the Contract utilizing the PADD Summary Usage Report Form available for download at <https://purchasing.idaho.gov/information-for-vendors/> . A Summary Usage Report Form must be submitted for each quarter (enter "0" if no purchases were made during

PARTICIPATING ADDENDUM



**PUBLIC SAFETY COMMUNICATIONS
PRODUCTS, SERVICE AND SOLUTIONS**

Lead by the State of Washington

a quarter) and must include a breakdown of purchases by Entity Type (i.e. State Agency, Higher Education, K-12, City, County and 'other'), as provided on the Form.

E-mail your completed Quarterly Summary Usage Reports to:

purchasing@adm.idaho.gov.

Mail your check, in the amount of the Quarterly Administrative Fee, to:

Division of Purchasing, State of Idaho

P.O. Box 83720

Boise, ID 83720-0075

5. **Subcontractors:** All contactors, dealers, and resellers authorized in the State of *Idaho*, as shown on the dedicated Contractor (cooperative contract) website, are approved to provide sales and service support to participants in the NASPO ValuePoint Master Agreement. The contractor's dealer participation will be in accordance with the terms and conditions set forth in the Master Agreement.

6. **Individual Customer:** Each ordering agency ("Purchasing Entity") that places a service order under this PA will be treated as if it is an individual customer. Except to the extent modified by this PA, each Purchasing Entity will be responsible to follow the terms and conditions of the Master Agreement and this PA; and will have the same rights and responsibilities for its purchases as the Lead State has in the Master Agreement. Each Purchasing Entity will be responsible for its own charges, fees, and liabilities; and will have the same rights to any indemnity or to recover any costs allowed in the Master Agreement for its individual purchases.

Additionally, the Division of Purchasing is entering into this PA for the convenience of Purchasing Entities, and the Division of Purchasing bears no responsibility for any agreements to which Purchasing Entities agree. It shall be the responsibility of Purchasing Entities to seek their own agencies' legal counsel prior to agreeing to the terms of any end user license agreements.

6.1 Restrictions: Purchases under this PA are restricted to purchases of Categories and Sub-Categories offered by the Contractor listed here:

- 1.1 Radio: Single-Band Portable Radio (P25)
- 1.2 Radio: Single-Band Mobile Radio (P25)
- 1.3 Radio: Single-Band Desktop Radio (P25)
- 1.4 Radio: Multi-Band Portable Radio (P25)
- 1.5 Radio: Multi-Band Mobile Radio (P25)
- 1.6 Radio: Multi-Band Desktop Radio (P25)
- 1.7 Radio: Base Station/Repeater (P25)
- 2.1 Radio: Conventional Analog Portable (Non-P25)
- 2.2 Radio: Conventional Analog Mobile (Non-P25)
- 2.3 Radio: Conventional Analog Desktop (Non-P25)
- 2.4 Radio: Conventional Analogy Base Station/Repeater (Non-P25)
- 4 Dispatch Consoles
- Radio Solution

**PUBLIC SAFETY COMMUNICATIONS
PRODUCTS, SERVICE AND SOLUTIONS**

Lead by the State of Washington

6.2 Assignment: Contractor shall not assign this PA, or its rights, obligations, or any other interest arising from this PA, or delegate any of its performance obligations, without the express written consent of the Administrator of the Division of Purchasing. Transfer without such approval shall cause the annulment of the PA, at the option of the State. All rights of action, however, for any breach of the PA are reserved to the State. (I.C. § 67-9230).

Notwithstanding the foregoing, to the extent required by applicable law (including I.C. § 28-9-406), Contractor may assign its right to payment on an account provided that the State shall have no obligation to make payment to an assignee until thirty (30) days after Contractor (not the assignee) has provided the responsible procurement officer with (a) proof of the assignment, (b) the identity of the specific state contract to which the assignment applies, and (c) the name of the assignee and the exact address to which assigned payments should be made. The state may treat violation of the clause as an event of default.

7. Orders: Any Order placed by a Purchasing Entity for a Product and/or service available from this Master Agreement shall be deemed to be a sale under (and governed by the prices and other terms and conditions) the Master Agreement unless the parties to the Order agree in writing that another contract or agreement applies to such Order.
8. Records Maintenance: The Contractor shall maintain or supervise the maintenance of all financial records necessary to properly account for all payments made to the Contractor for the costs authorized by the PA. These financial records shall be retained by the Contractor for at least three (3) years after PA terminates, or until all audits initiated within the three (3) years have been completed, whichever is later.
9. Terms and Conditions in the Master that Do Not Apply to this PA: Any terms or conditions contained in the Master Agreement that do the following are not applicable to this PA:
 - 9.1 Waive the sovereign immunity of the state of Idaho;
 - 9.2 Subject the state of Idaho, its agencies, or political subdivisions of the state of Idaho to the jurisdiction of the courts of other states.
 - 9.3 Limit the time in which the state of Idaho, its agencies, or political subdivisions of the state of Idaho may bring a legal claim to a period shorter than that provided in Idaho law.
 - 9.4 Impose a payment obligation, including a rate of interest for late payments, less favorable than the obligations set forth in Section 67-2302, Idaho Code; or,
 - 9.5 Require the state of Idaho, its agencies, or political subdivisions of the state of Idaho to accept arbitration or to waive right to a jury trial.
 - 9.6 Require indemnification not specifically authorized by the Idaho legislature or subject to appropriation (pursuant to Section 67-9213, Idaho Code, and Section 59-1016, Idaho Code).
 - 9.7 Hold employees or officers of the state of Idaho and of political subdivisions of the state

NASPO ValuePoint
PARTICIPATING ADDENDUM



**PUBLIC SAFETY COMMUNICATIONS
PRODUCTS, SERVICE AND SOLUTIONS**
Lead by the State of Washington

of Idaho personally liable.

IN WITNESS WHEREOF, the parties have executed this Addendum as of the date of execution by both parties below.

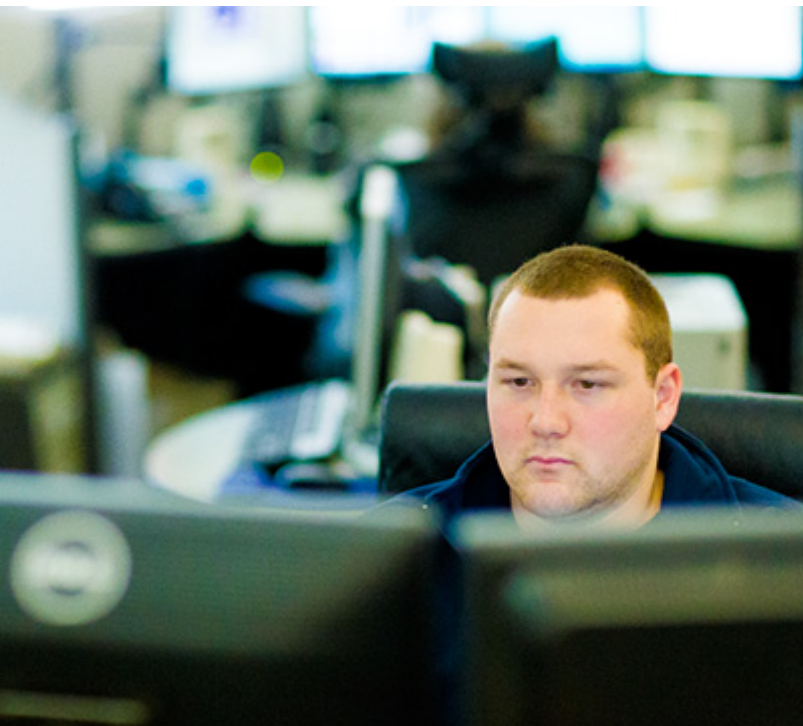
Participating Entity: State of Idaho	Contractor: Motorola Solutions, Inc.
Signature: Patrick Murphy Digitally signed by Patrick Murphy Date: 2022.04.27 14:35:42 -06'00'	Signature:
Name: Patrick Murphy	Name: Neil Thomas
Title: Purchasing Officer	Title: Regional Vice President
Date: 4/27/2022	Date: 4/27/2022

For questions on executing a participating addendum, please contact:

NASPO ValuePoint

Cooperative Development Coordinator:	Ted Fosket
Telephone:	(907) 723-3360
Email:	tfosket@naspovaluepoint.org

Please email fully executed PDF copy of this document to PA@naspovaluepoint.org.



MOSCOW, CITY OF

07/10/2024

07/10/2024

MOSCOW, CITY OF
206 E THIRD ST
MOSCOW, ID 83843

Dear Brian Nickerson,

Motorola Solutions is pleased to present MOSCOW, CITY OF with this quote for quality communications equipment and services. The development of this quote provided us the opportunity to evaluate your requirements and propose a solution to best fulfill your communications needs.

This information is provided to assist you in your evaluation process. Our goal is to provide MOSCOW, CITY OF with the best products and services available in the communications industry. Please direct any questions to Steven Fontaine at sfontaine@daywireless.com.

We thank you for the opportunity to provide you with premier communications and look forward to your review and feedback regarding this quote.

Sincerely,

Steven Fontaine

Motorola Solutions Manufacturer's Representative

Billing Address:
MOSCOW, CITY OF
206 E THIRD ST
MOSCOW, ID 83843
US

Quote Date:07/10/2024
Expiration Date:10/08/2024
Quote Created By:
Steven Fontaine
sfontaine@daywireless.com

End Customer:
MOSCOW, CITY OF
Brian Nickerson

Contract: 19860 - NASPO 00318

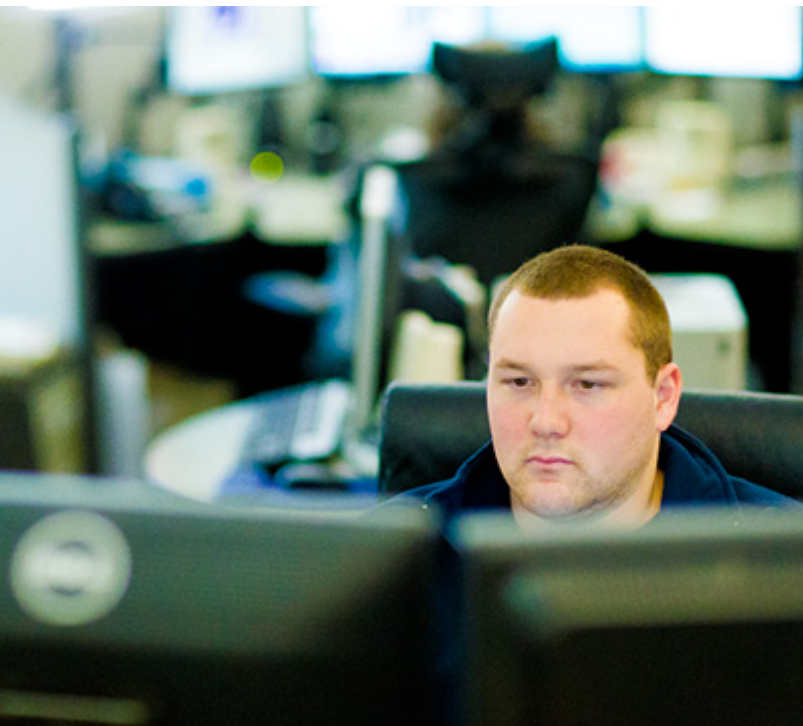
Line #	Item Number	Description	Qty	List Price	Sale Price	Ext. Sale Price
1	PMNN4486A	BATT IMPRES 2 LIION R IP67 3400T	30	\$188.27	\$137.44	\$4,123.20

Grand Total **\$4,123.20(USD)**

Notes:

- Unless otherwise noted, this quote excludes sales tax or other applicable taxes (such as Goods and Services Tax, sales tax, Value Added Tax and other taxes of a similar nature). Any tax the customer is subject to will be added to invoices.





MOSCOW, CITY OF

03/06/2024

03/06/2024

MOSCOW, CITY OF
229 Pintail LN
Moscow, ID 83843

Dear Brian Nickerson,

Motorola Solutions is pleased to present MOSCOW, CITY OF with this quote for quality communications equipment and services. The development of this quote provided us the opportunity to evaluate your requirements and propose a solution to best fulfill your communications needs.

This information is provided to assist you in your evaluation process. Our goal is to provide MOSCOW, CITY OF with the best products and services available in the communications industry. Please direct any questions to Steven Fontaine at sfontaine@daywireless.com.

We thank you for the opportunity to provide you with premier communications and look forward to your review and feedback regarding this quote.

Sincerely,

Steven Fontaine

Motorola Solutions Manufacturer's Representative

Billing Address:
229 Pintail LN
Moscow, ID 83843
US

Quote Date:03/06/2024
Expiration Date:08/19/2024
Quote Created By:
Steven Fontaine
sfontaine@daywireless.com

End Customer:
MOSCOW, CITY OF
Brian Nickerson

Contract: 19860 - NASPO 00318

Line #	Item Number	Description	Qty	List Price	Sale Price	Ext. Sale Price
1	RLN4941A	REC ONLY EARPIECE W/ TRANSLUCET TUBE	25	\$76.76	\$56.03	\$1,400.75
2	NNTN7624C	CHARGER,CHR IMP VEH EXT NA/EU KIT	10	\$509.76	\$372.12	\$3,721.20
3	NNTN8860B	CHARGER, SINGLE-UNIT, IMPRES 2, 3A, 115VAC, US/NA	130	\$186.50	\$136.15	\$17,699.50
4	PMMN4099CL	AUDIO ACCESSORY-REMOTE SPEAKER MICROPHONE,IP68 REMOTE SPEAKER MICROPHONE,3.5MM,UL	70	\$142.56	\$104.07	\$7,284.90
5	PMMN4106D	AUDIO ACCESSORY-REMOTE SPEAKER MICROPHONE,XE500 REMOTE SPKR MIC WITH CHANNEL KNOB, HIGH IMPACT GREEN	60	\$665.28	\$485.65	\$29,139.00
	APX™ 6000 Series	APX6000				
6	H98KGF9PW6BN	APX6000 VHF MHZ MODEL 2.5 PORTABLE	14	\$3,595.00	\$2,624.35	\$36,740.90
6a	QA05100AA	EHN: STD 1 YR WARRANTY APPLIES	14	\$0.00	\$0.00	\$0.00
6b	QA05570AA	ALT: LI-ION IMPRES 2 IP68 3400 MAH	14	\$115.50	\$84.32	\$1,180.48
6c	H35BU	ADD: CONVENTIONAL OPERATION	14	\$550.00	\$401.50	\$5,621.00
6d	QA09113AB	ADD: BASELINE RELEASE SW	14	\$0.00	\$0.00	\$0.00



Any sales transaction following Motorola's quote is based on and subject to the terms and conditions of the valid and executed written contract between Customer and Motorola (the "Underlying Agreement") that authorizes Customer to purchase equipment and/or services or license software (collectively "Products"). If no Underlying Agreement exists between Motorola and Customer, then Motorola's Standard Terms of Use and Motorola's Standard Terms and Conditions of Sales and Supply shall govern the purchase of the Products.

Line #	Item Number	Description	Qty	List Price	Sale Price	Ext. Sale Price
6e	Q806BM	ADD: ASTRO DIGITAL CAI OPERATION	14	\$567.00	\$413.91	\$5,794.74
6f	Q629AK	ENH: AES ENCRYPTION AND ADP	14	\$523.00	\$381.79	\$5,345.06
	APX™ 6500 / Enh Series	ENHANCEDAPX6500				
7	M25KSS9PW1BN	APX6500 ENHANCED VHF MOBILE	8	\$3,383.12	\$2,469.68	\$19,757.44
7a	G48BD	ENH: CONVENTIONAL OPERATION APX6500	8	\$550.00	\$401.50	\$3,212.00
7b	G609AC	ADD: REMOTE MOUNT CABLE 50 FT APX	16	\$39.00	\$28.47	\$455.52
7c	G629AB	ADD:1/4 WAVE BROADBAND ANT 146-174	8	\$70.00	\$51.10	\$408.80
7d	G67DT	ADD: REMOTE MOUNT E5 APXM	8	\$327.00	\$238.71	\$1,909.68
7e	GA00092AU	ADD: APXM DUAL E5 CH	8	\$627.00	\$457.71	\$3,661.68
7f	GA05100AA	ADD: STD WARRANTY - NO ESSENTIAL	8	\$0.00	\$0.00	\$0.00
7g	B18CR	ADD: AUXILIARY SPKR 7.5 WATT APX	16	\$66.00	\$48.18	\$770.88
7h	G843AH	ADD: AES ENCRYPTION AND ADP	8	\$523.00	\$381.79	\$3,054.32
7i	G444AH	ADD: APX CONTROL HEAD SOFTWARE	8	\$0.00	\$0.00	\$0.00
7j	G806BL	ENH: ASTRO DIGITAL CAI OP APX	8	\$567.00	\$413.91	\$3,311.28
7k	GA01670AA	ADD: APX E5 CONTROL HEAD	8	\$717.00	\$523.41	\$4,187.28
7l	GA01693AA	ADD : LEGACY TRUNNION SCREW KIT	8	\$11.00	\$8.03	\$64.24
7m	W22BA	ADD: STD PALM MICROPHONE APX	16	\$79.00	\$57.67	\$922.72
7n	QA09113AB	ADD: BASELINE RELEASE SW	8	\$0.00	\$0.00	\$0.00
7o	GA01606AA	ADD: NO BLUETOOTH/ WIFI/GPS ANTENNA NEEDED	8	\$0.00	\$0.00	\$0.00

APX™ 6500 / Enh Series ENHANCEDAPX6500



Any sales transaction following Motorola's quote is based on and subject to the terms and conditions of the valid and executed written contract between Customer and Motorola (the "Underlying Agreement") that authorizes Customer to purchase equipment and/or services or license software (collectively "Products"). If no Underlying Agreement exists between Motorola and Customer, then Motorola's Standard Terms of Use and Motorola's Standard Terms and Conditions of Sales and Supply shall govern the purchase of the Products.

Line #	Item Number	Description	Qty	List Price	Sale Price	Ext. Sale Price
8	M25KSS9PW1BN	APX6500 ENHANCED VHF MOBILE	14	\$3,383.12	\$2,469.68	\$34,575.52
8a	G48BD	ENH: CONVENTIONAL OPERATION APX6500	14	\$550.00	\$401.50	\$5,621.00
8b	G629AB	ADD:1/4 WAVE BROADBAND ANT 146-174	14	\$70.00	\$51.10	\$715.40
8c	G67DT	ADD: REMOTE MOUNT E5 APXM	14	\$327.00	\$238.71	\$3,341.94
8d	GA05100AA	ADD: STD WARRANTY - NO ESSENTIAL	14	\$0.00	\$0.00	\$0.00
8e	B18CR	ADD: AUXILIARY SPKR 7.5 WATT APX	14	\$66.00	\$48.18	\$674.52
8f	G843AH	ADD: AES ENCRYPTION AND ADP	14	\$523.00	\$381.79	\$5,345.06
8g	G444AH	ADD: APX CONTROL HEAD SOFTWARE	14	\$0.00	\$0.00	\$0.00
8h	G806BL	ENH: ASTRO DIGITAL CAI OP APX	14	\$567.00	\$413.91	\$5,794.74
8i	GA01670AA	ADD: APX E5 CONTROL HEAD	14	\$717.00	\$523.41	\$7,327.74
8j	GA01693AA	ADD : LEGACY TRUNNION SCREW KIT	14	\$11.00	\$8.03	\$112.42
8k	W22BA	ADD: STD PALM MICROPHONE APX	14	\$79.00	\$57.67	\$807.38
8l	QA09113AB	ADD: BASELINE RELEASE SW	14	\$0.00	\$0.00	\$0.00
8m	GA01606AA	ADD: NO BLUETOOTH/ WIFI/GPS ANTENNA NEEDED	14	\$0.00	\$0.00	\$0.00
	APX™ 6000 Series	APX6000				
9	H98KGF9PW6BN	APX6000 VHF MHZ MODEL 2.5 PORTABLE	116	\$3,595.00	\$2,624.35	\$304,424.60
9a	QA05100AA	EHN: STD 1 YR WARRANTY APPLIES	116	\$0.00	\$0.00	\$0.00
9b	Q667BB	ADD: ADP ONLY (NON-P25 CAP COMPLIANT) (US ONLY)	116	\$0.00	\$0.00	\$0.00
9c	QA05570AA	ALT: LI-ION IMPRES 2 IP68 3400 MAH	116	\$115.50	\$84.32	\$9,781.12



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Line #	Item Number	Description	Qty	List Price	Sale Price	Ext. Sale Price
9d	H35BU	ADD: CONVENTIONAL OPERATION	116	\$550.00	\$401.50	\$46,574.00
9e	QA09113AB	ADD: BASELINE RELEASE SW	116	\$0.00	\$0.00	\$0.00
9f	Q806BM	ADD: ASTRO DIGITAL CAI OPERATION	116	\$567.00	\$413.91	\$48,013.56
	APX™ 6500 / Enh Series	ENHANCEDAPX6500				
10	M25KSS9PW1BN	APX6500 ENHANCED VHF MOBILE	7	\$3,383.12	\$2,469.68	\$17,287.76
10a	G48BD	ENH: CONVENTIONAL OPERATION APX6500	7	\$550.00	\$401.50	\$2,810.50
10b	G629AB	ADD:1/4 WAVE BROADBAND ANT 146-174	7	\$70.00	\$51.10	\$357.70
10c	G67DT	ADD: REMOTE MOUNT E5 APXM	7	\$327.00	\$238.71	\$1,670.97
10d	GA05100AA	ADD: STD WARRANTY - NO ESSENTIAL	7	\$0.00	\$0.00	\$0.00
10e	B18CR	ADD: AUXILIARY SPKR 7.5 WATT APX	7	\$66.00	\$48.18	\$337.26
10f	G444AH	ADD: APX CONTROL HEAD SOFTWARE	7	\$0.00	\$0.00	\$0.00
10g	G806BL	ENH: ASTRO DIGITAL CAI OP APX	7	\$567.00	\$413.91	\$2,897.37
10h	GA01670AA	ADD: APX E5 CONTROL HEAD	7	\$717.00	\$523.41	\$3,663.87
10i	GA01693AA	ADD : LEGACY TRUNNION SCREW KIT	7	\$11.00	\$8.03	\$56.21
10j	W22BA	ADD: STD PALM MICROPHONE APX	7	\$79.00	\$57.67	\$403.69
10k	QA09113AB	ADD: BASELINE RELEASE SW	7	\$0.00	\$0.00	\$0.00
10l	G193AK	ADD: ADP ONLY (NON-P25 CAP COMPLIANT) (US ONLY)	7	\$0.00	\$0.00	\$0.00
10m	GA01606AA	ADD: NO BLUETOOTH/ WIFI/GPS ANTENNA NEEDED	7	\$0.00	\$0.00	\$0.00
	APX™ 6500 / Enh Series	ENHANCEDAPX6500				
11	M25KSS9PW1BN	APX6500 ENHANCED VHF MOBILE	3	\$3,383.12	\$2,469.68	\$7,409.04



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Line #	Item Number	Description	Qty	List Price	Sale Price	Ext. Sale Price
11a	W665BF	ADD: BASE STATION OP APX	3	\$77.00	\$56.21	\$168.63
11b	G91AF	ADD: CNTRL STATION PWR SUPPLY	3	\$296.00	\$216.08	\$648.24
11c	G48BD	ENH: CONVENTIONAL OPERATION APX6500	3	\$550.00	\$401.50	\$1,204.50
11d	G66BJ	ADD: DASH MOUNT E5 APXM	3	\$138.00	\$100.74	\$302.22
11e	GA01576AB	ADD: SMA TO QMA ADAPTER	3	\$22.00	\$16.06	\$48.18
11f	G142AD	ADD: NO SPEAKER APX	3	\$0.00	\$0.00	\$0.00
11g	GA05100AA	ADD: STD WARRANTY - NO ESSENTIAL	3	\$0.00	\$0.00	\$0.00
11h	G89AC	ADD: NO RF ANTENNA NEEDED	3	\$0.00	\$0.00	\$0.00
11i	G444AH	ADD: APX CONTROL HEAD SOFTWARE	3	\$0.00	\$0.00	\$0.00
11j	G806BL	ENH: ASTRO DIGITAL CAI OP APX	3	\$567.00	\$413.91	\$1,241.73
11k	GA01670AA	ADD: APX E5 CONTROL HEAD	3	\$717.00	\$523.41	\$1,570.23
11l	GA01693AA	ADD : LEGACY TRUNNION SCREW KIT	3	\$11.00	\$8.03	\$24.09
11m	W22BA	ADD: STD PALM MICROPHONE APX	3	\$79.00	\$57.67	\$173.01
11n	QA09113AB	ADD: BASELINE RELEASE SW	3	\$0.00	\$0.00	\$0.00
11o	G193AK	ADD: ADP ONLY (NON-P25 CAP COMPLIANT) (US ONLY)	3	\$0.00	\$0.00	\$0.00
11p	GA01606AA	ADD: NO BLUETOOTH/ WIFI/GPS ANTENNA NEEDED	3	\$0.00	\$0.00	\$0.00
12	NNTN8844B	CHARGER, MULTI-UNIT, IMPRES 2, 6-DISP, NA/LA-PLUG, ACC USB CHGR	2	\$1,705.20	\$1,244.80	\$2,489.60

Grand Total

\$673,517.17(USD)

Notes:

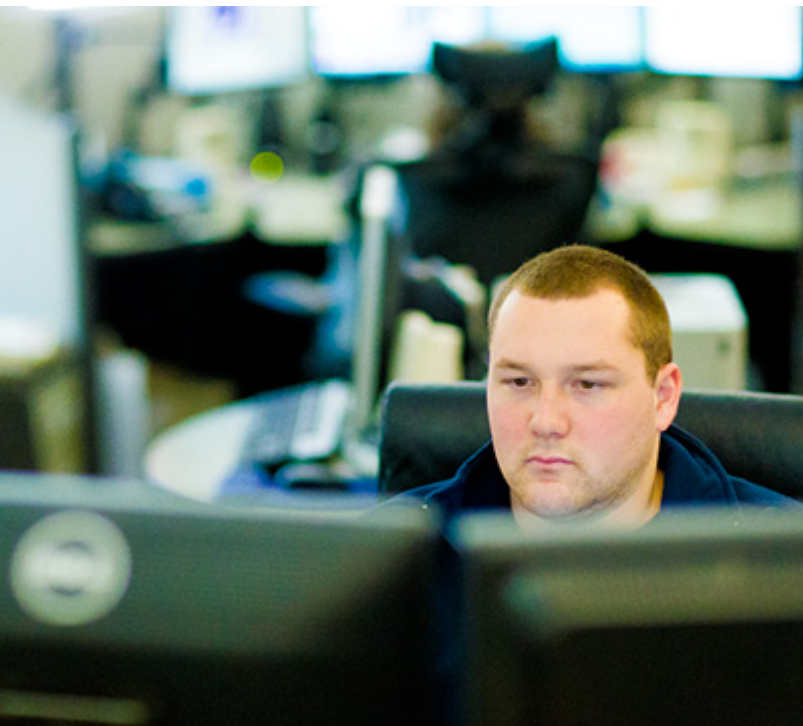


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- Unless otherwise noted, this quote excludes sales tax or other applicable taxes (such as Goods and Services Tax, sales tax, Value Added Tax and other taxes of a similar nature). Any tax the customer is subject to will be added to invoices.



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MOSCOW, CITY OF

06/18/2024

06/18/2024

MOSCOW, CITY OF
155 Southview Ave
Moscow, ID 83843

Dear Brian Nickerson,

Motorola Solutions is pleased to present MOSCOW, CITY OF with this quote for quality communications equipment and services. The development of this quote provided us the opportunity to evaluate your requirements and propose a solution to best fulfill your communications needs.

This information is provided to assist you in your evaluation process. Our goal is to provide MOSCOW, CITY OF with the best products and services available in the communications industry. Please direct any questions to Steven Fontaine at sfontaine@daywireless.com.

We thank you for the opportunity to provide you with premier communications and look forward to your review and feedback regarding this quote.

Sincerely,

Steven Fontaine

Motorola Solutions Manufacturer's Representative

Billing Address:
155 Southview Ave
Moscow, ID 83843
US

Quote Date:06/18/2024
Expiration Date:08/17/2024
Quote Created By:
Steven Fontaine
sfontaine@daywireless.com

End Customer:
MOSCOW, CITY OF
Brian Nickerson

Contract: 19860 - NASPO 00318

Line #	Item Number	Description	Qty	List Price	Sale Price	Ext. Sale Price
1	RLN4941A	REC ONLY EARPIECE W/ TRANSLUCET TUBE	57	\$76.76	\$56.03	\$3,193.71
2	NNTN8860B	CHARGER, SINGLE-UNIT, IMPRES 2, 3A, 115VAC, US/NA	57	\$186.50	\$136.15	\$7,760.55
3	PMMN4099CL	AUDIO ACCESSORY-REMOTE SPEAKER MICROPHONE,IP68 REMOTE SPEAKER MICROPHONE,3.5MM,UL	57	\$142.56	\$104.07	\$5,931.99
	APX™ 6000 Series	APX6000				
4	H98KGF9PW6BN	APX6000 VHF MHZ MODEL 2.5 PORTABLE	57	\$3,595.00	\$2,624.35	\$149,587.95
4a	QA05100AA	EHN: STD 1 YR WARRANTY APPLIES	57	\$0.00	\$0.00	\$0.00
4b	QA05570AA	ALT: LI-ION IMPRES 2 IP68 3400 MAH	57	\$115.50	\$84.32	\$4,806.24
4c	H35BU	ADD: CONVENTIONAL OPERATION	57	\$550.00	\$401.50	\$22,885.50
4d	QA09113AB	ADD: BASELINE RELEASE SW	57	\$0.00	\$0.00	\$0.00
4e	Q806BM	ADD: ASTRO DIGITAL CAI OPERATION	57	\$567.00	\$413.91	\$23,592.87
4f	Q629AK	ENH: AES ENCRYPTION AND ADP	57	\$523.00	\$381.79	\$21,762.03
	APX™ 6500 / Enh Series	ENHANCEDAPX6500				



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Line #	Item Number	Description	Qty	List Price	Sale Price	Ext. Sale Price
5	M25KSS9PW1BN	APX6500 ENHANCED VHF MOBILE	23	\$3,383.12	\$2,469.68	\$56,802.64
5a	G48BD	ENH: CONVENTIONAL OPERATION APX6500	23	\$550.00	\$401.50	\$9,234.50
5b	G629AB	ADD:1/4 WAVE BROADBAND ANT 146-174	23	\$70.00	\$51.10	\$1,175.30
5c	G67DT	ADD: REMOTE MOUNT E5 APXM	23	\$327.00	\$238.71	\$5,490.33
5d	GA05100AA	ADD: STD WARRANTY - NO ESSENTIAL	23	\$0.00	\$0.00	\$0.00
5e	B18CR	ADD: AUXILIARY SPKR 7.5 WATT APX	23	\$66.00	\$48.18	\$1,108.14
5f	G843AH	ADD: AES ENCRYPTION AND ADP	23	\$523.00	\$381.79	\$8,781.17
5g	G444AH	ADD: APX CONTROL HEAD SOFTWARE	23	\$0.00	\$0.00	\$0.00
5h	G806BL	ENH: ASTRO DIGITAL CAI OP APX	23	\$567.00	\$413.91	\$9,519.93
5i	GA01670AA	ADD: APX E5 CONTROL HEAD	23	\$717.00	\$523.41	\$12,038.43
5j	W22BA	ADD: STD PALM MICROPHONE APX	23	\$79.00	\$57.67	\$1,326.41
5k	QA09113AB	ADD: BASELINE RELEASE SW	23	\$0.00	\$0.00	\$0.00
5l	GA01693AA	ADD : LEGACY TRUNNION SCREW KIT	23	\$11.00	\$8.03	\$184.69
5m	GA01606AA	ADD: NO BLUETOOTH/ WIFI/GPS ANTENNA NEEDED	23	\$0.00	\$0.00	\$0.00

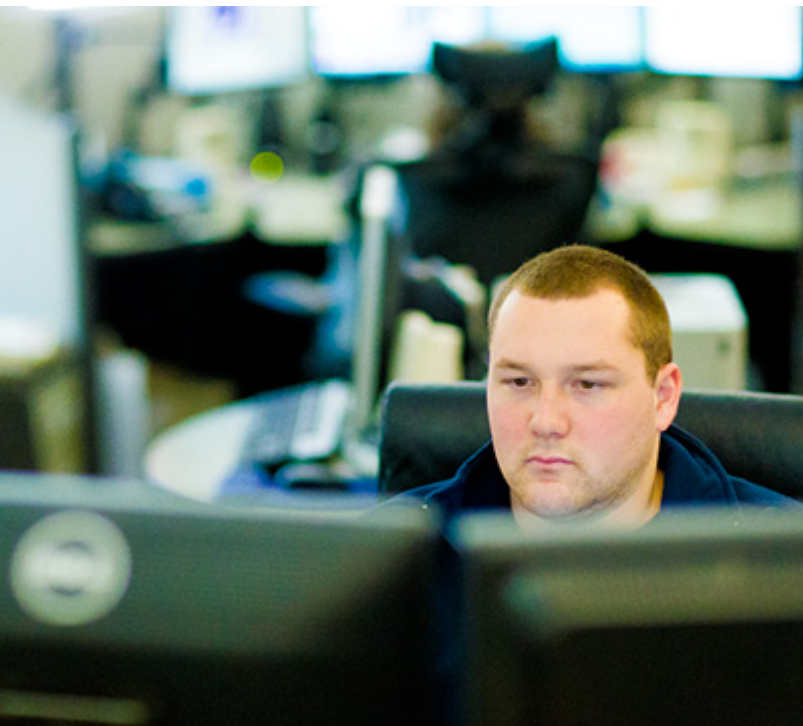
Grand Total **\$345,182.38(USD)**

Notes:

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MOSCOW, CITY OF

04/18/2024

04/18/2024

MOSCOW, CITY OF
229 Pintail LN
Moscow, ID 83843

Dear Brian Nickerson,

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This information is provided to assist you in your evaluation process. Our goal is to provide MOSCOW, CITY OF with the best products and services available in the communications industry. Please direct any questions to Steven Fontaine at sfontaine@daywireless.com.

We thank you for the opportunity to provide you with premier communications and look forward to your review and feedback regarding this quote.

Sincerely,

Steven Fontaine

Motorola Solutions Manufacturer's Representative

Billing Address:
229 Pintail LN
Moscow, ID 83843
US

Quote Date:04/18/2024
Expiration Date:08/19/2024
Quote Created By:
Steven Fontaine
sfontaine@daywireless.com

End Customer:
MOSCOW, CITY OF
Brian Nickerson

Contract: 19860 - NASPO 00318

Line #	Item Number	Description	Qty	List Price	Sale Price	Ext. Sale Price
APX™ 900						
1	H92KDF9PW6AN	APX 900 VHF MODEL 2 PORTABLE	10	\$1,973.92	\$1,440.96	\$14,409.60
1a	QA04097AA	ENH: P25 CONVENTIONAL	10	\$385.00	\$281.05	\$2,810.50
1b	QA05100AA	EHN: STD 1 YR WARRANTY APPLIES	10	\$0.00	\$0.00	\$0.00
1c	QA06765AA	ALT: IMPRESS LI-ION 3000MAH	10	\$98.70	\$72.05	\$720.50
1d	Q667BB	ADD: ADP ONLY (NON-P25 CAP COMPLIANT) (US ONLY)	10	\$0.00	\$0.00	\$0.00
1e	QA09113AB	ADD: BASELINE RELEASE SW	10	\$0.00	\$0.00	\$0.00
2	PMPN4576A	CHARGER,CHGR DESKTOP SINGLE UNIT IMPRES EXT PS US/NA/TW	10	\$82.08	\$59.92	\$599.20

Grand Total **\$18,539.80(USD)**

Notes:

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Quote #QO53524

Customer ID: 28783

Day Management Corp.
Day Wireless Systems
13212 E Indiana Ave
Spokane WA 99216
United States

Date 04/19/2024
Terms NET 30-GOV
Expires 08/10/2024
Representative Steven Fontaine
Direct Phone (509) 370-0524
E-Mail sfontaine@daywireless.com
Shop Phone (509) 484-1400
Customer Contact Dustin Neiswender
Contact Phone (509) 484-1400
Project Name 2024 APX Fleet Programming

Bill To	Ship To
Moscow, City of PO Box 9203 Moscow ID 83843 United States	Moscow, City of PO Box 9203 Moscow ID 83843 United States

Quantity	Description	Rate	Amount
1	2024 APX Fleet Programming	\$5,615.00	\$5,615.00
	Codeplug Development & 2 Days of on-site programming		
	Police: 80 Radios Fire: 169 Radios Public Works: 10 Radios		

Subtotal	\$5,615.00
Total	\$5,615.00

LEGAL NAME OF PURCHASER

AUTHORIZED SIGNATURE

P.O. NUMBER

DATE



Quote #QO53524

Customer ID: 28783

By approving this quotation, the customer is agreeing to purchase the items listed in the quote. The customer will be invoiced for the items as they arrive at a DWS facility and is expected to pay according to the terms of the quote or Net30. If the customer cancels any part of the order, the equipment must be picked up from the DWS facility. Normally stocked items may be returned for a 20% restocking fee, but non-stock items are not eligible for return and must be picked up and paid for in full at the DWS facility. Shipping and handling charges, as well as any applicable sales tax, may be included on the invoices. The terms of the order are subject to credit review. This quote is subject to review by management for completeness and accuracy, and prices are firm for 30 days unless otherwise stated. If paying by card the processing fee will be charged up to 3.5% of the transaction.

* Customers should reference the quotation number on any correspondence or purchase orders. *

* There may be a \$25 charge for insufficient funds and a 1.5% late fee may apply. *

COMMITTEE / CITY COUNCIL STAFF REPORT

DATE: Monday, July 22, 2024



AGENDA ITEM TITLE

Emergency Radio System Installation Agreement (ACTION ITEM) - Bill Belknap

RESPONSIBLE STAFF

Bill Belknap, City Supervisor

ADDITIONAL PRESENTER(S)

DESCRIPTION

The City's existing emergency radio system is reaching end of life and service and parts are no longer available. In addition, there are currently several locations within the City where radio coverage is not present and emergency responders are unable to communicate on their radios. The City Council has identified the replacement of the radio system as one of the City's strategic priorities within the City's strategic plan. The City recently solicited bids for the replacement of the emergency radio system and received one responsive bid from RACOM Communications for the project. Staff and RACOM representatives have refined the radio system design and have prepared an agreement for the project. The project will include the installation of a five-channel simulcast VHF radio system with repeaters to be installed on Moscow Mountain, Paradise Ridge, Well #10, City Hall, and the Latah County Courthouse, as well as interconnections with the Whitcom dispatch center. The proposal includes encryption for the Police dispatch and Police tactical channels to improve and enhance officer safety during critical incident response. The total contract cost is \$1,110,167.50. The City budgeted \$2,307,798 in funding for the project. The combined cost of the radio system and replacement portable and mobile radios is currently estimated at \$2,157,145.05, which is \$150,652 under the total project budget. Staff is seeking Council's approval of the agreement with RACOM to replace the City's emergency radio system.

REVIEWED BY

PROPOSED ACTIONS

PROPOSED ACTIONS: Recommend approval of the Agreement with RACOM in the amount of \$1,110,167.50, or provide staff further direction.

STAFF RECOMMENDATION

Recommend approval of the Agreement with RACOM in the amount of \$1,110,167.50

OTHER RESOURCES

FISCAL IMPACT

\$1,110,167.50 from line item# 295-130-770-74 (\$2,307,798 budgeted in FY2024)

PERSONNEL IMPACT

ATTACHMENTS

1. Construction Agreement_RACOM_Radio Project_Final with attachments

**CONSTRUCTION AGREEMENT
FOR MOSCOW RADIO SYSTEM UPGRADE PROJECT
BETWEEN CITY OF MOSCOW, IDAHO AND RACOM**

THIS CONSTRUCTION AGREEMENT FOR MOSCOW RADIO SYSTEM UPGRADE PROJECT BETWEEN CITY OF MOSCOW, IDAHO, AND RACOM (hereinafter "Agreement"), dated this ____ day of _____, 2024, by and between City of Moscow, Idaho, a municipal corporation of the State of Idaho, 206 East Third Street, Moscow, Idaho, 83843 (hereinafter "CITY"), and RACOM Corporation, 16608 East Sprague Avenue, Spokane Valley, Washington, 99037 (hereinafter "CONTRACTOR"):

W I T N E S S E T H:

WHEREAS, pursuant to the invitation of CITY, extended through an "Invitation to Bid" see Attachment 'A', CONTRACTOR submitted a Bid Proposal containing an offer invited by said invitation; and

WHEREAS, CITY has determined that said offer was the lowest responsive Bid Proposal; and

WHEREAS, CITY has accepted CONTRACTOR's Bid Proposal;

NOW THEREFORE, the Parties to this Agreement, in consideration of the mutual covenants and stipulations set out, agree as follows:

**ARTICLE 1.
CONTRACT DOCUMENTS**

The Contract Documents which comprise the entire Agreement between CITY and CONTRACTOR concerning the work to be performed, are this Agreement, pages one (1) through eight (8), and the following listed in order of precedence:

1. Drawings, Specifications and Proposal for: RADIO SYSTEM UPGRADE PROJECT, City of Moscow Project No. 295-001 ("RFP"), Attachment 'A', consisting of 254 pages; [*Note: Appendix A of original RFP will be removed and replaced with a modified Appendix A that Contractor will provide, attached herein as Attachment 'C'*]
2. Bid Proposal of CONTRACTOR, dated February 27, 2024, Attachment 'B', consisting of 425 pages;
3. Revised drawings, specifications, and cost proposal for Moscow Radio System Upgrade Project dated July 18, 2024, Attachment 'C' consisting of 34 pages;
4. Performance and Payment Bonds and Insurance Certificates;
5. Addenda, if applicable, consisting of Addendum No. 1, (2 pages), Addendum No. 2, (42 pages), Addendum No. 3, (2 pages), all included as Attachment 'D', for a total number of 46

pages; and

6. Change Orders, which may be delivered or issued after the effective date of this Agreement.

There are no Contract Documents other than those listed in Article 1. This Agreement may only be amended by mutually agreed to change order as provided for in the General Conditions. If there are any conflicting provisions between the General Conditions in Attachment 'A' and the CONTRACTOR'S bid proposal in Attachment 'B' or the CONTRACTOR's revised drawings, specifications, and cost proposal in Attachment 'C', the General Conditions in Attachment 'A' shall apply.

ARTICLE 2. WORK

CONTRACTOR shall complete the entire work as specified, indicated and required under the Contract Documents, contained herein under Article 1. for CITY project titled "MOSCOW RADIO SYSTEM UPGRADE PROJECT" (hereinafter "Project"), and more specifically described within the Revised drawings, specifications, and cost proposal for Moscow Radio System Upgrade Project dated July 18, 2024, included as Attachment 'C'.

ARTICLE 3. CONTRACT TIME/SUBSTANTIAL COMPLETION

The work to be performed pursuant to this Agreement shall be substantially complete (Equipment installed and operational at the sites) on or before April 30, 2025, unless adjustment of the Agreement time is made in accordance with the provisions of the Contract Documents. CONTRACTOR shall begin work in conformance with the Contract Documents.

CONTRACTOR and CITY recognize that time is of the essence and that CITY will suffer financial loss if the Project is not completed within the time specified above, unless approved extensions thereof are permitted in accordance with the Contract Documents. The Parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by CITY if the Project is not completed on time. Accordingly, instead of requiring any such proof, CITY and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty), CONTRACTOR shall pay CITY One Half of One Percent (0.5%) of the Contract Sum for each week that expires after the time specified above for Substantial Completion until the Project is substantially complete. After Substantial Completion, if CONTRACTOR shall neglect, refuse, or fail to complete the remaining Project within the Time of Completion or by any proper extension thereof granted by CITY, CONTRACTOR shall pay CITY One Half of One Percent (0.5%) of the Contract Sum for each day that expires after the time specified above for completion, until the Project is completed and ready for final payment. Any other claims for liquidated damages in addition to those outlined above are applicable.

ARTICLE 4. CONTRACT SUM

CITY shall pay CONTRACTOR for completion of the work in accordance with the Contract Documents in current funds in the amount of One Million One Hundred Ten Thousand One Hundred Sixty-Seven Dollars and Fifty Cents (\$1,110,167.50), as submitted by CONTRACTOR. In no event shall the Contract amount exceed CONTRACTOR's bid amount of One Million One Hundred Ten Thousand One Hundred Sixty-Seven Dollars and Fifty Cents (\$1,110,167.50), United States currency, unless otherwise authorized by CITY by written agreement. Said Contract Sum shall be paid in accordance with the Contract Documents.

ARTICLE 5. TERMINATION

This Agreement shall commence on the date first set forth above and shall continue until the later of April 30, 2025 and completion of the work, unless earlier terminated in accordance herewith. CONTRACTOR shall have the right to terminate this Agreement for CITY's material breach, including without limitation nonpayment of fees, if CITY fails to cure the breach within 10 days of receipt of written notice. CITY's termination rights are outlined in the General Conditions in Attachment 'A' and may terminate only if CONTRACTOR fails to cure the noncompliance within 10 business days from receipt of written notice from the CITY.

ARTICLE 6. INDEPENDENT CONTRACTOR

The Parties warrant by their signatures that no employer-employee relationship is established between CONTRACTOR and CITY by the terms of this Agreement. It is understood by the Parties hereto that CONTRACTOR is an independent CONTRACTOR and, as such, neither CONTRACTOR nor CONTRACTOR's employees, agents, representatives or subcontractors, if any, are employees of CITY for purposes of tax, retirement system, or social security (FICA) withholding.

ARTICLE 7. SCOPE OF SERVICES

CONTRACTOR shall perform all work required by the Contract Documents. All work shall be completed in accordance with the specifications and plans established for this Project.

ARTICLE 8. HOLD HARMLESS/INDEMNIFICATION

In addition to other rights granted CITY by the Contract Documents, the CONTRACTOR shall indemnify and hold harmless CITY, its officers and employees, from all third party suits, actions, or claims of any character brought against CITY (i) because of any injuries or damages received or sustained by any person, persons, or property on account of the operations of the CONTRACTOR or its subcontractors, or on account of or in consequence of any neglect in

safeguarding the work; or through use of unacceptable materials in constructing the work, or because of any act or omission, neglect, or willful misconduct of the CONTRACTOR or its subcontractors, in each case except to the extent the claim results from CITY's or its personnel's acts or omissions, neglect or willful misconduct; or (ii) because of any third party claims brought against CITY alleging any infringements of a third party's patent, trademark or copyright; or (iii) because of any third party claims arising under the Workmen's Compensation Act or any other applicable workers' compensation law, ordinance, order or decree. These obligations are subject to CITY promptly notifying CONTRACTOR of the claim for which it seeks indemnification, giving CONTRACTOR sole control over the defense and settlement of the claim, and providing CONTRACTOR with reasonable assistance in the defense of the claim at CONTRACTOR's expense.

ARTICLE 9. CONFLICT OF INTEREST

CONTRACTOR covenants that it presently has no interest and will not acquire any interest, direct or indirect, in the Project, which would conflict in any manner or degree with the performance of CONTRACTOR's services hereunder. CONTRACTOR further covenants that, in performing this Agreement, CONTRACTOR will employ no person who has any such interest. Should any conflict of interest arise during the performance of this Agreement, CONTRACTOR shall immediately disclose such conflict to the CITY.

ARTICLE 10. ENTIRE AGREEMENT, MODIFICATION AND ASSIGNABILITY

This Agreement, the attachments and exhibits hereto contain the entire Agreement between the Parties, and no statements, promises, or inducements made by either Party, or agents of either Party are valid or binding unless contained herein. This Agreement may not be enlarged, modified or altered except upon written agreement signed by the Parties hereto. CONTRACTOR may not subcontract or assign its rights (including the right to compensation) or duties arising hereunder, other than as provided within the Contract Documents, without the prior written consent and express authorization of CITY; provided that CONTRACTOR shall have the right to assign this Agreement without such prior consent to its successor in a merger, acquisition or other change of control, including without limitation the sale of all or substantially all of its assets, stock or business to which this Agreement relates.

ARTICLE 11. LICENSES AND ADHERENCE TO LAW REQUIRED

CONTRACTOR represents that it possesses the skill and experience necessary, and all licenses required to perform the work under this Agreement. CONTRACTOR further agrees to comply with all applicable Federal, State and Local statutes and regulations in the performance of the work hereunder and are hereby made a part of this Agreement and shall be adhered to at all times. Violation of any of these statutes or regulations by CONTRACTOR shall be deemed material and shall subject CONTRACTOR to termination of this Agreement for cause. No pleas of misunderstanding or ignorance on the part of CONTRACTOR will, in any way, serve to modify the

provisions of this requirement.

Anti-Boycott Against Israel Act. CONTRACTOR certifies it is not currently engaged in, and will not for the duration of this Agreement engage in, a boycott of goods and services from Israel or territories under its control. Failure to comply with Idaho Code § 67-2346 will result in this Agreement being void as against public policy.

Ownership or Operation by China. Pursuant to Idaho Code § 67-2359, CONTRACTOR certifies that it is not currently owned or operated by the government of China and will not for the duration of this Agreement be owned or operated by the government of China. The terms in this section defined in Idaho Code § 67-2359 shall have the meaning defined therein.

Not an Abortion Provider or Affiliate. Pursuant to Idaho Code Title 18 Chapter 87, CONTRACTOR certifies that it is not an abortion provider or an affiliate of any abortion provider and does not, and will not for the duration of this Agreement, authorize the use of state facilities or public funds for abortion related activity.

Anti-Boycott of Certain Sectors. Pursuant to Idaho Code § 67-2347A, SELLER certifies that it is not engaged in, and will not for the duration of this Agreement engage in, a boycott of any individual or company because the individual or company 1) engages in or supports the exploration, production, utilization, transportation, sale or manufacture of fossil fuel-based energy, timber, minerals, hydroelectric power, nuclear power, or agriculture or 2) engages in or supports the manufacture, distribution, sale, or use of firearms, as defined in Idaho Code § 18-3302 (2)(d).

ARTICLE 12. EMPLOYMENT DISCRIMINATION

It is illegal under the U.S. Federal law to discriminate against an employee, either intentionally or through disparate impact, on account of race, color, gender, religion, sex (including pregnancy), national origin, physical or mental disability, age, marital or familial status, sexual orientation, and gender expression or identity. CONTRACTOR shall not discriminate against any employee or applicant for employment. CONTRACTOR's action under this Section shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation and selection for training, including apprenticeship. CONTRACTOR agrees to post in conspicuous places, available to employees and other applicants for employment, notices setting forth the provisions of this non-discrimination Section. Furthermore, CONTRACTOR shall comply with City Ordinance No. 2013-06 Gender Anti-Discrimination in Housing, Employment & Public Accommodations.

ARTICLE 13. LEGAL FEES

In the event either Party incurs legal expenses to enforce the terms and conditions of this Agreement, the prevailing Party is entitled to recover reasonable attorney's fees and other costs and expenses, whether the same are incurred with or without a lawsuit.

ARTICLE 14.
JURISDICTION, VENUE AND NONWAIVER

It is agreed that this Agreement shall be construed under and governed by the laws of the State of Idaho. In the event of litigation concerning it, it is agreed that proper venue shall be the District Court of the Second Judicial District of the State of Idaho, in and for the County of Latah. Failure of CITY to exercise any of the rights under this Agreement, or breach thereof, shall not be deemed to be a waiver of such right or a waiver of any subsequent breach.

ARTICLE 15.
SPECIAL WARRANTY

CONTRACTOR warrants that nothing of monetary value has been given, promised or implied as remuneration or inducement to enter into this Agreement. CONTRACTOR declares that no improper personal, political or social activities have been used or attempted in an effort to influence the outcome of the competition, discussion, or negotiation leading to the award of this Agreement. Any such activity by CONTRACTOR shall make this Agreement null and void. CONTRACTOR further warrants that all materials and goods supplied under this Agreement shall be of good merchantable quality and that all services will be performed in a good workmanlike manner. CONTRACTOR acknowledges that it will be liable for any breach of this warranty.

ARTICLE 16.
FORCE MAJEURE

CONTRACTOR shall not be liable for any delay in or failure of its performance which is due to any cause beyond its reasonable control after taking commercially reasonable precautions ("Force Majeure Event"). The Parties agree that the deadline for fulfilling the obligation in question will be extended for at least a period of time equal to that of the continuance of the Force Majeure Event.

ARTICLE 17.
COMMUNICATIONS

Such communications as are required by this Agreement shall be satisfied by mailing or by personal delivery to the Parties at the following address:

CONTRACTOR:

RACOM Corporation
Scott Skibness
Sales Manager
16608 East Sprague Avenue
Spokane Valley, Washington 99037

CITY:

City of Moscow
Engineering Division
206 East Third Street
P O Box 9203
Moscow, Idaho 83843

ARTICLE 18.
NON-APPROPRIATIONS

This Agreement is contingent upon CITY receiving the necessary funding to cover the obligations of CITY. In the event that such funding is not received or appropriated, then, and in that event, CITY's obligations under this Agreement shall cease and each Party shall be released from further performance under this Agreement without any liability to the other Party, and CONTRACTOR shall be entitled to receive just and equitable compensation for any work satisfactorily completed hereunder.

ARTICLE 19.
APPROVAL REQUIRED AND SEVERABILITY

This Agreement shall not become effective or binding until approved by CITY. If any part of this Agreement is held unenforceable, the remaining portions of the Agreement will, nevertheless, remain in full force and effect.

ARTICLE 20. EXECUTION

IN WITNESS WHEREOF, said CONTRACTOR and CITY have caused this Agreement to be executed on the day and year first above written.

I, Mike Miller, certify under penalty of perjury pursuant to the law of the State of Idaho, that I am an authorized agent to bind RACOM Corporation to this Agreement.

CONTRACTOR:

RACOM Corporation

CITY:

City of Moscow, Idaho

Mike Miller, President

Arthur D. Bettge, Mayor

ATTEST:

Laurie M. Hopkins, City Clerk

Approved as to Form:

Mia Bautista, City Attorney

ACKNOWLEDGMENT

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 2024, before me, a Notary Public in and for said State, appeared Mike Miller, known to me to be the person named above and acknowledged that they executed the foregoing document as the duly authorized representative for RACOM Corporation.

Notary Public for _____
Residing at _____
Commission Expires: _____



ENGINEERING DIVISION

DRAWINGS, SPECIFICATIONS AND
PROPOSAL FOR:

RADIO SYSTEM UPGRADE PROJECT

CITY OF MOSCOW, IDAHO

**ENGINEERING DIVISION
504 S. WASHINGTON STREET
(208) 883-7034**

Plans, Specifications and Proposal

For

RADIO SYSTEM UPGRADE PROJECT

**PROJECT MANAGER:
DEMETRE N. MAKRAZAKIS**

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APPENDIX A

PROJECT NARRATIVE, DRAWINGS, AND SPECIFICATIONS

APPENDIX B

GEOTECHNICAL REPORT

INVITATION TO BID

The City of Moscow, Idaho is accepting sealed bids to be submitted to the Community Development Building (Engineering Division) at 504 South Washington Street, Moscow, Idaho, 83843. The sealed bid shall be clearly marked “**Bid Enclosed –RADIO SYSTEM UPGRADE PROJECT**” until **2:00 p.m.**, prevailing local time, **Tuesday, November 14, 2023**, for the following project:

RADIO SYSTEM UPGRADE PROJECT

At **2:05 p.m., on the same day**, all proposals will be publicly opened and read aloud in the Community Development Building, Main Floor Conference Room, at 504 South Washington Street, Moscow, Idaho, 83843.

In an effort to modernize and improve the telecommunications capabilities of vital City of Moscow emergency services, the City of Moscow is soliciting bids to furnish and install a system of base station repeaters, microwave radios and their associated antennas, VHF voting receivers, all associated equipment as described herein, and a systemwide interface across 9 sites within the region. Additionally, as part of this project, bidders are to provide design-build services for an 85’ monopole capable of supporting the antenna and transmission line systems and in full-adherence to the project specifications, ANSI/TIA 222, and all other applicable codes and standards. Also, within this project scope is full and complete systemwide integration, configuration, testing, programming, optimization, documentation etc. as required for a fully-complete, fully-operable, turnkey system meeting project specifications.

Complete digital Project Manual and Project Plans may be viewed at questcdn.com via the link provided on the City of Moscow Website at: www.ci.moscow.id.us – click on “Business” / “Bid Opportunities” / “Radio System Upgrade Project”.

Once on the Quest site, you may download the digital plan documents for a **non-refundable fee of \$22.00**. The Quest project number is **8745831**. Please contact QuestCDN.com at 952-233-1632 or info@questcdn.com for assistance in free membership registration, downloading, and working with digital project information.

IMPORTANT - All communication about this project, including addenda **will only be issued** via QuestCDN, and **only to those firms listed on the Plan Holder’s List**. Project Documents may also be examined at the City of Moscow Community Development Building (Engineering Division), 504 South Washington Street, Moscow, Idaho, 83843.

Questions should be directed to Demetre Makratzakis, City of Moscow Engineering, 504 South Washington Street, Moscow, Idaho. Phone 208-883-7034 or Email: dmakratzakis@ci.moscow.id.us

Any objections to the contents or terms of the Specifications shall be raised three (3) days prior to bid opening or it shall be deemed to have been waived.

The City reserves the right to reject any and all Bid Proposals, to waive any formality in the Bidding Contract Documents and to make selection to the lowest responsive, responsible and qualified Bidder as it may best serve the interest of the City.

Britany Luft

Britany Luft, Deputy City Clerk

Publish Dates: October 14, 2023 & October 21, 2023

BIDDER'S CHECKLIST

The Bidder's Checklist is offered to assist the prospective bidder in checking its Bid. This checklist does not relieve the bidder from properly completing its Bid.

Check off when completed:

1. _____ Are all blank spaces filled out on Bid Form?
2. _____ Have questions arising from the bidding, contract, specifications or plans been submitted to the proper authority and resolved in the proper manner?
3. _____ Are Bid amounts shown correctly as well as extensions and totals? Recheck for errors or omissions.
4. _____ Are authorized signatures properly affixed to the Bid form, giving also title, and Idaho Public Works Contractor license number, evidence of authority to sign, etc.?
5. _____ Have all plumbing, heating, air conditioning and electrical subcontractors to whom work will be awarded been listed, as well as their Idaho Public Works Contractor license number?
6. _____ Have all Addenda been received and acknowledged with the proper signature on the Bid Form?
7. _____ In order for a Bid to be considered, the required attachments must be placed in a properly addressed sealed envelope and delivered to the specified authority prior to the time designated for the bid opening.
8. _____ Has the Bid Security been enclosed?
9. _____ Has Bidder performed examinations in accordance with the Instructions to Bidders?
10. _____ Bidder has carefully studied site conditions, tests, investigations, and technical data which may affect the cost, progress, or performance of the Work.
11. _____ Has Bidder included Equipment Price Sheet?
12. _____ Has Bidder included Services Price Sheet?
13. _____ Has Bidder included Post-Installation Warranty Services Price Sheet?

BID PROPOSAL

TO: Mayor and City Council
City of Moscow, Idaho

Date: _____

This proposal is submitted as an offer by the undersigned bidder to enter into contract with the City of Moscow, Idaho as represented by the City Council, hereinafter referred to as the 'CITY' for RADIO SYSTEM UPGRADE PROJECT, (hereinafter "Project"), specified herein and which construction documents are on file with the City Engineer, 504 South Washington Street, Haddock Building, Moscow, Idaho, and which are a condition hereof with the same force and effect as though they were attached hereto. The offer is conditioned on the following declarations as to the facts, intention and understanding of the undersigned and the agreement of the CITY to the terms and prices herein submitted.

1. All Project specifications and drawings examined by the undersigned and their terms and conditions are hereby agreed to.
2. The undersigned certifies that it has received or made itself aware of any and all existing site conditions that may affect the proposed work.
3. It is understood that the contract drawings may be supplemented by additional drawings and specifications in explanation and elaboration of the contract drawings and it is agreed that such supplemental drawings, when not in conflict with those referred to in paragraph 1 above, will have the same force and effect as if attached hereto and that when received they will be considered a part of the contract.
4. The undersigned will furnish separate performance and payment bonds in the full amount of the contract price.
5. The cash, certified check, bid bond, or cashier's check accompanying this proposal shall be forfeited to CITY to the extent of 5% of the amount bid if the undersigned shall fail or refuse to execute the contract, furnish performance and payment bonds, and insurance certificates as required by the specifications within the time limit therein after notification that the said proposal is accepted, all in accordance with the provisions of this proposal and the specifications.
6. The undersigned further agrees that CITY shall have the right to accept or reject any bid which rejection or acceptance is deemed to be in the best interest of CITY.
7. The undersigned agrees to order all necessary equipment and materials within a period of three (3) days after Notice to Proceed has been issued by CITY.

8. The undersigned, as a bidder, acknowledges that Addenda Number _____ through _____, if any, have been delivered to it and have been examined as part of the contract documents.
9. The undersigned agrees to complete all work embraced in the contract within the time limitations set forth in paragraph IB-13 of the Instruction to Bidders.
10. The undersigned holds Idaho Public Work's License Number _____.
11. The undersigned proposes to use the following sub-contractors in the performance of meeting the contract requirements. Information herein must comply with Idaho Code Section 67-2310 and IB-16:

Subcontractors	Trade Specialty	Idaho Public Works License No.	\$ Amount
a.			
b.			
c.			
d.			
e.			

12. The undersigned proposes to furnish labor, materials, equipment and services of all kinds required for RADIO SYSTEM UPGRADE PROJECT as described in the specifications, including all appurtenant work, all as required by the specifications and this proposal for the prices in accordance with the completed schedule contract prices as follows:

BID SCHEDULE

<u>No.</u>	<u>Item Description</u>	<u>Quantity & Unit</u>	<u>Unit Price</u>	<u>Total Price</u>
1.	Radio System Upgrade	1 LS	\$ _____	\$ _____

Base Bid Total Price _____
(Use Words)

13. The undersigned bidder, certifies under penalty of perjury pursuant to the law of the State of Idaho, that the undersigned bidder is an authorized agent to bind the bidder to the terms of this Bid Proposal.

Firm Name of Bidder

Bidders Mailing Address

Public Works License No.

State of Incorporation if Incorporated

Signature of Bidder

Official Title

SEAL (if incorporated)

Dated at _____

This ____ day of _____, 2023

Services Cost Sheet

Category	Hourly Rate	Hours	Total Labor Cost	Expenses	Total Cost
Project Management					
Engineering					
Documentation					
Coverage Testing					
Technical Optimization					
Training					
Warranty Services					
Monopole Tower Installation					
Other (Describe)					
Total Services Cost:					

Equipment Price Sheet

[illegible]

Total Site Equipment Price:

Post Warranty Services Cost Sheet

Post Warranty Service	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10
Technical Support									
Depot Repair									
Other (Describe)									

**CONSTRUCTION AGREEMENT
FOR RADIO SYSTEM UPGRADE PROJECT
BETWEEN CITY OF MOSCOW, IDAHO
AND COMPANY**

THIS CONSTRUCTION AGREEMENT FOR RADIO SYSTEM UPGRADE PROJECT BETWEEN CITY OF MOSCOW, IDAHO, AND COMPANY (hereinafter "Agreement"), dated this ____ day of _____, 2023, by and between City of Moscow, Idaho, a municipal corporation of the State of Idaho, 206 East Third Street, Moscow, Idaho, 83843 (hereinafter "CITY"), and Company Name and Address (hereinafter "CONTRACTOR"):

W I T N E S S E T H:

WHEREAS, pursuant to the invitation of CITY, extended through an "Invitation to Bid" see Attachment 'A', CONTRACTOR submitted a Bid Proposal containing an offer invited by said invitation; and

WHEREAS, CITY has determined that said offer was the lowest responsive Bid Proposal; and

WHEREAS, CITY has accepted CONTRACTOR's Bid Proposal;

NOW THEREFORE, the Parties to this Agreement, in consideration of the mutual covenants and stipulations set out, agree as follows:

**ARTICLE 1.
CONTRACT DOCUMENTS**

The Contract Documents which comprise the entire Agreement between CITY and CONTRACTOR concerning the work to be performed, are this Agreement, pages one (1) through seven (7), and the following:

1. Drawings, Specifications and Proposal, Attachment 'A' for: RADIO SYSTEM UPGRADE PROJECT, consisting of number of pages;
2. Bid Proposal of CONTRACTOR, dated date, 2023, see Attachment 'B', consisting of number of pages;
3. Performance and Payment Bonds and Insurance Certificates;
4. Addenda, if applicable, Attachment 'C', consisting of number of pages; and
5. Change Orders, which may be delivered or issued after the effective date of this Agreement.

There are no Contract Documents other than those listed in Article 1. This Agreement may only be amended by change order as provided in the General Conditions of Attachment 'A'.

**ARTICLE 2.
WORK**

CONTRACTOR shall complete the entire work as specified, indicated and required under the Contract Documents, contained herein under Article 1. for CITY project (hereinafter “Project”) titled:

“RADIO SYSTEM UPGRADE PROJECT”

**ARTICLE 3.
CONTRACT TIME/SUBSTANTIAL COMPLETION**

The work to be performed pursuant to this Agreement shall be substantially complete on or before December 31, 2024, unless adjustment of the Agreement time is made in accordance with the provisions of the Contract Documents. CONTRACTOR shall begin work in conformance with the Contract Documents.

CONTRACTOR and CITY recognize that time is of the essence and that CITY will suffer financial loss if the Project is not completed within the time specified above, unless approved extensions thereof are permitted in accordance with the Contract Documents. The Parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by CITY if the Project is not completed on time. Accordingly, instead of requiring any such proof, CITY and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty), CONTRACTOR shall pay CITY One Half of One Percent (0.5%) of the Contract Sum for each day that expires after the time specified above for Substantial Completion until the Project is substantially complete. After Substantial Completion, if CONTRACTOR shall neglect, refuse, or fail to complete the remaining Project within the Time of Completion or by any proper extension thereof granted by CITY, CONTRACTOR shall pay CITY One Half of One Percent (0.5%) of the Contract Sum for each day that expires after the time specified above for completion, until the Project is completed and ready for final payment.

**ARTICLE 4.
CONTRACT SUM**

CITY shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents in current funds in the amount of Dollar Amount (\$000.00), as submitted by CONTRACTOR. In no event shall Contract amount exceed CONTRACTOR’s bid amount of Dollar Amount (\$000.00), United States currency, unless otherwise authorized by CITY by written agreement. Said Contract Sum shall be paid in accordance with the Contract Documents.

**ARTICLE 5.
TERMINATION**

Termination provisions are governed by the attached Contract Documents.

**ARTICLE 6.
INDEPENDENT CONTRACTOR**

The Parties warrant by their signatures that no employer-employee relationship is established between CONTRACTOR and CITY by the terms of this Agreement. It is understood by the Parties hereto that CONTRACTOR is an independent contractor and, as such, neither CONTRACTOR nor CONTRACTOR's employees, agents, representatives or subcontractors, if any, are employees of CITY for purposes of tax, retirement system, or social security (FICA) withholding.

ARTICLE 7. SCOPE OF SERVICES

CONTRACTOR shall perform all work required by the Contract Documents. All work shall be completed in accordance with the specifications and plans established for this Project.

ARTICLE 8. HOLD HARMLESS/INDEMNIFICATION

In addition to other rights granted CITY by the Contract Documents, CONTRACTOR agrees to indemnify, defend, and hold harmless CITY, its officers, agents, employees, and engineers, from and against any and all losses, lawsuits, actions, claims, judgments for damages, or any injuries or damages received or sustained by any person, persons, or property, and losses, expenses, and other costs, including litigation costs and attorney's fees, arising out of, resulting from, or in connection with the acts and/or any performances, activities, errors or omissions by CONTRACTOR, CONTRACTOR's servants, agents, officers, employees, representatives, guests, business invitees or its subcontractors; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any claims or amounts recovered from any infringements of patent, trademark or copyright; or from any claims or amounts arising out of or recovered under the Workmen's Compensation Act or any other law, ordinance, order, or decree.

ARTICLE 9. CONFLICT OF INTEREST

CONTRACTOR covenants that it presently has no interest and will not acquire any interest, direct or indirect, in the Project, which would conflict in any manner or degree with the performance of CONTRACTOR's services hereunder. CONTRACTOR further covenants that, in performing this Agreement, CONTRACTOR will employ no person who has any such interest. Should any conflict of interest arise during the performance of this Agreement, CONTRACTOR shall immediately disclose such conflict to the CITY.

ARTICLE 10. ENTIRE AGREEMENT, MODIFICATION AND ASSIGNABILITY

This Agreement and the exhibits and attachments hereto contain the entire Agreement between the Parties, and no statements, promises, or inducements made by either Party, or agents of either Party are valid or binding unless contained herein. This Agreement may not be enlarged, modified or altered except upon written agreement signed by the Parties hereto. CONTRACTOR may not subcontract or assign its rights (including the right to compensation) or duties arising hereunder,

other than as provided within the Contract Documents, without the prior written consent and express authorization of CITY.

ARTICLE 11. LICENSES AND ADHERENCE TO LAW REQUIRED

CONTRACTOR represents that it possesses the skill and experience necessary and all licenses required to perform the services under this Agreement. CONTRACTOR further agrees to comply with all applicable Federal, State and Local statutes and regulations in the performance of the services hereunder, and are hereby made a part of this Agreement and shall be adhered to at all times. Violation of any of these statutes or regulations by CONTRACTOR shall be deemed material and shall subject CONTRACTOR to termination of this Agreement for cause. No pleas of misunderstanding or ignorance on the part of CONTRACTOR will, in any way, serve to modify the provisions of this requirement. CONTRACTOR and its surety shall indemnify, defend and hold harmless CITY and its employees, agents, engineers and representatives against any claim or liability arising from or based on the violation of any such laws, codes, ordinances, or regulations, whether by CONTRACTOR, CONTRACTOR's employees, or its subcontractors.

Anti-Boycott Against Israel Act. CONTRACTOR certifies it is not currently engaged in, and will not for the duration of the Agreement engage in, a boycott of goods and services from Israel or territories under its control. Failure to comply with I.C. § 67-2346 will result in this Agreement being void as against public policy.

Ownership or Operation by China. Pursuant to Idaho Code § 67-2359, CONTRACTOR certifies that it is not currently owned or operated by the government of China and will not for the duration of this Agreement be owned or operated by the government of China. The terms in this section defined in Idaho Code § 67-2359 shall have the meaning defined therein.

Employment of Residents of Idaho. Pursuant to Idaho Code § 44-1001, CONTRACTOR certifies that it will employ ninety-five percent (95%) bona fide Idaho residents, as that term is defined in Idaho Code § 44-1003, as employees for the completion of the terms required in this Agreement. If CONTRACTOR employs less than fifty (50) employees on this project, CONTRACTOR may employ up to ten percent (10%) nonresidents for the completion of the terms required in this Agreement. In all cases, CONTRACTOR agrees to give a preference to bona fide Idaho residents. The parties agree that if Project involves the expenditure of federal aid funds, that this clause will not be enforced in a manner that conflicts with federal statutes prescribing a labor preference for veterans or prohibiting unlawful discrimination or preferences among United States citizens.

Not an Abortion Provider or Affiliate. Pursuant to Idaho Code Title 18 Chapter 87, CONTRACTOR certifies that it is not an abortion provider or an affiliate of any abortion provider and does not, and will not for the duration of this Agreement, authorize the use of state facilities or public funds for abortion related activity.

ARTICLE 12. EMPLOYMENT DISCRIMINATION

It is illegal under the U.S. Federal law to discriminate against an employee, either intentionally or through disparate impact, on account of race, color, gender, religion, sex (including pregnancy), national origin, physical or mental disability, age, marital or familial status, sexual orientation, and gender expression or identity. CONTRACTOR shall not discriminate against any employee or applicant for employment. CONTRACTOR's action under this Section shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation and selection for training, including apprenticeship. CONTRACTOR agrees to post in conspicuous places, available to employees and other applicants for employment, notices setting forth the provisions of this non-discrimination Section. Furthermore, Contractor shall comply with City Ordinance No. 2013-06 Gender Anti-Discrimination in Housing, Employment & Public Accommodations.

ARTICLE 13. LEGAL FEES

In the event either Party incurs legal expenses to enforce the terms and conditions of this Agreement, the prevailing Party is entitled to recover reasonable attorney's fees and other costs and expenses, whether the same are incurred with or without a lawsuit.

ARTICLE 14. JURISDICTION, VENUE AND NONWAIVER

It is agreed that this Agreement shall be construed under and governed by the laws of the State of Idaho. In the event of litigation concerning it, it is agreed that proper venue shall be the District Court of the Second Judicial District of the State of Idaho, in and for the County of Latah. Failure of CITY to exercise any of the rights under this Agreement, or breach thereof, shall not be deemed to be a waiver of such right or a waiver of any subsequent breach.

ARTICLE 15. SPECIAL WARRANTY

CONTRACTOR warrants that nothing of monetary value has been given, promised or implied as remuneration or inducement to enter into this Agreement. CONTRACTOR declares that no improper personal, political or social activities have been used or attempted in an effort to influence the outcome of the competition, discussion, or negotiation leading to the award of this Agreement. Any such activity by CONTRACTOR shall make this Agreement null and void. CONTRACTOR further warrants that all materials and goods supplied under this Agreement shall be of good merchantable quality and that all services will be performed in a good workmanlike manner. CONTRACTOR acknowledges that it will be liable for any breach of this warranty.

ARTICLE 16. COMMUNICATIONS

Such communications as are required by this Agreement shall be satisfied by mailing or by personal delivery to the Parties at the following address:

CONTRACTOR:

Company Name
Authorized Agent
Street Address
City, State Zip

CITY:

City of Moscow
Engineering Division
206 East Third Street
P O Box 9203
Moscow, Idaho 83843

ARTICLE 17. NON-APPROPRIATIONS

This Agreement is contingent upon CITY receiving the necessary funding to cover the obligations of CITY. In the event that such funding is not received or appropriated, then, and in that event, CITY's obligations under this Agreement shall cease and each Party shall be released from further performance under this Agreement without any liability to the other Party, and CONTRACTOR shall be entitled to receive just and equitable compensation for any work satisfactorily completed hereunder.

ARTICLE 18. APPROVAL REQUIRED AND SEVERABILITY

This Agreement shall not become effective or binding until approved by CITY. If any part of this Agreement is held unenforceable, the remaining portions of the Agreement will, nevertheless, remain in full force and effect.

ARTICLE 19. EXECUTION

IN WITNESS WHEREOF, said CONTRACTOR and CITY have caused this Agreement to be executed on the day and year first above written.

I [Name](#), certify under penalty of perjury pursuant to the law of the State of Idaho, that I am an authorized agent to bind [Company](#) to this Agreement.

CONTRACTOR:

[Company Name](#)

CITY:

City of Moscow, Idaho

By: [Authorized Agent](#)

Arthur D. Bettge, Mayor

ATTEST:

Laurie M. Hopkins, City Clerk

Approved as to Form:

Mia Bautista, City Attorney

ACKNOWLEDGMENT

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 2023, before me, a Notary Public in and for said State, appeared [Authorized Agent](#), known to me to be the person named above and acknowledged that they executed the foregoing document as the duly authorized representative for [Company Name](#).

Notary Public for the State of _____
Residing at _____
My commission expires _____

INSTRUCTION TO BIDDERS

IB-1. INTENT OF PLANS AND SPECIFICATIONS

- A. It is the intention of these specifications to provide for careful, thorough and workmanlike construction procedure in the installation of material and equipment and in the manufacture or delivery of such materials and equipment. The bidder to whom the contract is awarded shall furnish all the material, equipment and labor necessary to complete said contract in accordance with all of its terms and conditions. All contracts shall be awarded subject to those instructions to bidders.
- B. The plans and specifications shall be considered and used together; anything appearing as a requirement of either shall be accepted as applicable to both even though not stated therein or shown. All specifications and notes appearing on the plans shall have the same force and effect as though they were repeated herein.

IB-2. PLANS, SPECIFICATIONS, AND ADDITIONAL INFORMATION

Additional information relative to the Plans and Specifications may be obtained from the office of Community Development, Engineering Division.

IB-3. EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE

Bidders shall satisfy themselves by personal examination of the plans, specifications, and site of the proposed improvement, and by any other examinations and investigation which they may desire to make, as to the accuracy of the estimate of quantities, the nature of the soil, conditions of the project site, and difficulties to be encountered.

IB-4. PREPARATION AND DELIVERY OF PROPOSAL

- A. Bids shall be prepared and submitted upon the "Proposal" form supplied by the Engineer. Each and every blank provided for in the "Proposal" shall be filled in with ink or typing. Proposals, which are incomplete or submitted on an unauthorized form, may be rejected as informal.
- B. After the date and hour set for the opening of the bids, no bidder may withdraw its proposal unless award of contract is delayed for a period exceeding the time limits described in IB-8, AWARD OF CONTRACT.
- C. If discrepancies exist between the Unit Prices and the Total Price or Bid Total amount, the CITY will use the Unit Prices and calculate a corrected Bid Total.

- D. The CITY reserves the right to reject any or all bids, any or all schedules or to accept the bid or schedule deemed to be in the best interest of the CITY.

IB-5. PROPOSAL GUARANTY

Each proposal must be accompanied by cash, a certified check, bid bond, or cashier's check, of legal United States currency, in an amount not less than five percent (5%) of the total amount bid. This guaranty or "Good faith token" will be held until the successful bidder has, within ten (10) days from the date of notification of award of contract, executed the contract and furnished approved separate performance and payment bonds, each in an amount equal to one hundred percent (100%) of the amount of the contract. There shall also be submitted with the surety bonds, evidence of public liability insurance coverage in amounts not less than those specified in the general specifications included herein.

IB-6. RETURN OF PROPOSAL GUARANTY

Immediately after the bid prices have been compared, the City Clerk will return the guaranties accompanying the proposals that in the CITY's judgment will not be considered for awarding the contract. All other proposal guaranties will be held until the successful bidder has completed all tasks required for the contract and executed, furnished and/or complied with any other legal requirements, after which they will be returned to the respective bidders whose proposals they accompany.

IB-7. QUALIFICATIONS OF BIDDER

- A. The CITY desires that this project shall be built by a contractor who is competent and adequately financed. The CITY may request the Bidder to submit a written statement to show experience in construction work of this character as an indication of qualification and business standing. If required, the Bidder may make its statement in such form as may deem appropriate; said statement shall be notarized.
- B. This public works project is not financed in whole or in part by federal-aid funds. Bid proposals will be accepted from those contractors only (prime contractors, subcontractors and/or specialty contractors) who, prior to the bid opening, hold current licenses as public works contractors in the State of Idaho.
- C. The bidder shall submit with its proposal a list of the subcontractors and their license numbers.
- D. The successful bidder, in addition to listing the names and addresses of subcontractors in its bid, shall, within seven (7) days after opening of the bids, notify the Engineer in writing of the names of all major equipment and material suppliers proposed for the principal parts of the work, and for such others as the Engineer may direct, and shall not employ any subcontractors, (or purchase any equipment), to which the Engineer or CITY may, within a reasonable time, object to as incompetent or undesirable.

IB-8. AWARD OF CONTRACT

- A. The contract will not be awarded until the CITY is satisfied the successful bidder is reasonably familiar with the class of work upon which it has submitted a proposal and has the necessary capital and tools to satisfactorily perform the same. The CITY may request and the bidder must provide the CITY with a current balance sheet and a list of tools owned by the bidder.
- B. Within thirty (30) days after the opening of the proposals the CITY will accept one of the proposals or reject all bids. The award will be made upon the basis of the proposal that, in the CITY's judgment, will serve the best interest of the CITY.
- C. The contract will not be awarded until the bidder has obtained an appropriate Idaho public works license from the Idaho Public Works Contractors State License Board. Subcontractors are also subject to this requirement.

IB-9. FAILURE TO EXECUTE CONTRACT

In the event the successful bidder fails to furnish approved performance and payment bonds, execute the contract and comply with all other pertinent legal requirements within ten (10) days after notification by the Engineer of the award of contract, the certified check, bank draft, money order of bid bond will be forfeited to the CITY as liquidated damages. The amount of any such damages will be five percent (5%) of the total bid submitted. Any excess amount that may have been included in the "good faith token" will be returned to the bidder. The next best proposal will then be considered the successful bid and, at the discretion of the CITY, be awarded the contract.

IB-10. NONDISCRIMINATION IN EMPLOYMENT

- A. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, gender, religion, sex (including pregnancy), national origin, physical or mental disability, age, marital or familial status, sexual orientation, and gender expression or identity. The Contractor will take action, if necessary, to ensure that applicants and employees are treated equally without regard to their race, color, gender, religion, sex (including pregnancy), national origin, physical or mental disability, age, marital or familial status, sexual orientation, and gender expression or identity. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and other applicants for employment, notices setting forth the provisions of this non-discrimination Section.
- B. The Contractor shall comply with City Ordinance No. 2013-06 Gender Anti-Discrimination in Housing, Employment & Public Accommodations.

IB-11. WAGE RATES

Contractors are not required to pay prevailing wages on this Project. Prevailing wages no longer are required on Public Works projects in Idaho.

IB-12. CONTRACTOR FOR PUBLIC WORKS TO PAY OR SECURE TAXES AGREEMENT

The Contractor, in consideration of securing the business of erecting or constructing public works in the State of Idaho, recognizes that the business in which it is engaged in is of a transitory character, and that in the pursuit thereof, its property used therein may be purchased outside the State of Idaho when taxes, excises, or license fees to which it is liable become payable, agrees:

1. To pay promptly when due all taxes, (other than real property), excises and license fees due to the State of Idaho, its subdivisions, any governmental entity, and municipal quasi-municipal corporations therein, accrued or accruing during the term of this contract, whether or not the same shall be payable at the end of such term;
2. That if the said taxes, excises, and license fees are not payable at the end of said term, but liability, for the payment thereof exists, even though the same constitute liens upon its property, to secure the same to the satisfaction of the respective officers charged with the collection thereof; and
3. That, in the event of its default in the payment or securing of such taxes, excises, and license fees, Contractor agrees that CITY may withhold from any payment due to Contractor hereunder the estimated amount of such accrued and accruing taxes, excises, and license fees for the benefit of all taxing units to which said contractor is liable.

IB-13. PERFORMANCE PERIOD

The work to be performed shall be substantially complete on or before December 31, 2024, unless adjustment of the Agreement time is made in accordance with the provisions of the Contract Documents.

IB-14. CONSIDERATION OF MULTIPLE DIVISIONS OF WORK

The bidder shall submit a proposal for all divisions, if applicable. Considerations of proposals for each division of work shall be made separately (i.e. one bidder may be awarded one division; another bidder may be awarded one of the other divisions).

IB-15. ALTERNATES

If an alternative bid schedule is included, the bidder must submit a bid for each item in the alternate bid schedule. Low bid will be based upon the combined total price of the alternate(s) that the CITY elects to use plus the base bid. If the CITY elects to use an alternate(s), the amount of the contract will be the amount of the base bid modified in accordance with the amount of the alternate(s). An alternate may be additive to the scope of work described by the base bid items or

may be substituted for the base bid item. Unit prices for alternate items will receive the same consideration for award as unit prices for base bid items.

IB-16. SUBCONTRACTORS TO BE LISTED ON BID

- A. All bidders shall comply with Idaho Code Section 67-2310. **Failure to comply with Idaho Code Section 67-2310 shall render such bid unresponsive and void.** Information provided pursuant to this section must be current and correct as of the date of the submission of the bid. Do not use the term "mechanical" when identifying any work to be performed on this project.
- B. The name, address, Idaho Public Works License Number and bid amount for each subcontractor to be utilized on the project must appear on the bid. Every subcontractor intending to perform plumbing work, and/or heating and air conditioning work, and/or electrical work must include its name, address, and Idaho Public Works License Number which allows it to perform such work, and bid amount for each of the following areas: plumbing work, heating and air conditioning work, electrical work. If a subcontractor intends to perform work in more than one of these specialties, such a subcontractor must list its name, address, Idaho Public Works License Number, and bid amount more than once (i.e., for each of the following subject areas: plumbing work, heating and air conditioning work, electrical work). It is helpful, but not mandatory, that each subcontractor includes its specialty construction category numbers, if any, with its submission of its Idaho Public Works License Number.
- C. Every contractor intending to perform its own plumbing work, and/or heating and air conditioning work, and/or electrical work, must include its name, address, and Idaho Public Works License Number which allow it to perform such work for each of the following areas: plumbing work, heating and air conditioning work, electrical work. A contractor does not need to list the amount of the bid for plumbing work, heating and air conditioning work, or electrical work which it intends to perform.
- D. Subcontractors- Equipment and Material: The successful bidder, in addition to listing the names and addresses of subcontractors in its bid, shall, within seven (7) days after opening of the bids, notify the Engineer in writing of the names of all major equipment and material suppliers proposed for the principal parts of the work, and for such others as the Engineer may direct, and shall not employ any subcontractors, (or purchase any equipment), to which the Engineer or CITY may within a reasonable time object to as incompetent or undesirable.

GENERAL CONDITIONS

GC-1. COMPLIANCE

- A. The Contractor shall observe and comply with all Federal, State, and Local laws, codes, ordinances, and regulations, including all licensing and permit requirements which, in any manner, apply to the work being performed under this contract. No pleas of misunderstanding or ignorance on the part of the Contractor will in any way serve to modify the provisions of this requirement. The Contractor and its surety shall indemnify and hold harmless CITY and its employees, agents and representatives against any claim or liability arising from or based on the violation of any such laws, codes, ordinances, or regulations, whether by itself, its employees, or its subcontractors.
- B. All work shall be completed in accordance with the specifications and plans established for this Project.

GC-2. DEFINITIONS

Architect	The Project Architect, if such is designated by the Contract Documents.
Assistant Parks and Recreation Director	The City Parks & Facilities Manager of Moscow, Idaho, and/or engineers and inspectors acting under their orders; their authority being limited to the particular duties to which they are assigned
Attorney	The City Attorney of Moscow, Idaho.
City	The City of Moscow, located in Latah County, Idaho ("CITY"), a municipal corporation existing under and by virtue of the laws of the State of Idaho. Action herein designated as taken by the CITY is to be considered the acts of the Council acting through the Mayor and Clerk.
City Engineer	The City Engineer of Moscow, Idaho, resident engineers and inspectors acting under their orders; their authority being limited to the particular duties to which they are assigned.
Clerk	The duly appointed City Clerk of the City of Moscow, Idaho or designee.
Contract Documents	These generally consist of the plans, specifications, agreement, performance bond, payment bond and proof of various types of insurance, including all modifications thereof incorporated in the documents before their execution. These are identified in the Contract.
Contractor	The person, persons, firm, partnership, corporation or other entity contracting to do the work under these specifications. The term also includes the Contractor's agents or employees.

Council	The duly elected City Council of the City of Moscow, Idaho.
Engineer	The City Engineer or the designated Project Engineer, if such is designated by the Contract Documents.
Subcontractor	The person, persons, firm, corporation or other entity performing work under contract with the "Contractor" but subject, in such performance, to all the requirements of the 'Contract Documents' insofar as they are pertinent.
Bid/Proposal	The written document which is required to be signed by the bidder and which contains the formal statement of price or prices to be paid by the CITY for the performance required.

GC-3. PLANS AND SPECIFICATIONS AND ADDITIONAL DRAWINGS

- A. The plans for this improvement and the specifications accompanying them shall be considered as a whole, and anything shown or called for in one (1) and omitted in the other is as binding as if called for or shown by both. Figure dimensions shall be in all cases used in preference to scale dimensions. The intention of the documents is to include all labor and materials, equipment and transportation necessary for the proper execution of the work. Materials or work described in words so applied having a well-known technical or trade meaning shall be held to refer to such recognized standards.
- B. The Engineer shall furnish to the Contractor the necessary plans and specifications required for the execution of the work at no additional cost. The Engineer shall furnish with reasonable promptness, additional instructions, by means of drawings or otherwise, necessary for the proper execution of the work.
- C. The Contractor shall submit with such promptness as to cause no delay in its own work or in that of any other Contractor, copies of all shop drawings and schedules required for the work of various trades as required by the Engineer, and the Engineer shall pass upon them with reasonable promptness, making desired corrections relating to effects on design. The Contractor shall make any corrections required by the Engineer, file with Engineer such corrected copies as the Engineer shall direct, and furnish such other copies as may be needed. The Engineer's approval of such drawings or schedules shall not relieve the Contractor from responsibility for deviation from drawings or specifications, unless Contractor has in writing called the Engineer's attention to such deviation at the time of submission, nor shall it relieve Contractor from responsibility for errors of any sort in shop drawings or schedules.
- D. The Contractor shall keep one (1) copy of all drawings and specifications on the work, in good order, available to the Engineer, CITY, and its representatives.

GC-4. ALTERATION OR MODIFICATION OF CONTRACT DOCUMENTS

No alteration or modification of the terms and conditions of the Contract Documents, except by written change order as provided herein, will be binding unless outlined in detail in a separate written addendum, and then only when properly signed and attested by the Contractor, CITY, and when applicable, the Engineer.

GC-5. INVESTIGATION BY BIDDERS

The instructions to bidders cover the general scope of this investigation under the article entitled "Examination of the Plans, Specifications and Site". Bidders are specifically instructed to faithfully examine and investigate the entire bid prices submitted on their proposals. No bidder may, without the consent of CITY, withdraw its proposal or claim damages or extra compensation by reason of any error or omission made by said bidder in preparing its proposal.

GC-6. NON-DISCRIMINATION

- A. The Contractor will not discriminate against an employee, either intentionally or through disparate impact, on account of race, color, gender, religion, sex (including pregnancy), national origin, physical or mental disability, age, marital or familial status, sexual orientation, and gender expression or identity.
- B. The Contractor shall comply with City Ordinance No. 2013-06 Gender Anti-Discrimination in Housing, Employment & Public Accommodations.

GC-7. INTERPRETATION OF THE SPECIFICATIONS

- A. In the event the specifications and plans are deficient or not clearly expressed, the parties submitted proposals hereunder must apply to the Engineer for the required information or explanation before the bids are submitted.
- B. The request for such explanation or interpretation shall be made in writing and the person submitting the request will be responsible for its prompt delivery. Such interpretation or explanation will be given by the Engineer in writing and a copy will be filed in the office of the City Clerk. CITY will not be responsible for any other explanation or interpretation of the plans and specifications as an Addenda. After submission of bids, no bidder shall claim any misunderstanding in or to the nature of the amount of work to be performed or attempt to hold CITY or any person responsible for any error or omission that may have been made by the bidder.

GC-8. CONTRACTS

- A. Contract Form:

A copy of the construction agreement form is included in these documents.

- B. Execution of Agreement:

Within ten (10) days after receiving properly prepared Contract Documents from CITY, the successful bidder shall sign the Agreement. Work shall be started upon written notice to proceed from the Engineer.

C. Subcontracts:

1. The Contractor agrees that it is as fully responsible to CITY for the acts and omissions of its subcontractors and of persons either directly or indirectly employed by them, as it is for the acts and omissions of persons directly employed by it, and that the Contractor shall hold CITY harmless for any activities of such subcontractors and shall indemnify and defend CITY from damages and claims of whatever nature relating to or resulting from the activities of such subcontractors.
2. Relations of Contractor and Subcontractor: The Contractor agrees to bind every subcontractor to the terms of the construction agreement, the information to bidders, the general conditions, the plans, and the specifications as far as applicable to its work, including the following provisions of this section. Nothing in this section shall create any obligation on the part of CITY to pay to or to see to the payment of any sums to any subcontractor.
 - a. The Contractor shall bind every subcontractor to the following terms:
 - (1) To be bound to the Contractor by the terms of the Contract Documents, and to assume toward every subcontractor all the obligations and responsibilities that it, by those documents, assumes toward the CITY. Nothing contained in the Contract Documents shall create any contractual relation between any subcontractor and CITY.
 - (2) To submit to the Contractor applications for payment in such reasonable time as to enable the Contractor to apply for payment. The Engineer shall, on request, furnish to any subcontractor, wherever practical, evidence of the amounts certified on its account.
 - (3) To make all claims for extras, for extension of time and for damages for delays or otherwise, to the Contractor in the manner provided in the general conditions for like claims by the Contractor upon the CITY, except that the time for making claims for extra cost is one (1) week from the date such claim arises.
 - b. The Contractor agrees:
 - (1) To be bound to the subcontractor by all the obligations that CITY assumes to the Contractor under the Contract Documents.
 - (2) To pay the subcontractor for conforming work, upon the payment of certificates, if issued under the terms of payments for the work, the amount allowed to the Contractor on account of the subcontractor's work to the extent of the subcontractor's interest therein.
 - (3) To pay the subcontractor for conforming work, upon the payment of certificates, if issued otherwise than as in (2) so that at all times its total payments shall be as large in proportion to the value of the work done

by the subcontractor as the total amount certified to the Contractor is to the value of the work done by it.

- (4) To pay the subcontractor for conforming work to such extent as may be provided by the Contract Documents or the subcontract if either of these provides for earlier or larger payments than the above.
- (5) To pay the subcontractor for conforming work on demand on its work or materials as far as executed and fixed in place, less retained percentage, at the time the certificate should be issued, even though the Engineer fails to issue it for any cause not the fault of the subcontractor.
- (6) To make no demands for liquidated damages or penalty for delay in any sum in excess of such amount as may be specifically named in the subcontract.
- (7) That no claim for services rendered or material furnished by the Contractor to the subcontractor shall be valid unless written notice thereof is given by the Contractor to the subcontractor during the first ten (10) days of the calendar month following that in which the claim originated.
- (8) To give the subcontractor an opportunity to be present and to submit evidence in any hearing involving its rights.
- (9) To pay each subcontractor for satisfactory performance of its contract no later than twenty (20) calendar days from receipt of each payment the Contractor receives from CITY. The Contractor shall return retainage to each Subcontractor within twenty (20) calendar days after the Subcontractor's work is satisfactorily completed.
- (10) To certify with each estimate payment to subcontractors has been made within the prescribed time frames. The certification will be made on forms provided by CITY, and returned within twenty (20) calendar days of receiving the estimate payment.

D. CITY's Right to Terminate Agreement - If the Contractor:

1. Fails to begin work within a reasonable time after the effective date of "Notice to Proceed," or
2. Fails to supply sufficient skilled workers or suitable materials or equipment to complete the work within the time limits specified; or
3. Performs the work unsuitably or neglects or refuses to remove materials or to re-perform such work which is not in accordance with the plans and specifications; or
4. Discontinues the prosecution of the work for more than ten (10) days; or

5. Fails to resume work which has been discontinued within a reasonable time after notice to do so; or
6. Fails to make prompt payments to subcontractors or for labor, materials, or equipment; or
7. Disregards laws, ordinances, or the instruction of the Engineer; or
8. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency; or
9. Makes an assignment for the benefit of creditors; or
10. Is guilty of a substantial violation of any provisions of the Agreement; in any such event(s), CITY, upon recommendation of the Engineer that sufficient cause exists to justify such action may, without prejudice to any other right or remedy, give notice to the Contractor and its surety of such delay, neglect, or default. If the Contractor or its surety, within a period of ten (10) days after such notice, does not proceed in accordance therewith, then CITY shall have full power and authority, without violating the Agreement, to take the prosecution of the work from the Contractor. CITY may appropriate or use any or all materials and equipment on the grounds as may be suitable and acceptable and may enter into an Agreement for the completion of said contract according to the terms and provisions thereof, or use such other methods as may be required for the completion of the contract in an acceptable manner.
11. Costs and charges incurred by CITY, together with the cost of completing the work under the Agreement, will be deducted from any moneys due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the Agreement, then the Contractor and its surety shall be liable and shall pay to CITY the amount of such excess.

E. Contractor's Right to Stop Work or Terminate Agreement:

If the work should be stopped pursuant to lawful order of a court of competent jurisdiction, or pursuant to lawful order of other public authority having jurisdiction, for a period of three (3) months, through no act or fault of the Contractor or of anyone employed by it, or if the CITY should fail to issue any certificate for payment within twenty-two (22) days after it is due, or if CITY should fail to pay to the Contractor within twenty-two (22) days of its maturity and presentation, any sum certified by the Engineer or awarded by the court, then the Contractor may, upon twenty-two (22) days' notice to CITY and Engineer, stop work or terminate this Agreement or recover from CITY payment for all work executed and any loss sustained upon any plant or materials and reasonable profit and damages.

F. Assignment:

The Contractor shall not assign this contract or sublet or subcontract any portion of it without the prior written consent of CITY nor shall the Contractor assign any moneys due

or to become due to it hereunder, without the prior written consent of CITY. Any such assignment or sublet without such prior written consent shall be null and void and shall be a ground for termination for cause of this contract by CITY.

GC-9. QUANTITIES FURNISHED BIDDERS

A. Unit Price Contract. The estimates of quantities are only approximate and are for the purpose of comparing bids. CITY reserves the right to increase or decrease individual items in such amount as may be in CITY'S sole judgment, to CITY'S best interests depending upon conditions encountered or observed during the Project. It shall be Contractor's responsibility to satisfy itself as to the accuracy of the estimates. Contractor will be paid for the actual quantities of work finally installed or performed at the applicable unit prices stated in its proposal.

1. The unit price of an item of Unit Price Contract shall be subject to reevaluation and adjustment under the following conditions:
 - i. If the total cost of a particular item of Unit Price Contract amounts to fifteen percent (15%) or more of the total Contract Price at the time of award and the variation in the quantity of that particular item of Unit Price Contract performed by Contractor differs by more than twenty-five percent (25%) from the estimated quantity of such item indicated in the Bid Form; and
 - ii. If there is no corresponding adjustment with respect to any other item of Work; and
 - iii. If Contractor thinks that Contractor has incurred additional expense as a result thereof; or if the CITY thinks that the quantity variation entitles the CITY to an adjustment in the unit price, either the CITY or Contractor may demand a Change in Contract Price. Such Change in Contract Price shall be based upon any increase or decrease in costs due solely to the variation above one hundred twenty-five percent (125%) or below seventy-five percent (75%) of the estimated quantity. If the quantity variation is such as to cause an increase in Contract Time necessary for completion, Contractor may request an extension of Contract Time for the Delay in completion resulting from performing the quantity in excess of one hundred twenty-five percent (125%) of the estimated quantity. If the Parties are unable to agree on the effect of any such variation in the quantity of unit price work, either the CITY or Contractor may make a claim for an adjustment in the Contract Price and/or Contract Time in accordance with the General Conditions.

Items identified as contingency items will be paid at the unit price regardless of variation in quantity of that particular item of Unit Price Work performed by Contractor.

- B. Lump Sum Contract. The Contractor shall include in the contract sum all allowances named in the Contract Documents and shall cause the work so covered to be performed for such sums as the Engineer may direct, the contract sum being adjusted in conformity therewith. The Contractor declares that the contract sum includes such sums for expenses and profit on account of cash allowances as Contractor deems proper. No demand for expenses or profits other than those included in the contract sum shall be allowed.

GC-10. MAJOR CHANGES

- A. If unforeseen conditions require a substantial change in the dimensions of a structure, location of underground utilities, or major variation of a similar nature from the original plans, such change shall be covered by a change order. The change order is to set forth in complete detail the nature of the change and reasons therefore, including compensation to be paid and time allotted the Contractor. The change order shall also detail whether the change constitutes an addition or reduction with respect to the original contract costs. Should additional or supplemental drawings be required, they will be furnished by the Engineer providing the Engineer determines the change is warranted.
- B. During the progress of the work, if subsurface or latent physical conditions are encountered at the site differing materially from those indicated in the contract or if unknown physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract, are encountered at the site, the Party discovering such conditions shall promptly notify the other Party in writing of the specific differing conditions before they are disturbed and before the affected work is performed.
- C. Upon written notification, the Engineer will investigate the conditions, and if it is determined that the conditions differing materially and cause an increase or decrease in the cost or time required for the performance of any work under the contract, and adjustment, excluding loss of anticipated profits, will be made and the contract modified in writing accordingly. The Engineer will notify the Contractor of the determination whether or not an adjustment of the contract is warranted.
- D. No contract adjustment which results in a benefit to the Contractor will be allowed unless the Contractor has provided the required written notice.

GC-11. EXTRA WORK

- A. CITY shall have the right to issue written change orders to Contractor within the general scope of the work without the consent of the Contractor and without notice to any surety of the Contractor. If for any reason extra work is ordered by CITY and the compensation for such extra work cannot be agreed upon in advance, such work will be paid for at the actual cost of the labor, materials, and field supervision required, with the addition of not to exceed a total of fifteen percent (15%) to cover general overhead and profit (including subcontractor's general overhead and profit), use of small tools, payment of insurance and medical aid, taxes, and all other costs in connection therewith. If a fixed sum or unit prices can be agreed upon for any extra work that may be ordered, such sum and prices, together with a description of the work, shall be made a part of the written order. Such orders will be prepared by the Engineer and Engineer will provide a copy to CITY and Contractor.

- B. If during the progress of the work, the Contractor believes it is entitled to extra compensation for performing certain phases or items, any and all such claims must be promptly presented to CITY and the Engineer. Unless such claim is presented in writing within fifteen (15) days after it occurs, CITY may, at its discretion, reject the claim. CITY shall specifically reject claims of this nature that have been withheld by the Contractor for more than thirty (30) days.

GC-12. MONTHLY PAYMENTS

- A. The Contractor shall file a monthly request for payment with the Engineer on the 20th day of each month for all work completed to the 20th day of the month. If monthly requests for payment are not received as stated, the CITY shall have the right to withhold payment for that month. The Engineer shall review Contractor's monthly requests for payment on the first day of the month for all work completed to the 20th day of the preceding month, and shall certify such requests for payment. Progress payments will be made by the CITY for all work completed to the 20th day of the preceding month and duly certified by the Engineer, on or before the 10th day of each month in cash or interim warrants. These payments will be equal to ninety-five percent (95%) of the total amounts of the certified requests for payment. The CITY shall retain five (5) percent of the total amount owing the Contractor after the contract has been completed and accepted by the CITY for a minimum period of thirty (30) days. Should any liens or claims be filed during the retention period, the retained percentage will be held until a satisfactory agreement is reached between the CITY, the Contractor, and the Contractor's surety. Before final payment will be made by the CITY, Contractor agrees that it shall furnish the CITY with satisfactory evidence that all persons, including subcontractors, that have performed work or furnished materials pursuant to this Agreement and are entitled to a lien for their work or materials under the laws of the State of Idaho have been fully paid or are no longer entitled to such lien. Final payment will not be made until CITY has received a tax release from the Idaho State Tax Commission per GC-38.
- B. Progress payments for materials shall be considered eligible only if the materials are required for the jobsite with accurate, clearly detailed invoices from the material supplier. The ownership of these materials shall, upon payment from CITY to the Contractor, be vested in the City, and such materials may not be removed from the jobsite without written authorization of the Engineer.
- C. CITY may, but is not obligated to, withhold any payments to the Contractor, in addition to retained percentage, in such an amount or amounts as may be necessary to cover:
1. Payments that may be earned or due for just claims or labor or materials furnished in and about the work;
 2. Defective, condemned, or non-conforming work or materials not remedied;
 3. Failure of the Contractor to make proper payments to a subcontractor;
 4. Reasonable doubt that this contract can be completed for the balance then unpaid;
 5. Damages to another Contractor where there is evidence thereof;
 6. Payments that cover all taxes, excises and license fees due the State and its taxing entities whether or not these moneys are yet due and payable.

- D. CITY shall have the right, but not the obligation, to disperse and shall have the right to act as agent for the Contractor for the limited purpose of dispersing such funds as have been withheld pursuant to this paragraph to the party or parties who are entitled to payment there from. In the event CITY elects to disperse such funds, CITY shall render to the Contractor a proper accounting of all such funds dispersed on behalf of the Contractor. Nothing herein shall create in such party or parties entitled to payment a cause of action against CITY for failure to exercise its rights pursuant to this section. Contractor further agrees that no cause of action shall accrue on behalf of the Contractor as a result of CITY's exercise of such right to disperse.

GC-13. TIME OF COMPLETION/LIQUIDATED DAMAGES

- A. The date of completion for this Agreement shall be defined by the Instruction to Bidders included in the Contract Documents. Contractor agrees that time is of the essence in the performance of this Agreement, and that failure to complete this Agreement by such date will result in financial injury to CITY. Contractor further agrees that failure to complete this Agreement by such date shall subject Contractor to payment of liquidated damages to CITY. The Contractor also recognizes the delays, expense and difficulties involved in proving in a legal proceeding of the actual loss suffered by CITY occasioned by failure to complete the work on time. Accordingly, instead of requiring such proof, CITY and the Contractor agree that as liquidated damages for delay (but not as a penalty) the Contractor shall pay to CITY the sum of one-half of one percent (0.5%) of the Agreement amount, including change orders, will be deducted by CITY for each and every calendar day that the date of final completion is delayed. Should such deductions exceed the outstanding amount of the Agreement, the Contractor and its surety shall be liable for the excess.
- B. The Contractor herewith specifically waives claims for damages for any hindrance or delay. Contractor shall be granted extensions of time for which liquidated damages will not be claimed by CITY for the following reasons:
1. A delay caused the Contractor by any suit or other legal action against CITY (except a legal action instituted by the Contractor) regarding this Project shall entitle the Contractor to an equivalent extension of time unless the period of such delay exceeds ninety (90) days. When such period is exceeded, CITY will, upon request by the Contractor in writing, either negotiate a termination of the Agreement or grant a further extension of time, whichever shall be agreed.
 2. Time lost by inclement weather, causing suspension of work, will entitle the Contractor to an extension equivalent to the total time so lost, whether it be a single continuous period or the accumulated total of several periods. Inclement weather is defined as that which, in the opinion of the Engineer, would seriously affect the progress of the work or the quality of the work.
 3. Should unforeseen conditions require the performance under a change order, or work more complex or difficult than that originally specified and shown on the plans, and such work, in the Contractor's opinion, requires more time to execute than the proportional increase in dollar value, the Contractor shall state to CITY and Engineer, in writing prior to the performance of such work, its estimate of the added time

required for such work. CITY may, if such estimate be reasonable, allow an added extension proportionate to the increase in the dollar value of the work.

- C. If the performance of all or any portion of the work is suspended or delayed by the Engineer for an unreasonable period of time (not originally anticipated, customary, or inherent to the construction industry) and the Contractor believes that additional compensation and/or contract time is due as a result of such suspension or delay, the Contractor shall submit to the Engineer in writing a request for adjustment within seven (7) calendar days of receipt of the notice to resume work. The request shall set forth the reasons and support for such adjustment.
- D. Upon receipt of the Contractor's request for adjustment, the Engineer will evaluate the Contractor's request. If the Engineer agrees that the cost and/or time required for the performance of the Agreement has increased as a result of such suspension and the suspension was caused by condition beyond the control of and not the fault of the Contractor, its suppliers, or subcontractors at any approved tier, and not caused by weather, the Engineer will make adjustment as provided (excluding profit) and modify the Agreement in writing accordingly through a change order. The Engineer will notify the Contractor of the determination whether or not an adjustment of the Agreement is warranted.
- E. No Agreement adjustment will be allowed unless the Contractor has submitted the request for adjustment within the time prescribed.
- F. No Agreement adjustment will be allowed under this clause to the extent that performance would have been suspended or delayed by any other cause, or for which an adjustment is provided for or excluded under any other term of condition of this Agreement.

GC-14. ABANDONMENT OF WORK

If the Contractor abandons the work for a period of twenty (21) days for any cause other than failure of CITY to make monthly payments, or refuses to comply with the provisions of the plans and specifications, CITY shall have the right to notify the Contractor's surety and require said surety to complete the work in accordance with the aforesaid plans and specifications. In the event no liens or claims have been filed and CITY fails to make progress payments, the Contractor may then, at its option, cease operations until payments are resumed by notifying CITY of its intention to cease operations for this cause. Should the Contractor abandon the work, fail or refuse to complete the work set out in this contract, or fail to pay just claims for labor and materials, CITY reserves the right to charge against the Contractor, and Contractor agrees to pay, all legal, engineering, or other costs caused by such abandonment, failure or refusal. The Contractor agrees that such legal costs shall also include CITY's costs of defending any suits in connection with such abandonment, failure or refusal and nonpayment of claims wherein CITY is made a co-defendant.

GC-15. AUTHORITY OF ENGINEER

- A. The Engineer shall decide questions which may arise as to the quality and acceptability of materials furnished and work performed, and as to the manner of performance and rate of progress of the work; questions which may arise as to the interpretation of the plans and specifications; and questions as to the satisfactory and acceptable fulfillment of the terms of the Agreement.
- B. The Engineer, including its employees and agents, shall at all times have access to the work wherever it is in preparation or progress and the Contractor shall provide proper facilities

for such access and for inspection. Inspections by the Engineer shall be promptly made. If any work should be covered up without approval or consent of the Engineer, it shall be uncovered, if required by the Engineer, for examination. The costs associated with the uncovering of such non-approved work shall be the responsibility of Contractor and shall not be charged to CITY.

- C. Reexamination of questioned work may be ordered by the Engineer and if so ordered the work must be uncovered by the Contractor. If such work be found in accordance with the plans and specifications, CITY shall pay the cost of the reexamination and replacement. If such work is found not in accordance with the plans and specifications, the Contractor shall pay such costs.
- D. If the performance of all or any portion of the work is suspended or delayed by the Engineer for an unreasonable period of time (not originally anticipated, customary, or inherent to the construction industry) and the Contractor believes that additional compensation and/or Agreement time is due as a result of such suspension or delay, the Contractor shall submit to the Engineer in writing a request for adjustment within seven (7) calendar days of receipt of the notice to resume work. The request shall set forth the reasons and support for such adjustment.
- E. Upon receipt of the written request for adjustment, the Engineer will evaluate the Contractor's request. If the Engineer agrees that the cost and/or time required for the performance of the Agreement has increased as a result of such suspension and the suspension was caused by conditions beyond the control of and not the fault of the Contractor, its suppliers, or sub-contractors at any approved tier, and not caused by weather, the Engineer will make an adjustment and modify the Agreement in writing accordingly, through a change order. The Engineer will notify the Contractor of the determination whether or not an adjustment of the Agreement is warranted.
- F. In making the Agreement adjustment, a markup for profit will only be allowed on changed or extra work caused by the delay or suspension. No profit will be allowed on any other delay or suspension costs including, but not limited to, standby costs or extended indirect costs. Payment for changed and extra work will be made in accordance with section GC-11.
- G. No contract adjustment will be allowed unless the Contractor has submitted the request for adjustment within the prescribed time.

GC-16. PERFORMANCE AND PAYMENT BONDS

- A. The Contractor shall execute a separate performance bond and payment bond, each in penal amounts at least equal to one hundred percent (100%) of the full Agreement price, such bonds to be executed by a corporate bonding company (surety) licensed to do business in the State of Idaho and which is acceptable to CITY. Such corporate bonding company (surety) shall be required to be named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570. The premiums of such bonds shall be paid by Contractor. The performance bond shall be conditioned upon the Contractor's faithful performance of all the covenants and agreements on the part of the Contractor to be kept and performed at the times and in the manner set forth in the Agreement, including the repair or replacement where required, or the cost of repair or replacement, of all work performed under the terms of this Agreement. The payment bond shall be conditioned upon the payment to all persons, including subcontractors, who have, and fulfill, contracts for performing labor and furnishing

materials in the prosecution of the work provided for in such Agreement, provided that every such payment bond shall be construed, regardless of its language, as incorporating within its provisions the obligation to pay those persons who furnish labor or materials as stated in the Contract Documents.

- B. Such bonds shall remain in full force and effect during the term of this Agreement and during the terms of any warranty required by the specifications and shall be held in the custody of CITY. The current power of attorney for the persons who sign for the surety company shall be attached to the bond. The power of attorney shall be sealed and certified with a "first hand signature" by an officer of the surety. A facsimile signature shall not be acceptable to CITY.
- C. If, at any time, a surety on any such bond is declared as bankrupt or loses its right to do business in the State of Idaho or is removed from the list of surety companies accepted on Federal bonds, the Contractor shall, within ten (10) days after notice from CITY to do so, substitute an acceptable bond (or bonds) in such form and sum signed by such other surety or sureties as may be satisfactory to CITY. The expense of such replacement bonds shall be borne by the Contractor. No further payments by CITY pursuant to this Agreement shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable bond to CITY.

GC-17. INSURANCE/CITY TO BE NAMED AS ADDITIONAL INSURED

- A. The Contractor shall not commence work until it has obtained all insurance required under this section or until it has satisfied CITY in this respect; nor shall it allow any subcontractor to commence work until such subcontractor has also obtained such required insurance applicable to such subcontractor's work. The Contractor shall maintain such required insurance coverage throughout the term of this Agreement. The Contractor will hold CITY harmless and shall indemnify CITY for any losses arising out of the Contractor's operations, including any contingent liability arising there from. The cost of such insurance shall be borne by the Contractor. The Contractor shall furnish copies of all insurance policies and/or certificates of insurance to CITY at the time of execution of this Agreement. Each policy shall include a provision to the effect that it shall not be subject to cancellation, or reduction in the amounts of its liabilities, or any other material change, until notice has been given in writing to CITY and the Engineer not less than fifteen (15) days prior to such action. Contractor shall further cause CITY to be named as an additional insured on all applicable insurance policies.
- B. The Contractor shall take out and maintain during the term of this Agreement, statutory worker's compensation insurance, in the statutory limits for as required by law of Contractor, for all employees who will work on this Project, and if any work is subcontracted, the Contractor shall require the subcontractor similarly to provide such insurance for all of the latter's employees unless they are included under the protection afforded by the Contractor.
- C. The Contractor shall take out and maintain during the term of this Agreement comprehensive public and general liability insurance and automobile liability insurance. The comprehensive public and general liability insurance shall have, at a minimum, a coverage limit of at least ONE MILLION DOLLARS (\$1,000,000.00) per occurrence, and

TWO MILLION DOLLARS (\$2,000,000.00) aggregate. The automobile liability insurance shall have, at a minimum, a coverage of ONE MILLION DOLLARS (\$1,000,000) combined single limit. Policies containing deductible clauses will not be acceptable.

- D. The Contractor shall take out and maintain, during the term of this Agreement, builders' risk insurance which shall be written in completed value form, shall protect the Contractor and CITY against 'all-risks' of direct physical loss to buildings, structures, equipment and materials to be used in providing, performing or completing the Project. This insurance shall be written with limits not less than the insurable value of the Project at completion. This insurance shall include coverage while equipment or materials are in warehouses, during installation, during testing, and after the Project is completed, but prior to final payment.
- E. Contractor's Responsibility for Materials. The Contractor shall be responsible for all materials and work performed until final acceptance by CITY.
- F. Contractor shall require all subcontractors to maintain the above referenced insurance requirements and shall verify that such requirements have been met by requiring all subcontractors to provide certification therefore.

GC-18. PATENT ROYALTIES AND PROCESS FEES

The Contractor shall furnish CITY a license or licenses for the use of any process or processes in connection with this Project. The Contractor shall include in the unit price bid any patent royalties or license fees for equipment installed or construction methods used.

GC-19. CONTRACTOR RESPONSIBLE FOR WORK

- A. The Contractor shall be responsible for all work until its acceptance by CITY.
- B. The Contractor shall be responsible for all quality control including but not limited to correction and removal of defective work and the following tests and inspections:
 - 1. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
 - 2. Contractor shall employ an independent testing laboratory or testing agency and shall be responsible for arranging and shall pay for all specified tests, inspections, and approvals (including tests, inspections, and approvals to be paid for on a cash allowance basis) required for CITY's and Engineer's acceptance of the Work at the site except: costs incurred in connection with tests or inspections as otherwise specifically provided in the Contract Documents.
 - 3. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in

connection therewith, and furnish Engineer the required certificates of inspection or approval.

4. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to City and Engineer.
5. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation.
6. Uncovering Work as provided in paragraph 5. above shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

GC-20. USE OF COMPLETED PORTION

CITY reserves the right to use and occupy any portion of the improvement which has been completed sufficiently to permit use and/or occupancy, and such use and/or occupancy shall not be construed as an acceptance of the work as a whole or any part thereof. Any claims which CITY may have against the Contractor shall not be deemed to have been waived by such use and/or occupancy.

GC-21. SIGNATURES

A bid made by a corporation shall be signed and sealed by the legally authorized officers of said corporation. If awarded the Agreement, the Agreement shall also be executed by proper authorized officers and be affixed with the corporate seal. If a proposal or Agreement is signed by an agent, such agent shall furnish satisfactory written evidence of the agent's authority to sign as the legal representative of the bidder. An authorized partner of a co-partnership may sign the Agreement subject to the approval of the Attorney, who may, at the Attorney's discretion, require each and every member of the co-partnership to sign the Agreement.

GC-22. ORDERS TO BEGIN WORK

The successful bidder shall not begin work until after the Agreement has been executed and the surety bond and insurance has been approved by the Attorney. The order for the Contractor to begin work shall be issued by the Engineer by a written "Notice to Proceed".

GC-23. ORDER OF WORK

- A. The Agreement period and time of completion will be as set forth in the Instruction to Bidders included in the Contract Documents.
- B. GC-13 "Time of Completion/Liquidated Damages" of the General Conditions shall apply to interim as well as final completion dates.
- C. The specific details of the order of work will be established by the Engineer before construction begins. Before the successful bidder is authorized to begin work, it shall

attend a pre-construction conference with the Engineer. At this time the successful bidder shall present a written schedule for the entire Project, specifying the beginning and completion dates for each phase of work. Once approved by the Engineer, this schedule shall be adhered to by the Contractor and it shall employ the necessary work force and equipment to maintain such schedule. Contractor further agrees that the approval by the Engineer of such schedule shall not create any liability to the Engineer or CITY for Contractor's means, methods, sequences, techniques or site safety.

GC-24. EFFICIENCY OF OPERATION/LICENSING

The work set forth for this Project shall be started at the earliest possible date after issuance of the Notice to Proceed, and shall be prosecuted regularly and without interruption thereafter, unless otherwise directed by the Engineer. The Contractor shall furnish work force and equipment sufficient to accomplish full completion of the work within the time specified in the proposal and Agreement. The Contractor shall at all times employ efficient and experienced workers. The Contractor shall also require and verify that all workers and subcontractors are licensed in accordance with all applicable laws and/or regulations and as required by this Agreement.

GC-25. PROTECTION OF WORK AND PROPERTY

- A. The Contractor shall exercise particular care in protecting surrounding buildings, structures, trees, and property from injury during the demolition and construction operation, and shall be responsible for their protection and shall repair or compensate the CITY thereof for any damage which may result from such demolition and construction operations. The expense of such compensation or repair shall be borne by Contractor, and shall not be the responsibility of CITY.
- B. The Contractor shall exercise particular care in protecting trees, located on private or public property, from injury during the demolition and construction operations. If the Contractor's duties under this Agreement shall cause any damage, mutilation, or destruction whatsoever, of any tree, due to Contractor's need to remove, top, excavate, fill, or compact the roots of such tree, or by the placement or storage of any materials which are hazardous to trees, near such tree, the Contractor shall:
 - 1. Inform the Engineer in writing of such need; and
 - 2. Plot the location of such tree on the site plan which is the subject of this Agreement; and
 - 3. Comply with all permit requirements as set forth in the Community Forest Ordinance, pursuant to Moscow City Code Title 5, Chapter 8.
- C. Any utilities damaged by the Contractor shall be repaired by the Contractor and the Contractor shall be responsible to maintain temporary service until such damage is repaired. The expense of such repair and/or temporary service shall be borne by Contractor, and shall not be the responsibility of CITY.
- D. The Contractor shall provide and maintain temporary sidewalks, warning lights, barricades and other preventive means to safeguard pedestrian and vehicular traffic around the construction, as deemed necessary by CITY.

- E. During all construction operations, the Contractor shall construct and maintain such facilities as may be required to provide access by all property owners to their property. No person shall be cut off from access to their residence or place of business unless the Contractor has made a special arrangement with the affected persons.
- F. Construction operations and parking of vehicles shall be confined to areas designated by CITY. Contractor shall consult the proper traffic regulatory authorities regarding the routing of trucks and other vehicles, and shall follow the direction of such authorities.
- G. Any structures, tanks, mechanisms or equipment damaged by the Contractor shall be repaired at the Contractors expense. Any fines or penalties incurred by CITY as a result of any damages to the facilities shall be paid or mitigated by the Contractor.

GC-26. RESPONSIBILITY FOR SAFETY

The Contractor shall be responsible for the safety of its work, equipment, and materials until the finished Project is accepted by CITY.

GC-27. GUARDS AND BARRICADES

The Contractor shall erect and maintain such barricades, detour signs and warning lights as will effectively mark any hazards or detours and the Contractor shall be liable for any damage occasioned by its acts or negligence, or the acts or negligence of its employees, agents or subcontractors, and shall indemnify CITY and the Engineer against loss and/or liability for any such damage, acts or negligence. Traffic signs shall be in accordance with the standards presented in the most current edition of the "Manual on Uniform Traffic Control Devices".

GC-28. EXISTING TRAFFIC SIGNS AND FACILITIES

Existing traffic and street name signs which will interfere with construction shall be removed by the Contractor and stored in a safe place. These signs shall not be removed until the Contractor has obtained the consent of the traffic regulatory authorities having jurisdiction over the traffic signs and until the necessary measures have been taken to safeguard traffic after the signs have been removed. Preservation and maintenance of the signs shall be the sole responsibility of the Contractor. As soon as sign location no longer interferes with work, the Contractor shall reset all such signs at locations indicated by the traffic regulatory authorities having jurisdiction, in cooperation with the Engineer and CITY Streets Department. All costs incurred in work outlined above shall be considered as incidental to the construction contract, and shall be borne by Contractor.

GC-29. MAINTAINING POSTAL SERVICE

- A. Postal service shall be maintained in accordance with instructions of the U.S. Post Office Department. The Contractor shall be responsible for moving mail boxes to temporary locations designated by the Post Office Department, and at completion of the work Contractor shall replace them in locations and in condition satisfactory to the Post Office Department.
- B. It will be the Contractor's responsibility to contact the U.S. Post Office Department for their requirements in maintenance of postal service and to follow those requirements.

- C. In cases where posts upon which the box or boxes are fastened are in such condition that they cannot be reset, the Contractor shall furnish posts for this purpose at its own expense.
- D. All costs incurred in work outlined above shall be considered as incidental to the construction contract, and shall be borne by Contractor.

GC-30. EMERGENCY WORK

The Contractor will not be allowed added compensation for any emergency work performed on Sundays or legal holidays unless such work is ordered in writing by the Engineer.

GC-31. SUPERVISION OF WORK

- A. During the progress of the work, the Contractor shall employ a competent superintendent and any necessary assistants at the job site. The superintendent shall not be changed except with the approval of the Engineer (or upon the order of the Engineer should the superintendent be or become unsatisfactory to the Engineer) unless the superintendent proves to be unsatisfactory to the Contractor and ceases to be in its employ. The superintendent shall represent the Contractor in the Contractor's absence and all directions given to them shall be as binding as if given to the Contractor. Important directions shall be so confirmed on written request in each case.
- B. The Contractor shall give efficient supervision to the work, using its best skill and attention. Contractor shall carefully study and compare all drawings, specifications and other instructions and shall at once report to the Engineer any error, inconsistency or omission which it may discover, but it shall not be held responsible for their existence of discovery.

GC-32. CORRECTION AND COMPLETION OF WORK

- A. Correction of Work before Final Payment:
 - 1. The Contractor shall promptly remove from the premises all materials condemned by the Engineer as failing to conform to the Agreement, whether incorporated in the work or not, and shall re-execute any work condemned by the Engineer as failing to conform to the Agreement, and the Contractor shall promptly replace such non-conforming materials and re-execute such non-conforming work in accordance with the Agreement, such costs of replacement and re-execution to be borne by Contractor at no additional expense to CITY.
 - 2. If the Contractor does not re-execute such non-conforming work and/or remove and replace such non-conforming materials within a reasonable time, fixed by written notice of the Engineer, then and in that event, CITY may remove them and may store the material at the expense of the Contractor. If the Contractor does not pay the expenses of such removal within ten (10) days' time thereafter, CITY may, upon ten (10) days' written notice, sell such materials at auction or at private sale and shall account to Contractor for the net proceeds thereof, after deducting all the costs and expenses of such removal, storage, sale and repair. Nothing contained herein shall relieve the Contractor from its responsibility to perform the work in accordance with the Contract Documents, nor to reduce the liability of the Contractor to replace such non-conforming materials or re-execute such non-conforming work.

B. Correction of Work after Final Payment:

Neither the final certificate, nor payment, nor any provision in the Contract Documents shall relieve the Contractor of responsibility for faulty and/or non-conforming materials or workmanship and unless otherwise specified, it shall remedy any defects due thereto and pay for any damage to other work resulting therefrom, which shall appear within a period of one (1) year from the date of final acceptance. CITY shall give notice of observed defects with reasonable promptness.

C. Deductions for Uncorrected Work:

If the Engineer and CITY deem it inexpedient to correct work injured or done not in accordance with the Agreement, an equitable deduction from the Agreement price and/or extended warranty shall be made therefore.

GC-33. SUBSTITUTES CLAUSE

- A. In order to establish a basis of quality, certain processes, types of machinery and equipment, kinds of material, may be specified on the plans or herein, by designating a manufacturer by name and referring to its brand or product designation. It is not the intent of these specifications to exclude other processes, equipment or materials or a type and quality equal to those designated.
- B. The materials, products and equipment described in the bidding documents establish a standard or required function, dimension, appearance and quality to be met by any proposed substitution.
- C. Approval of alternate and equal specified equipment and material will be only by addenda issued by the Engineer at least five (5) days prior to bid opening. Requests for approval of alternate equipment and materials manufacturers must come from the manufacturer or bidder at least ten (10) days prior to bid opening. All such requests must be accompanied by drawings and specifications in sufficient detail to allow the Engineer to determine whether or not the equipment and materials proposed is equal to that specified. The determination as to whether or not the proposed substitute equals that specified, shall rest solely with the City, based upon the opinion of the Engineer. The burden of proof of the merit of the proposed substitute shall be upon the proposer.
- D. No extra compensation will be allowed to the Contractor for any changes required to adopt the substitute equipment; therefore, the Contractor's proposal, including the approved alternate, shall include all costs for any modifications to the plans such as structural and foundation changes, additional piping or changes in piping, electrical changes, or any other modifications which may be necessary or required for approval and adoption of the proposed alternate equipment.

GC-34. DETAILED BREAKDOWN OF CONTRACT PRICE

The Contractor shall, within ten (10) days after receipt of the notice to proceed, submit a complete breakdown of all lump sum bid items showing the value assigned to each part of the work, including an allowance for profit and overhead. Upon acceptance of the breakdown of the contract price by the Engineer, it shall be used as the basis for all requests for payment.

GC-35. CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTIES AND SERVICE

- A. Certain utilities and structures which are expected to be adjacent to or encountered in the work are shown on the plans. It is known that there are discrepancies and omissions in the locations and quantities of existing utilities and structures shown. Those shown are for the convenience of the Contractor only, and no responsibility is assumed by either the City or the Engineer for their accuracy or completeness.
- B. It is the Contractor's responsibility to notify "CALL BEFORE YOU DIG" at nationwide #811 prior to excavating and to comply with Idaho Code Section 55-2207 and all other applicable laws and regulations regarding the protection of underground utilities.
- C. At points where the Contractor's operations could cause damage which might result in considerable expense, loss, and inconvenience when its operations are adjacent to or near a railway, telephone, television, power, oil, gas, water, sewer, irrigation, or other private or municipal systems, the operations shall be suspended until all arrangements necessary for the protection thereof have been made by the Contractor.
- D. The Contractor shall notify all utility offices which are affected by the construction operation at least two business days in advance of such construction. Under no circumstances shall the Contractor expose any utility without first requesting permission from and being granted to do so from the affected agency. Once permission has been granted, Contractor shall locate, if necessary, and expose all existing underground utilities in advance of any trenching operation. Hand digging shall be required within twenty-four (24) inches of a marked utility.
- E. The Contractor shall protect all other poles from damage. If interfering power poles, telephone poles, guy wires, or anchors are encountered, Contractor shall notify the Engineer and the affected utility company at least forty-eight (48) hours in advance of construction operations to permit the necessary arrangements to be made with the affected utility company for protection or relocation of the interfering structure.
- F. The Contractor shall be solely and directly responsible to the CITY and operators of such properties for any damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims, of any character brought because of any injuries or damage which may result from the carrying out of the work to be done under the Agreement. Contractor shall hold harmless, indemnify and defend CITY from any such claims.
- G. In the event of interruption to domestic water, sewer, storm drain, or to other utility services as a result of accidental breakage, or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authority. After such notification, the Contractor shall cooperate with said authority in restoration of service as promptly as possible and the Contractor shall bear all costs of repair. In no case shall interruption of any water or utility service be allowed to exist beyond working hours unless prior approval is received from the Engineer.
- H. In the event the Contractor encounters utility lines that interfere with trenching, the Contractor may, by obtaining prior written approval of the appropriate utility company, cut the service, dig through and restore the service with similar and equal materials at the Contractor's expense.

GC-36. STREET CLEANUP DURING CONSTRUCTION

The Contractor shall clean all spilled dirt, gravel, or other foreign material caused by the construction operations from all streets and roads at the conclusion of each day's work.

GC-37. CLEANUP

The Contractor shall at all times during the work keep the premises clean and orderly. Contractor shall promptly remove all waste materials and rubbish. All directions from the Engineer and all authorized public officials having jurisdiction over health and safety shall be obeyed.

GC-38. PROOF OF TAX PAYMENT

- A. The Contractor shall, within ten (10) days after receipt of the Notice of Award, furnish the Idaho State Tax Commission with a completed State of Idaho Form WH-5, PUBLIC WORKS CONTRACT REPORT. Copies of the form may be obtained from CITY, or from the Idaho State Tax Commission.
- B. The Contractor shall furnish evidence that it has paid all state and local taxes which have become due and payable and that it has secured payment of state and local taxes which have accrued, but which are not due. CITY shall not make final payment to Contractor until a tax release from the Idaho State Tax Commission has been received by CITY.

GC-39. HOLD HARMLESS REQUIREMENT

In addition to other rights granted CITY by the Contract Documents, the Contractor shall indemnify and hold harmless CITY, its officers and employees, from all suits, actions, or claims of any character brought because of any injuries or damages received or sustained by any person, persons, or property on account of the operations of the Contractor or its subcontractors; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of the Contractor or its subcontractors; or because of any claims or amounts recovered from any infringements of patent, trademark or copyright; or from any claims or amounts arising or recovered under the Workmen's Compensation Act or any other law, ordinance, order or decree.

GC-40. JURISDICTION AND DISPUTE RESOLUTION

- A. Either CITY or Contractor, may request mediation of any Claim submitted to Engineer for a decision before such decision becomes final and binding. A mediator with a background in construction litigation shall be selected by mutual agreement. In the event the parties cannot mutually agree upon a mediator, the Trial Court Administrator for the Second Judicial District shall submit a list of three (3) mediators to the Parties. Each Party will be allowed to strike one (1) of the listed mediators, Contractor proceeding first and CITY second. The remaining person shall then be the mediator. Costs of the mediation shall be borne equally by the Parties.
- B. CITY and Contractor shall participate in the mediation process in good faith. The process shall be concluded within sixty (60) days of filing of the request.

- C. If the Claim is not resolved by mediation, Engineer's action or denial shall become final and binding thirty (30) days after termination of the mediation unless, within that time period, CITY or Contractor:
1. agrees with the other Party to submit the Claim to another dispute resolution process; or
 2. gives written notice to the other Party of the intent to file an action in the Second Judicial District of the State of Idaho. The action must then be filed not later than sixty (60) days after substantial completion of the Project.

GC-41. PERMITS AND LICENSES

- A. The Contractor shall obtain and pay for all permits and licenses, including but not limited to the following:
1. Those required by the Moscow City Code, such as:

Community Forestry Ordinance	§5-8-1 et seq.
Building Code	§7-1-1 et seq.
Plumbing Code	§7-1-2 et seq.
Electrical Code	§7-1-3 et seq.
Gas Code	§7-1-4 et seq.
Contractor Licensing Ordinance	§7-16-1 et seq.
 2. Those required by the Idaho Code or other State Law.
 3. Those required by the Code of Federal Regulations or other Federal Law.

GC-42. ENVIRONMENTAL MATTERS

Contractor shall comply with all statutes and regulations regarding environmental matters, including, but not limited to, matters of health, safety, exposure, disposal, reporting, mitigation, etc.

GC-43. NO THIRD PARTY BENEFICIARIES

No claim as a third-party beneficiary under this Agreement by any person other than Contractor shall be made or shall be valid against CITY, and CITY shall not be liable for or be held to pay any money to such person.

GC-44. COMPLIANCE WITH GRANT CONDITIONS

Contractor shall comply with all conditions of, and all laws applicable to, and all policies, practices and procedures of the CITY applicable to, any federal, state or local grant received by the CITY or Contractor at any time with respect to this contract or with respect to the provision, performance or completion of the work.



APPENDIX A

PROJECT NARRATIVE, DRAWINGS,
AND SPECIFICATIONS

RADIO SYSTEM UPGRADE PROJECT

CITY OF MOSCOW VHF SIMULCAST RADIO SYSTEM

HIGH LEVEL SCOPE OF WORK BY LOCATION

1. Moscow Mountain Site

Provide and install base station repeater equipment for a VHF simulcast subsystem system with 3 repeaters, including transmitter combining and receiver multicoupler systems, simulcast and receiver voting systems, ethernet switch, backup DC power systems, antennas, transmission lines and surge arrestors. Equipment is to be installed in new equipment racks inside the exiting shelter at the Moscow Mountain site and connected to an existing electrical panel at the site. Antennas are to be installed on the existing tower at Moscow Mountain.

Provide and install three microwave radios and associated antennas to provide links to the Well 10, KUID-TV and Whitcom sites. Microwave antennas are to be installed on the roof of the existing shelter at the Moscow Mountain site. Interface the microwave radios with the simulcast radio system. Provide frequency coordination and FCC licensing for the microwave links.

2. KUID-TV Site

Provide and install base station repeater equipment for two VHF simulcast subsystems with 3 repeaters on one subsystem and 2 repeaters on the other subsystem, including transmitter combining and receiver multicoupler systems, simulcast and receiver voting systems, ethernet switch, backup DC power systems, antennas, transmission lines and surge arrestors. Equipment is to be installed in new equipment racks inside the exiting shelter at the KUID-TV site and connected to an existing electrical panel at the site. Antennas are to be installed on the existing tower at the KUID-TV site.

Provide and install two microwave radios and associated antennas to provide links to the Well 10 and Moscow Mountain and sites. Microwave antennas are to be installed on the existing tower at the Moscow Mountain site. Interface the microwave radios with the simulcast radio system. Provide frequency coordination and FCC licensing for the microwave links.

3. Well 10 Site

Provide and install base station repeater equipment for two VHF simulcast subsystems with 3 repeaters on one subsystem and 2 repeaters on the other subsystem, including transmitter combining and receiver multicoupler systems, simulcast and receiver voting systems, ethernet switch backup DC power systems, antennas, transmission lines and surge arrestors. Equipment is to be installed in new equipment racks inside the equipment building at the Well 10 site and connected to an existing electrical panel at the site. Antennas are to be installed on a new monopole (to be provided as a design-build component) at the Well 10 site.

Provide and install four microwave radios and associated antennas to provide links to the KUID-TV, Moscow Mountain, Residence WT and Rotary Park WT sites. Microwave antennas are to be installed on the new monopole (to be provided as a design-build component) at the Well 10 site. Interface the microwave radios with the simulcast radio system. Provide frequency coordination and FCC licensing for the microwave links.

NOTE: The new monopole at the Well 10 site is to be designed, provided and installed by the contractor under the provisions of the design-build subsection of the specifications. Provide and install a new 85' monopole capable of supporting the antenna and transmission line systems shown in the drawings and compliant with the current revision of ANSI/TIA 222 and all applicable City of Moscow codes and standards.

4. City Hall Site

Provide and install base station repeater equipment for a single VHF simulcast subsystem with 2 repeaters on one subsystem and 2 repeaters on the other subsystem, including transmitter combining and receiver multicoupler systems, simulcast and receiver voting systems, ethernet switch, backup DC power systems, antennas, transmission lines and surge arrestors. Equipment is to be installed in new equipment racks inside the basement communications room at City Hall and connected to an existing electrical panel at the site. Antennas are to be installed on the roof of City Hall (replacing the existing antennas now installed at that site).

Provide an interface between the simulcast radio system and existing City of Moscow fiber links to Whitcom, the Well 10 site and the Vista Water Tank site (the Well 10 site provides microwave links to the other sites in the system, including to Whitcom (via the Moscow Mountain Site).

5. Latah County Courthouse Site

Provide 2 new VHF stand-alone base station repeaters configured for main/backup redundant operation to replace the existing City of Moscow Public Works repeater at this site. Equipment to include backup DC power system and main/backup switching system. Re-use the existing duplexer and existing antenna system at the Courthouse site. Equipment to be installed in the existing data/communications room at the Courthouse site and connected to an existing electrical panel at the site.

6. Residence Water Tower Site

Provide and install a 5-channel VHF voting receiver system, including an ethernet switch, a receiver multicoupler system, a voting receiver controller, a backup DC power system, a receive antenna and transmission line and surge arrestor. Equipment will be installed in a new air-conditioned outdoor cabinet and will be connected to an existing electrical panel at the site. The RX antenna is to be installed on the water tank at this site.

Provide and install one microwave radio and associated antennas to provide a link to the Well 10 site. Microwave antennas are to be installed on the existing water tank at this site. Interface the microwave radios with the voting receiver system. Provide frequency coordination and FCC licensing for the microwave link.

7. Rotary Park Water Tower Site

Provide and install a 5-channel VHF voting receiver system, including an ethernet switch, a receiver multicoupler system, a voting receiver controller, a backup DC power system, a receive antenna and transmission line and surge arrestor. Equipment will be installed in a new air-

conditioned outdoor cabinet and will be connected to an existing electrical panel at the site. The RX antenna is to be installed on the water tank at this site.

Provide and install one microwave radio and associated antennas to provide a link to the Well 10 site. Microwave antennas are to be installed on the existing water tank at this site. Interface the microwave radio with the voting receiver system. Provide frequency coordination and FCC licensing for the microwave link.

8. Vista Water Tank Site

Provide and install a 5-channel VHF voting receiver system, including an ethernet switch, a receiver multicoupler system, a voting receiver controller, a backup DC power system, a receive antenna and transmission line and surge arrestor. Equipment will be installed in the existing pump building and will be connected to an existing electrical panel at the site. The RX antenna is to be installed on the existing wood pole at this site.

Provide an interface between the voting receiver system and the existing City of Moscow fiber link to City Hall, and connect this link to the rest of the interconnect system at that site

9. Whitcom Site

Provide and install equipment to provide an interface between the City of Moscow simulcast systems and the Whitcom dispatch console, including an ethernet switch and other equipment required to provide a console interface. Coordinate with Whitcom and Whitman County Department of Emergency Management to properly configure the new radio channels at the console dispatch positions.

Provide and install one microwave radio and associated antenna to provide a link to the Moscow Mountain site. Microwave antennas are to be installed on the existing tower at this site. Interface the microwave radios with the console interface system. Provide frequency coordination and FCC licensing for the microwave link.

10. System-Wide Tasks

Provide complete alignment and optimization of the simulcast sub-systems and receiver voting systems. Complete all tests required by the specifications, including transmission line and antenna sweeps. Configure the microwave/fiber interconnect system to provide redundant connections among the main radio sites (not including the voting receiver sites) and to the Whitcom dispatch center. Re-program City of Moscow mobile and portable radios for new system configuration/frequencies. Complete coverage testing as described in the specifications and drawings. Provide all testing and as-build documentation described in the specifications. Provide warranty service for the radio system as described in the specifications.

SECTION 26 20 00 - DC POWER SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. DC power systems, including all component parts reasonably incidental to providing a complete system.
 - 2. DC power systems are defined to include, but are not limited to the following components (common to each --48 VDC and 12 VDC power system):
 - Meter & alarm panel/controller
 - Shunt switch panel
 - Fuse panels
 - Power return bar
 - Wiring and hardware
 - Battery termination bus assembly
 - Batteries and battery racks
 - Rectifiers/chargers
 - DC-DC Converters
 - DC-AC Inverters
- B. Related Sections
 - 1. Division 01 Sections.
 - 2. Section 33 83 00 – Land Mobile and Microwave Radio Systems
 - 3. Section 26 07 00 - Basic Electrical Materials and Methods

1.2 REFERENCES

- A. ANSI/NFPA
 - 1. ANSI/NFPA 70 - National Electrical Code
- B. ANSI/ATIS
 - 1. ANSI/ ATIS T1.311 DC Power Systems – Telecommunications Environment Protection
 - 2. ANSI/ATIS-0600017 DC Power Wire and Cable for Telecommunications Power Systems
 - 3. ANSI/ATIS -0600315 Voltage Levels for DC-Powered Equipment Used in the Telecommunications Environment
 - 4. ANSI/ATIS-0600330 Valve-Regulated Lead-Acid Batteries Used in the Telecommunications Environment
 - 5. ANSI/ATIS-0600333 Grounding and Bonding of Telecommunication Equipment

1.3 SYSTEM DESCRIPTION

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CITY OF MOSCOW, IDAHO

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- A. Both the existing City of Moscow radio system and the proposed new City of Moscow VHF simulcast radio system are described in detail in Section 33 83 00.
- B. Because the VHF analog base stations that make are part of the new City of Moscow VHF simulcast system are available from various vendors, and because some radios require --48 VDC power and some radios require 12 VDC (nominal 13.6 VDC) power, these specifications and the attached Contract Drawings show typical equipment configurations and equipment rack layouts for both --48 VDC equipment and for 12 VDC equipment. Vendors may specify a system configuration with either power supply alternative, provided that all of the radio equipment (excluding the transmitter combiner and receiver multicoupler equipment), microwave or fiber interconnect equipment and backup DC power equipment fits into a single EIA 19" equipment rack (because of equipment space limitations at some of the repeater sites). The configuration of equipment shown in the Contract Drawings is typical, and Vendors may provide a different configuration of equipment as long as it meets the space requirement described above.
- C. Provide and install DC power systems at the City of Moscow VHF Simulcast System and Voting Receiver Sites as described herein and as shown in the drawings.
- D. These systems provide all the necessary components to provide primary distribution of --48 V DC and 12 VDC at the VHF simulcast sites and the voting receiver sites that make up the proposed City of Moscow VHF radio system.
- E. The 12 VDC system provides distribution breakers, metering, and power plant alarm functions, and cable termination for input and distribution loads. The -48 VDC system also provides distribution breakers, metering, and power plant alarm functions, and cable termination for input and distribution loads. The systems specified herein have charging capacity to cover the full design and future load at the City of Moscow radio sites.

1.4 DESIGN REQUIREMENTS

- A. Manufacturer's Standard of Design and Quality: Specification of product by model name/manufacturer is intended to represent a standard of quality, and is not intended to restrict competition. Proposed product must meet or exceed all functions and features of specifications. Specified product is manufactured by manufacturer as indicated. Drawings and specifications are based on information furnished by manufacturer. Other products with equal or better characteristics are acceptable, subject to approval by Officer-in-Charge. Should other manufacturer require different drawings and details than shown, provide shop drawings and field adjustment at no cost to City.
- B. The required configurations for the -48 VDC systems and the 12 VDC systems are shown in the drawings.
- C. At the following sites, for a proposed radio system requiring -48 VDC provide and install a new -48 VDC rectifier system (La Marche LMP-100A or approved equivalent, as shown in the drawings. A single -48 VDC battery string will be installed at these sites, as described herein and as shown in the drawings.
 - 1. Moscow Mountain
 - 2. KUID-TV

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CITY OF MOSCOW, IDAHO

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3. Well 10

Detailed specifications for the LaMarche LMP100A rectifier system are shown in Section 2.2.B below.

- D. At the following sites, for a proposed radio system requiring -48 VDC provide and install a new -48 VDC rectifier/power supply system (Newmar PFM-500 Power Function Manager + Newmar PM48-20 or PM48-10 Power Modules or approved equivalents), as shown in the drawings. A single -48 VDC battery string will be installed at these sites, as described herein and as shown in the drawings.

1. City Hall – 1 PFM-500 + 1 PM48-20
2. Residence Water Tower – 1 PFM-500 + 2 PM48-20
3. Rotary Park Water Tower – 1 PFM-500 + 2 PM48-20
4. Vista Water Tank – 1 PFM-500 + 1 PM48-20
5. Whitcom Site - 1 PFM-500 + 1 PM48-10

Detailed specifications for the Newmar PFM-500 Power Function Manager and the Newmar PM48-50 and PM48-10 power modules are shown in Section 2.2.C and 2.2.D below.

- E. At the following sites, for a proposed radio system requiring -48 VDC provide and install a new -48 VDC integrated power system [Newmar IPS 48-11 Integrated Power System (or approved equivalent)], as shown in the drawings. A single -48 VDC battery string will be installed at this site, as described herein and as shown in the drawings.

1. Courthouse – 1 IPS 48-11

Detailed specifications for the Newmar IPS 48-11 Integrated Power System are shown in Section 2.2.E below.

- F. At the following sites, for a proposed radio system requiring 12 VDC provide and install a new 12 VDC rectifier/power supply system (Newmar PFM-500 Power Function Manager + Newmar PM12-80 or PM12-40A Power Modules or approved equivalents), as shown in the drawings. A single 12 VDC battery string will be installed at these sites, as described herein and as shown in the drawings.

1. Moscow Mountain – 1 PFM-500 + 1 PM12-80
2. KUID-TV – 1 PFM-500 + 2 PM12-80
3. Well 10 – 1 PFM-500 + 2 PM12-80
4. City Hall – 1 PFM-500 + 1 PM12-80
5. Residence Water Tower - 1 PFM-500 + 1 PM12-80
6. Rotary Park Water Tower - 1 PFM-500 + 1 PM12-80
7. Vista Water Tank - 1 PFM-500 + 1 PM12-80
8. Whitcom - 1 PFM-500 + 1 PM12-40A

Detailed specifications for the Newmar PFM-500 Power Function Manager and the Newman PM48-50 and PM48-10 power modules are shown in Section 2.2.C and 2.2.D below.

- G. At the following sites, for a proposed radio system requiring 12 VDC provide and install a new 12 VDC integrated power system [Newmar IPS 12-40 Integrated Power System (or approved equivalent)], as shown in the drawings. A single 12 VDC battery string will be installed at this site, as described herein and as shown in the drawings.

9. Courthouse – 1 IPS 12-40

Detailed specifications for the Newmar IPS 48-11 Integrated Power System are shown in Section 2.2.E below.

- H. At the following sites, for a proposed radio system requiring 12 VDC provide and install a new 12 VDC to 48 VDC DC-DC Converter (Wilmore 1760-13-48-7.5 [or Wilmore 1760-48-7.5-M3 for multiple units connected in parallel] or approved equivalent), as shown in the drawings.

1. Moscow Mountain – Quantity 3 - 1760-13-48-7.5-M3
2. KUID-TV – Quantity 3 - 1760-13-48-7.5-M3
3. Well 10 – Quantity 3 - 1760-13-48-7.5-M3
4. City Hall – Quantity 1 - 1760-13-48-7.5
5. Residence Water Tower - Quantity 1 - 1760-13-48-7.5
6. Rotary Park Water Tower - Quantity 1 - 1760-13-48-7.5
7. Vista Water Tank - Quantity 1 - 1760-13-48-7.5

Detailed specifications for the Wilmore 1760-13-48-7.5 converters are shown in Section 2.2.F below.

- I. At the following sites, for a proposed radio system requiring 12 VDC or for a proposed radio system requiring -48 VDC provide and install a new 48 VDC to 120 VAC Inverter (Samlex PSR-1200-48 or approved equivalent) to provide 120 VAC power for the Ethernet switch at each site, as shown in the drawings.

1. Moscow Mountain – 1 PSR-1200-48
2. KUID-TV – 1 PSR-1200-48
3. Well 10 – 1 PSR-1200-48
4. City Hall – 1 PSR-1200-48
5. Residence Water Tower - 1 PSR-1200-48
6. Rotary Park Water Tower - 1 PSR-1200-48
7. Vista Water Tank - 1 PSR-1200-48
8. Whitcom - 1 PSR-1200-48

Detailed specifications for the Samlex PSR-1200-48 converters are shown in Section 2.2.G below.

- J. Provide 12 VDC systems at the City of Moscow simulcast repeater and voting receiver sites with interconnections between the battery banks and the battery bus feed point at the rectifier/charger system using stranded Extra Flexible power wire with a minimum wire size of AWG 3 (Southwire Telcoflex or approved equivalent). Battery interconnection cables shall comply with ANSI/ATIS-0600017.2014 (DC Power Wire and Cable for Telecommunications Power Systems), and shall be Class 1 cable, highly stranded, as defined in Section 5.3, Table 4 of ANSI/ATIS -0600017.2014. Cables shall

use RHW flame retardant insulation, and shall be Type 2 or Type 4 cable, as defined in Section 5.6.3.2 of ANSI/ATIS -0600017.2014. Terminate cables with lug-type terminations (Tyco Electronics TE-20001 series or approved equivalent).

Detailed Specifications for the Telcoflex (or approved equivalent) battery cable are shown in Section 2.2.J below

- K. Provide -48 VDC systems at the City of Moscow simulcast repeater and voting receiver sites with interconnections between the battery banks and the battery feed point at the rectifier/charger system using stranded Extra Flexible power wire with a minimum wire size of AWG 5 (Southwire Telcoflex or approved equivalent). Battery interconnection cables shall comply with ANSI/ATIS-0600017.2014 (DC Power Wire and Cable for Telecommunications Power Systems), and shall be Class 1 cable, highly stranded, as defined in Section 5.3, Table 4 of ANSI/ATIS -0600017.2014. Cables shall use RHW flame retardant insulation, and shall be Type 2 or Type 4 cable, as defined in Section 5.6.3.2 of ANSI/ATIS -0600017.2014. Terminate cables with terminations (Tyco Electronics TE-20001 series or approved equivalent).

Detailed Specifications for the Telcoflex (or approved equivalent) battery cable are shown in Section 2.2.J below.

- L. Provide AC power connections from the rectifier systems to the local electrical panel at each simulcast repeater site, voting receiver site and at the Whitcom site as shown in the drawings and as follows:

1. Moscow Mountain – 50 Amp 240 VAC breaker at electrical sub-panel
2. KUID-TV – 1 PSR-1200-48 – 50 Amp 208 VAC breaker at KUID Generator panel
3. Well 10 – 1 PSR-1200-48-80 – 50 AMP 240 VAC Breaker at main electrical panel
4. City Hall – 1 PSR-1200-48-80 – 120 VAC power cord from rectifier system to local outlet with generator backup
5. Residence Water Tower – 20 Amp 120 VAC breaker at electrical panel
6. Rotary Park Water Tower - 20 Amp 120 VAC breaker at electrical panel
7. Vista Water Tank - 20 Amp 120 VAC breaker at electrical panel
8. Whitcom - 1 PSR-1200-48 - 120 VAC power cord from rectifier system to local outlet with generator backup

- M. Provide and install a new 12 VDC distribution breaker panel equipped with a minimum of 18 distribution circuit breakers mounted in a Unipower Telecom DPP2U-A1-B1-S (or approved equivalent) circuit breaker panel, with Option R Grounded Return Bus Bars and Option D "Breaker Tripped" alarm contacts (SPDT Form C), as shown in the Contract Drawings. Use available bolt-in breakers from 5 to 100A for circuit breaker panels. Connect each circuit breaker panel to the distribution output of the Newmar PFM-500 Power Function Module or the Newmar Integrated Power System at each site depending upon the rectifier/power supply system for each site shown in the Contract Drawings). Provide and install suitable breakers cabling and connections to the equipment connected to the breaker panel, as shown in the block diagrams included in the rack elevation drawings for each site.

Detailed specifications for these distribution breaker panels are shown in Section 2.2.H below

- N. Provide and install a new --48 distribution breaker panel equipped with a minimum of 18 distribution circuit breakers mounted in a Unipower Telecom DPP2U-A1-B1-S (or approved equivalent) circuit breaker panel, with Option R Grounded Return Bus Bars and Option D "Breaker Tripped" alarm contacts (SPDT Form C), as shown in the Contract Drawings. Use available bolt-in breakers from 5 to 100A for circuit breaker panels. Connect each circuit breaker panel to the distribution output of the LaMarche LMP-100A rectifier system, the Newmar PFM-500 Power Function Module or the Newmar integrated Power System at each site (depending upon the rectifier/power supply system for each site shown in the Contract Drawings). Provide and install suitable breakers, cabling and connections to the equipment connected to the breaker panel, as shown in the block diagrams included in the rack elevation drawings for each site.

Detailed specifications for these distribution breaker panels are shown in Section 2.2.H below

- O. Provide and install new 12 VDC and -48 VDC battery strings made up of 12 VDC batteries (Energys PowerSafe 12V125F VRLA batteries or approved equivalent) at the simulcast repeater sites, the voting receiver sites, and the Courthouse and Whitcom sites, as shown in the Contract Drawings.

Detailed specifications for these batteries are shown in Section 2.2.I below

- P. The drawings, which constitute a part of these specifications, indicate the general installation locations for the battery banks, rectifiers, distribution panels, and other components of the DC power systems. Data presented on these drawings are as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification, of all dimensions, routing, etc., is directed.
- Q. Specifications and drawings are for assistance and guidance, but exact routing, locations, distances and levels will be governed by actual field conditions. Make detailed field surveys as part of work prior to submitting system layout shop drawings.

1.5 PERFORMANCE REQUIREMENTS

- A. Conform to all applicable code for manufacture and installation of DC power systems and associated equipment and materials.
- B. Install and configure DC power systems in accordance with good engineering practices.

1.6 SUBMITTALS

- A. Submittal Drawings: Submit shop drawings showing details and location of DC Power System equipment (battery banks, rectifiers and associated equipment) at each site. Provide schematic line drawing showing configuration of DC power distribution for each DC power system provided under this specification.
- B. Product Data: Submit manufacturer's data on DC power systems including, but not limited to, batteries and battery racks, rectifiers, controllers and alarm equipment, DC distribution and alarm panels.

- C. Manufacturer's Installation Instructions: Submit preparation requirements, and special installation instructions.

1.7 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Submit as-built drawings recording actual locations, configuration, and installation details of DC power systems.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five (5) years' experience.
- B. Installer: Company specializing in performing Work of this section and approved and certified by manufacturer.

1.9 PRE-INSTALLATION MEETINGS

- A. Convene pre-installation meeting minimum one week prior to commencing work of this section.
- B. Attendance is to include all parties directly affecting, or affected by work of this section, including electrical sub-contractor, and contractor responsible for installation of new racks, microwave radio and mobile radio systems at the City of Moscow radio sites.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products with adequate protection against damage. Avoid breakage, denting and scoring finishes. Do not install damaged equipment.
- B. Deliver material to work site in original factory packaging.
- C. Store batteries, rectifiers, and other DC power system components and accessories in original cartons or shipping containers and in a clean dry space; protect from weather and construction traffic. Wet materials should be unpacked and dried before storage.

1.11 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.12 SEQUENCING

- A. Sequence work to allow for installation of electrical systems, land mobile and microwave radio equipment, security equipment, and other work required before installation of DC power systems.

1.13 COORDINATION

- A. Coordinate work with sub-contractors installing electrical systems, cable tray systems, equipment racks, and radio & microwave radio systems.

1.14 WARRANTY

- A. Provide standard manufacturer's warranty for all equipment listed in these Specifications.

1.15 MAINTENANCE SERVICE

- B. Furnish service and maintenance of DC power systems for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 GENERAL

- A. Manufacturer: Subject to compliance with these specifications, or approved equal.

2.2 DC POWER SYSTEM COMPONENTS

- A. DC Power Equipment Configuration:

All DC supply equipment shall be installed in 19-inch wide, EIA universal mounting spacing, welded steel, zinc plated and gold chromate conversion, seismic rated floor supported equipment racks (Cooper B-Line SB506084XUYZ) or approved equivalent, as shown in the Contract Drawings. Detailed specifications for these racks are shown in Section 33 83 00 Land Mobile Radio Systems.

- B. -48 VDC Rectifier Systems

The detailed specifications for the -48 VDC rectifier systems (LaMarche LMP-100A or approved equivalent) are shown below:

Specifications

		100A (1RU)
AC Input	Input Mode	176-300VAC (1Ph) Linearly Derated (85-175VAC)
	Max Input Current	36A
	Input Frequency	50Hz/60Hz (45 to 66Hz)
	SPD (Surge Protection)	
DC Distribution*	Output Voltage	-42 to -58VDC, Nominal: -53.5VDC
	Rated Output	6000W
	Battery Breakers	1 × 40A (Fuse)
	Load Breakers (1P)	1 × 80A (Fuse) 1 × 40A (Fuse)
	Low Voltage Disconnect (1P)	BLVD
Rectifier	Input Voltage	85 to 300VAC, rated 220VAC
	Rated Power	3000W (176 to 300VAC) Linearly Derated (85 to 175VAC)
	Efficiency	>96% Peak
	Power Factor	>=0.99
	THD	<=5%
	Operating Temperature	-40°C to 65°C (full load @ 55°C)
	Dimension (W×D×H)	4.17 × 11.73 × 1.67in 106 × 298 × 42.5mm
	Weight	3.53 lbs (1.6 kg)
	Cooling	Forced Cooling
Controller	Signal Input	1 Battery Temp., 1 Ambient Temp, 2 Common DI
	Alarm Output	4 Dry Contacts
	Communication Port	RS232/485, Ethernet
	Display Mode	LCD
System**	Dimension (W×D×H)	17.32 × 14 × 1.73in 440 × 354 × 44mm
	Weight (w/out rect.)	14.33lbs (6.5kg)
	Mounting	19/23" Rack Mount
	Terminals	Front Access
Standards and Compliance	IEC 60950 Standards EN 61000-4-5 UL/IEC 62368-1 FCC Part 15 Subpart B ROHS	
Environmental	Operating Temperature	-40°F to 149°F (-40°C to 65°C)
	Storage Temperature	-40°F to 158°F (-40°C to 70°C)
	Operating Humidity	5% to 95% (Non-Condensing)
	Altitude	0 to 6562ft (0 to 2000m)

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C. -48 VDC and 12 VDC Power Function Managers

The detailed specifications for the -48 VDC and 12 VDC power function managers (Newmar PFM-500 Power Function Manager or approved equivalent) are shown below:

1. Low voltage battery disconnect protects batteries in the event of extended AC power loss
2. Simplifies wiring with parallel tie point for power modules 12, 24 or 48 VDC input/output
3. Digital meter displays: system bus voltage, battery voltage, total rectifier amperage, connect/disconnect voltage set points, and system ambient temperature
4. Up to five isolated distribution circuit breaker capacity with alarm contacts; easy front panel plug-in installation
5. Alarm LED (summary) indicates impending LVD disconnection, Power Module output fail or load circuit breaker trip
6. Summary alarm contacts (form C) allow remote monitoring of system status
7. Manual battery disconnect switch allows service/ replacement of batteries without system shutdown
8. Maximum Voltage Range 8 - 65 VDC
9. Continuous Current 500 Amps DC
10. Low Voltage Battery Disconnect 500 Amp, Contactor
11. Size 19/23", 2 RU
12. Weight 20 Lbs.

D. 12 VDC & -48 VDC Power Modules

The detailed specifications for the Newmar PM12-80 or PM12-40A 12 VDC Power Modules and the Newmar PM48-20 or PM48-10 -48 VDC Power modules are shown below:

Input:

- 85 - 135/170-270 VAC (selectable),
47 - 63 Hz., 560 watt models
- 90 - 265 VAC, 1000 watt models
- 207 - 253 VAC, 2200 watt model

Power Factor: 0.7, 560W & 2200W models

0.98, 1000W models

Regulation: $\pm 1\%$ at direct output (V2);
 $\pm 2\%$ through "oring" diode (V out)

Ripple: 1% (Typical)

Efficiency: 80-85% @ full load

Front panel Output Voltage Adjustment

Pot Range: $\pm 10\%$

Altitude Range: Full output to 5,000 feet. Derate
output current 4% per 1,000 feet to 10,000
feet max.

Temperature Rating

560 watt models: -40° C to +60° C;

Derate linearly from 100% load @ 50° C to
75% @ 60° C

1000 watt models: -20° C to + 70° C;

Derate linearly from 100% load @ 50° C to
50% @ 70° C

2200 watt model: 0 - 50° C

Mechanical/General

- Powder coated aluminum front panel and cover
- Vinyl laminated base and cover
- 19" Rackmount brackets provided
- Wallmount via optional brackets
- AC Input wiring:
 - 560 watt units: IEC AC entry, 6' IEC cord with NEMA 5-15 plug provided
 - 1000 watt units: IEC entry, 6' IEC power cord with NEMA 20 plug provided
 - 2200 watt unit: Hardwire junction box, no power cord provided
- 1/4" -20 Output stud (560 watt models)
- Output bus bar (1,000 & 2200 watt models) with 1/4" - 20 bolts
- Output "OK" L.E.D.
- Multi color LED: Green = Ok, Red = Fail (1000W models only)
- Loss-of-output alarm contacts- Form C, plus loss of AC alarm contacts Form C (1000 & 2200 watt units only)
- Front panel voltage test points

Options

- Three stage charger function with gel/lead-acid selector Model: CFB (560 & 1000 watts only)
- Temperature compensation (for battery charging). All models.
- DC Quick Connect Wiring Kit:
560 watt models: QCK-3 (for 2-3 unit PM system) & QCK-6 (for 4-6 unit PM system)
1000 watt models: QCK-3A (for 2-3 unit PM system) & QCK-6A (for 4-6 unit PM system)
2200 watt model: CCK-4
- "Universal" mounting bracket; Model: UMB-PM (500 & 1KW models only)
- Metering, alarms, LVD and distribution breakers (PFM-400 or ULM-100 module options)

Protection

- Output fuse for reverse polarity
- Current limit
- Input circuit breaker
- Automatic high temp. output power reduction (560W & 2200W models)
- Forced air cooling with filter provided (560W models only)

Design Standards

- UL 1950 / EN 60950 (Safety)
- EN 50082 (Immunity)
- EN 55014 (Conducted)

Model	Input Amps @ Full Load 115/230V	Output			Watts	Weight	
		VDC V Out	VDC V2	Amps Cont.+		Lbs	Kg.
PM-12-40A	8.5/4.3	13.6	14.3	40	560	12.2	5.5
PM-12-80	16/8	13.6	—	80	1000	15.2	6.9
PM-24-20	8.5/4.3	27.2	27.9	20	560	12.2	5.5
PM-24-40	16/8	27.2	—	40	1000	15.2	6.9
PM-48-10	8.5/4.3	54.4	55.1	10	560	12.2	5.5
PM-48-20	16/8	54.4	—	20	1000	14.0	6.4
PM-48-50	* /22	54.4	—	50	2200	34	15

VDC (V out) Measured at output terminal with oring diode

* 230 VAC input only

VDC (V2) Measured at direct output terminal

+ For parallel configuration/load sharing derate output 10%

Case Size – All Models			
			
Inches	H	W*	D
	3.5	17	20.5
Centimeters			
	13.5	43.2	52.1
*19" mounting brackets provided			

E. -48 and 12 VDC Integrated Power Systems

The detailed specifications for Newmar IPS 12-40 Integrated Power System and the Newmar IPS 48-11 Integrated Power System (or approved equivalents) are shown below:

Specifications

Model	Input Amps @ Full Load 115 / 230	Output			Supplemental Input Port*	Internal Battery Capacity	Ground Reference
		VDC	Adjustment Range	Amps Continuous			
IPS 48-11	11 / 5.5	54.4	40-60 VDC	11	40 Amps	5 A-H	Positive
IPS 24-22	11 / 5.5	27.2	20-30 VDC	22	40 Amps	10 A-H	Negative
IPS 12-40	11 / 5.5	13.6	10-15 VDC	40	N/A	20 A-H	Negative

AC Input

Input Range (switch selectable):

115V = 92-130 VAC

230V = 184-260 VAC

Frequency: 47-63 Hz

DC Output

Voltage/Amperage: See Matrix above

Maximum Load with External Rectifier

and Battery Inputs: 40 amps

Regulation: Line: $\pm 1\%$, Load: $\pm 2\%$

Ripple: $\pm 1\%$

Power Scaling via Back Panel Quick Connects

External Rectifier Input: 24V, 48V only;

560 or 1,000 watt (see PM Series page 6)

External Battery Bank: 12V/24V/48V

Environmental

Temperature Rating: -10° to + 60° C;

Derate linearly from 100%

load @ 50° C to 75% @ 60° C

Internal Batteries

Type: 12 Volt, 5 A-H Sealed Lead-Acid

Maintenance-Free

Amp-Hour Capacity: See Matrix below

Weight: 4 Lbs. each; 4 Batteries per Unit

Approvals: UL Recognized, DOT and IATA
approved for shipment by air

Indicators and Alarms

System "Nominal" indicator lights:

- AC OK
- External Rectifier ON/OK*
- *Except IPS-12-40
- Internal Rectifier On/OK
- Battery Contactor Closed

System "Warning" indicator lights:

- Check System
- Battery Disconnected

Form C Alarm Contacts:

- Summary Failure
- AC Input Failure (Optional)

Options

AC Input Fail Contacts - Specify 115 or 230 VAC

Rectifier/Battery Input Cable Assembly (Model CA-24)

Rear Support Bracket for Flush Mounting Models: RSB-19 or RSB-23

Distribution Panel Models: DST-10 (UL), DST-20A (UL)

Unit Supplied Without Batteries

Internal Battery Constant Current Performance (Amps) to 1.75 VPC					
MODEL	5 MIN.	15 MIN.	30 MIN.	1 HR.	2 HRS.
IPS 48-11	15.0	8.0	5.0	3.0	2.0
IPS 24-22	30.0	16.0	10.0	6.0	4.0
IPS 12-40	40.0	32.0	20.0	12.0	8.0

Mechanical

Chassis: Aluminum

Rack Size: 19" or 23", 2 RU (3.5")

Cooling: Forced Air

Dimensions: 3.5"H x 17"W x 18"D

Weight: 33 Lbs. (with batteries)
17 Lbs. (without batteries)

Protection

- Current Limit, Short Circuit
- Over Voltage
- Auto Thermal Shutdown/Recovery
- Input Fuse and Circuit Breaker
- Circuit Breaker For Internal Battery
- Low Voltage Battery Disconnect (Adjustable)

F. 12 VDC to -48 VDC DC-DC Converters

Detailed Specifications for the 12 VDC to -48 VDC DC-DC Converters ((Wilmore 1760-13-48-7.5 [or Wilmore 1760-48-7.5-M3 for multiple units connected in parallel] or approved equivalent) are shown below:

Table 1

Input Voltage Range (VDC)	Input Current ¹ (ADC)	Output Voltage (VDC)	Output Current (ADC)	Model Number ²
10.5 - 16 (13V nominal)	17.8	24	8	17xx-13-24-8
	33.5		15	17xx-13-24-15
	17.5	48	4	17xx-13-48-4
	33.1		7.5	17xx-13-48-7.5

¹Typical current at full load and nominal input voltage

Output Voltage Regulation

Versus line: $\pm 0.5\%$

Versus load: $\pm 2\%$

Output Voltage Ripple

5 millivolts rms (typical)

50 millivolts peak-to-peak (typical)

Isolation and Grounding

Mutual electrical isolation is provided between the input circuit, the output circuit, and chassis ground.

Protection

Protection against overloads, short-circuits and output overvoltages is provided electronically. Recovery to normal operating conditions is automatic upon removal of the overload or short-circuit fault. Following an overvoltage shutdown, input power to the converter must be removed and reapplied to resume converter operation. Protection against accidental reversal of the dc input-voltage polarity during installation is provided by a shunt diode working in conjunction with the front-panel circuit breaker.

Ambient Temperature Range

Operating: -30°C to $+50^{\circ}\text{C}$
(convection cooling)

Storage: -40°C to $+95^{\circ}\text{C}$

Efficiency

The efficiency reaches 80% at approximately 20% of full load and remains above 80% for most of the load range. The no-load input power is typically less than 6 watts. Full-load heat dissipation is approximately 250 BTU/hour for 360-watt models and approximately 135 BTU/hour for 200-watt models.

Dimensions 1.72" H X 19" W X 11.2" D (with rack mounting ears)

G. -48 VDC to 120 VAC Inverters

Detailed specifications for the -48 VDC to 120 VAC Inverters (Samlex PSR-1200-48 or approved equivalent) are shown below:

MODEL NO.		PSR-1200-24	PSR-1200-48
AC OUTPUT IN INVERTER MODE	OUTPUT VOLTAGE	100 - 120 VAC (User selectable) ; Default: 120 VAC	
	OUTPUT FREQUENCY	45 - 65 Hz (User Selectable) ; Default: 60Hz	
	TYPE & OUTPUT WAVE FORM	High Frequency Type ; Pure Sine Wave	
	TOTAL HARMONIC DISTORTION OF OUTPUT WAVFORM	< 2%	
	CONTINUOUS OUTPUT POWER	1200W	
	SURGE OUTPUT POWER	2000W	
	PEAK EFFICIENCY	> 88%	> 90%
AC OUTPUT IN BYPASS MODE	NEUTRAL ISOLATION	• Neutral bonded to Chassis Ground when Inverter is supplying the load • Neutral isolated from Chassis Ground when Grid is supplying the load	
	OUTPUT VOLTAGE	Same as external AC input source	
	TYPE OF OUTPUT WAVEFORM	Same as external AC input source	
	THD OF OUTPUT WAVEFORM	Same as external AC input source	
	CONTINUOUS OUTPUT POWER	1200W continuous (Protected by 15A AC input breaker)	
	RATING OF TRANSFER RELAY	16A	
	TRANSFER RELAY SWITCHING TIME	< 8ms	
DC/AC INPUT	TRANSFER TYPE	Synchronized or Unsynchronized (User selectable)	
	NEUTRAL ISOLATION	Neutral and Chassis Ground are isolated through internal relay	
	NOMINAL DC INPUT VOLTAGE	24 VDC	48 VDC
	DC INPUT VOLTAGE RANGE	20 - 34 VDC	40 - 60 VDC
DISPLAY	DC INPUT NO LOAD CURRENT	< 0.6A	< 0.5A
	AC INPUT FROM GRID/GENERATOR	100 - 120 VAC, 50/60 Hz	
LOCAL CONTROL & MONITORING	LCD	Alphanumeric: 2 lines x 16 characters each	
	LEDs	4 LEDs: AC GRID ; INVERTER ; BYPASS ; ALARM	
REMOTE CONTROL & MONITORING	MODE AND PARAMETER SETUP	Through Menus displayed on the LCD screen	
	MONITORING OPERATING STATUS	Through LCD screen and 4 LEDs	
	PARAMETER SETUP AND MONITORING USING USB / RS-232	Through computer screen using ASCII coded commands	
	MONITORING USING ETHERNET / SNMP	Through computer's Web Browser and Ethernet connection • E-mail notification of faults and alarms Notification of faults and alarms through Ethernet / SNMP Trap Messaging	
	WIRED ON/OFF CONTROL THROUGH TERMINALS MARKED ENB (HIGH), ENB(LOW) AND GND	To switch ON: • External + 10 to 40VDC fed to ENB and GND (< 6mA) • Short ENB and GND • Battery Positive fed to ENB	To switch ON: • External + 20 to 60VDC fed to ENB and GND (< 6mA) • Short ENB and GND • Battery Positive fed to ENB
REMOTE CONTROL & MONITORING	WIRED SIGNALLING	Signaling of faults and alarms through SPDT relay contact switching (no voltage) • Relay contact rating: 240 VAC, 16A	

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MODEL NO.		PSR-1200-24	PSR-1200-48
PROTECTIONS	COOLING	3 load / temperature controlled fans: • Switch ON when output load is >300W and switch OFF when the load reduces to <280W • Switch ON when internal heat sink temperature is ≥ 50°C and switch OFF when temperature reduces to ≤ 45°C	
	DC INPUT UNDER VOLTAGE (UV) ALARM	17.0 to 23.0 VDC ; Default: 21.5 VDC (Auto reset at 0.5V > the set voltage)	34.0 to 46.0 VDC ; Default: 43.0 VDC (Auto reset at 1.0V > the set voltage)
	DC INPUT OVER VOLTAGE (OV) ALARM	25.0 to 35.0VDC ; Default: 33.0VDC (Auto reset at 0.5V < the set voltage)	50.0 to 62.0 VDC ; Default: 56.0 VDC (Auto reset at 1.0V < the set voltage)
	FAN FAULT ALARM	Fan stops	Fan stops
	DC INPUT UNDER VOLTAGE PROTECTION (UVP)	17.0 to 23.0 VDC ; Default: 20.0 VDC	34.0 to 46.0 VDC ; Default: 40.0 VDC
	DC INPUT UNDER VOLTAGE PROTECTION (UVP) RECOVERY	17.5 to 23.5 VDC ; Default: 23.0 VDC	35.0 to 47.0 VDC ; Default: 46.0 VDC
	DC INPUT OVER VOLTAGE PROTECTION (OVP)	25.0 to 35.0 VDC ; Default: 34.0 VDC	50.0 to 62.0 VDC ; Default: 60.0 VDC
	DC INPUT OVER VOLTAGE PROTECTION (OVP) RECOVERY	24.5 to 34.5 VDC ; Default: 33.0 VDC	49.0 to 61.0 VDC ; Default: 58.0 VDC
	OUTPUT OVERLOAD (OL) PROTECTION	• Programmable from 100% to 110% • Default: 110% • Shut down when load is > programmed value for > 2 sec	
	SHORT CIRCUIT PROTECTION	Shut down in case of the following: • Output voltage is < 80V RMS for 1.2 sec • Output current is > 24A for 1.2 sec	
INPUT /OUTPUT CONNECTIONS	OVER TEMPERATURE PROTECTION	Shut down when internal heat sink temperature is >105°C. Auto reset at 85°C.	
	DC INPUT OVER CURRENT PROTECTION	4 pieces of 20A fuses in parallel = 80A Each fuse: Mini Blade Fuse, 20A: Littell Fuse 0297020.WXN or equivalent	4 pieces of 10A fuses in parallel = 40A Each fuse: Mini Blade Fuse, 10A: Littell Fuse 0997010.WXN or equivalent
	AC INPUT OVER CURRENT PROTECTION	Breaker, 250 VAC, 12A	
	DC INPUT	Terminals with cylindrical hole and set screw • Hole diameter: 7/16" • Set screw: 5/16" x 24 TPI; ½" length; Slotted head	
	DC CHASSIS GROUND	Terminal with cylindrical hole and set screw • Hole diameter: 5/16" • Set screw: 5/16" x 24 TPI; 3/8" length; Slotted head	
SAFETY AND EMI / EMC COMPLIANCE	AC INPUT CONNECTION	• Male AC Power Inlet Connector IEC 60320, C14 • Detachable AC Power Cord with mating Connector IEC 60320, C13 on one end and NEMAS-15P Plug on the other end (Supplied with the unit)	
	AC OUTPUT CONNECTION	NEMAS-20R Duplex Outlet	
ENVIRONMENT	SAFETY	ETL listed to UL Standard 62368-1 and CSA Standard C22.2 No. 62368-1	
	EMV/EMC	Certified to comply with FCC Part 15(B), Class B	
	OPERATING TEMPERATURE RANGE	-20 to +50°C	
DIMENSIONS	RELATIVE HUMIDITY	Up to 90%, non condensing	
	STORAGE TEMPERATURE	-30 to +70°C	
	(W X D X H) MM	482 X 386.8 X 44	
WEIGHT	(W X D X H) INCHES	19 X 15.24 X 1.73	
	KG	5.8	
	LBS	12.8	

NOTES:

1. All AC power ratings in the Inverter Section are specified at Power Factor = 0.95
2. All specifications given above are at ambient temperature of 25°C / 77°F unless specified otherwise
3. Specifications are subject to change without notice

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H. -48 VDC and 12 VDC Distribution Breaker Panels

Detailed specifications for the -48 VDC and 12 VDC Distribution Breaker Panels (Unipower Telecom DPP2U-A1-B1-S or approved equivalent) are shown below:

SPECIFICATIONS

Typical at 25°C Unless Otherwise Noted.

INPUT/OUTPUT

Panel Capacity	
@35°C.....	450A per Bus
@40°C.....	400A per Bus
@50°C.....	320A per Bus
@70°C.....	200A per Bus
Configuration.....	450A Single Bus with 1 to 20 Breakers 900A Dual Bus 1 to 10 Breakers Each Bus
Breaker Capacity ¹	2.5A to 200A
Voltage.....	21-60VDC
Polarity.....	Neutral, Positive or Negative Ground

ALARMS

Alarm Indicator	Dual Color LED Per Bus
LED Status Indication.....	Green = Normal Red = CB Trip Alarm Off = No Power
Alarm Relays.....	Form C Contacts for each Bus

SAFETY

Safety	UL60950-1 2 nd Ed., CSA22.2 No. 60950-1 2 nd Ed., EN60950-1 2 nd Ed.
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ENVIRONMENTAL

Operating Temp. Range.....	-10°C to +70°C
Storage Temp. Range.....	-40°C to + 85°C
Humidity	0% to 95%, Non-Condensing

PHYSICAL SPECIFICATIONS

Case Material.....	Steel
Finish.....	Powder Coat Black
Overall Dimensions, Inches (mm) ²	
without Plastic Safety Cover	3.45 H x 17.16 W x 9.48 D (87.6 x 435.9 x 240.8)
with Plastic Safety Cover	3.45 H x 17.16 W x 14.08 D (87.6 x 435.9 x 357.6)
Weight [excluding breakers].....	25 lbs. (11.4 kg.)
Rack Mounting (universal brackets included)	19 or 23 Inch

CONNECTIONS

Input Connections.....	Bus Bar
Output Connections.....	1/4-20 Stud, 2-hole lugs
Chassis Ground Connection.....	1/4-20 Stud, 2-hole lugs
Alarm Relay Connections.....	Spring Clamp Terminals, 16-26AWG

Notes:

1. See ordering guide to specify.
2. Excluding mounting brackets. Depth from front face, see details on page 3.

- I. Batteries
Provide and install the following Valve Regulated Lead Acid (VRLA) batteries (Energys PowerSafe 12V125F or approved equivalent). Configure individual strings of 4 batteries as 12 VDC battery systems (wired in series) or as -48 VDC battery systems (wired in parallel), as shown in the drawings. Specifications for these batteries are shown below:

General Specifications

Battery Type	Number of Cells	Nominal Voltage (V)	Nominal Capacity (Ah)		Nominal Dimensions						Typical Weight		Short Circuit Current	Internal Resistance**	Terminals	Electrolyte (1.200 ± 0.1)				Pure Acid (H ₂ SO ₄ 1.260 ± 0.01)				Lead Weight	
			8hr. Rate 1.75Vpc @77°F	10hr. Rate 1.80Vpc @68°F	Length		Width		Height							Volume		Weight		Volume		Weight		Weight	
			in	mm	in	mm	in	mm	lb	kg	(A)	mΩ				gal	L	lb	kg	gal	L	lb	kg	lb	kg
12v36F-FT	6	12	31	31	11.0	280	3.8	97	6.3	159	23.8	10.8	1327	9.87	M8 F	0.37	1.41	3.96	1.80	0.16	0.60	1.68	0.76	16.8	7.61
12v38F-FT	6	12	38	38	11.0	280	3.8	97	7.2	184	27.6	12.5	1500	8.53	M8 F	0.48	1.81	5.10	2.31	0.20	0.77	2.17	0.98	19.8	8.99
12v62F-FT	6	12	62	62	11.0	280	3.8	97	10.4	264	42.3	19.2	2080	5.98	M8 F	0.77	2.91	8.20	3.72	0.33	1.23	3.48	1.58	29.6	13.4
12v92F-FT	6	12	92	92	15.6	395	4.1	105	10.4	264	60.8	27.6	2410	5.19	M8 F	1.12	4.25	12.0	5.44	0.48	1.81	5.09	2.31	43.3	19.7
12v100FC-FT	6	12	100	100	15.6	395	4.3	108	11.3	287	68.3	31.0	1930	6.46	M8 F	1.34	5.06	14.3	6.48	0.57	2.15	6.07	2.75	46.6	21.1
12v101F-FT	6	12	101	100	20.1	510	4.3	110	9.3	235	73.9	33.5	2108	5.92	M8 F	1.19	4.52	12.8	5.79	0.47	1.76	4.98	2.26	50.0	22.7
12V125F	6	12	125	125	22.1	561	4.1	105	12.4	316	98.1	44.5	2355	5.30	M6 M	1.98	7.48	21.1	9.57	0.89	3.37	9.50	4.31	62.7	28.5
12V155FS	6	12	155	150	22.1	561	4.9	125	11.1	283	106.9	48.5	3325	3.80	M6 M	2.16	8.16	23.0	10.4	0.92	3.47	9.79	4.44	70.4	31.9
12V170FS	6	12	170	170	22.1	561	4.9	125	11.1	283	112.0	50.8	3360	3.75	M6 M	2.12	8.01	22.6	10.3	0.90	3.40	9.61	4.36	77.3	35.1
12V190F	6	12	190	190	22.1	561	4.9	125	12.4	316	126.3	57.3	3625	3.50	M6 M	2.42	9.17	25.9	11.7	1.03	3.90	11.0	4.99	89.4	40.6

Notes:
-- Resistance values are for reference only and not intended to represent an Ohmic Value or Baseline measurement

- J. Detailed Specifications for cables used to connect the batteries to the rectifier systems (Southwire Telcoflex or approved equivalent) are shown below:

SPECIFICATIONS:

- ASTM B-33 and B-172 Class I tinned copper
- UL 44 Type RHH, FT4-ST1, VW-1, 600 Volts DC or AC
- KS-24194™ List 2
- UL 2731 Telecommunications Central Office Power Cable
- ATIS-0600017.2014 Non-Halogenated DC Power Wire and Cable for Telecommunications Power Systems
- Telecordia GR-347-CORE
- CSA AWM IB 105°C 600V. FT4-ST1
- Lead-Free, Silicone-Free, RoHS Complaint
- IEC including 60674 and 60332
- REACH - European Community Regulation

K. Safety and Hazards

1. The design of the plant shall not expose personnel to any safety hazards, and product damage shall not occur during normal installation, operation, and maintenance.
2. The safe replacement of components such as fuse holders shall not require that the plant be de-energized.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Check work with related trade's shop drawings and make corrections when required.
- B. Verify that field conditions are acceptable and are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

- A. Install battery banks and 12 VDC and -48 VDC rectifier/charger systems as shown in the drawings. Provide and install all required interconnecting cable in compliance with all applicable electrical codes.
- B. Coordinate installation of battery and DC power system equipment with other electrical work as necessary to properly integrate installation of DC power system work with other work.

3.3 FIELD QUALITY CONTROL AND TESTING

- A. Section 01 40 00 - Quality Requirements: Field sample requirements, and testing and inspection services, and 01 70 00 - Execution Requirements: Testing, adjusting, and balancing.
- B. The tests described in the following sections apply to the DC power systems in the new Communications Room only.
- C. Test each tray of batteries for ground faults prior to installation as soon as the batteries are received from the manufacturer, after the battery trays have been installed in the racks at each site, and one week after installation of the battery system. Perform the tests as follows:
- D. Connect a megohm meter (Extech 380360 or equivalent) between the tray and one of the terminals of the battery (or one terminal of a series of cells if the cells are strapped together). Set the test set for 2000 megohms with 1000 Volt test voltage. If the value is above 2000 megohms the batteries are acceptable for installation. If a lower value is obtained, isolate the problem cell by disconnecting the connectors between the batteries, and replace the bad battery or batteries with a new cell.
- E. Using a battery impedance tester, perform a battery impedance (or internal battery resistance, depending upon the test equipment used) measurement of each battery in the battery bank and record the results to establish a baseline for each battery. Compare the values with the manufacturer's specifications for the battery cell. Values should be within approximately $\pm 20\%$ of the manufacturer's nominal specification. Perform these tests one week after battery plant has been put into service.

3.1 CLEANING

- A. Upon completion of this section of work, remove protective wraps and debris. Repair damages due to installation of this section of work.

3.2 PROTECTION OF FINISHED WORK

- A. Protect DC power systems work from damage after installation.

END OF SECTION

SECTION 33 83 40 - MICROWAVE RADIO AND ANTENNA SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Product requirements and specifications for microwave radios, antennas and associated hardware, waveguides, connectors, grounding kits, and weatherproofing, for the City of Moscow simulcast repeater and voting receiver sites.
 - 2. Requirements and specifications for installation of microwave antennas and associated equipment at the City of Moscow simulcast repeater and voting receiver sites.
- B. Related Sections:
 - 1. Division 01 Sections.
 - 2. Section 33 83 00 Land Mobile Radio and Antenna Systems

1.2 REFERENCES

- A. The equipment and accessories shall be designed, manufactured, and tested in accordance with the applicable standards from the following organizations, including all amendments in effect at the time of purchase order placement.
- B. These codes and standards set forth minimum requirements necessary to assure satisfactory performance of the Vendor's equipment. Other internationally recognized codes and standards will be acceptable provided they meet or exceed the requirements of the listed codes and standards.

If different from the project list, the Vendor shall submit for City's approval, details of the codes and standards, which Vendor proposes to use. Vendor shall demonstrate to the satisfaction of City that these codes and standards meet or exceed the requirements of the codes and standards listed.
- C. In the event of any conflict between codes, standards, and this specification; the Vendor shall refer the conflict to City for written resolution before start of design.
- D. Vendor shall provide a list of codes and standards used for the manufacture of Vendor's product in effect at the time of purchase order.
- E. All materials and equipment supplied under this specification shall comply with all applicable regulations and standard listed below, and all Federal, State and Local Statutes. All electrical material and equipment shall be listed and/or labeled by OSHA through a National Recognized Testing Laboratory (NRTL) and approved by the authority having jurisdiction.
- F. ANSI – American National Standards Institute
 - 1. ANSI T1.101 – Synchronization Interface Standard
 - 2. ANSI T1.102 - Digital Hierarchy – Electrical Interfaces
 - 3. ANSI T1.105 - Synchronous Optical Network (SONET) - Basic Description including

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- Multiplex Structure, Rates and Formats
 - 4. ANSI T1.106 - Digital Hierarchy - Optical Interface Specifications (Single Mode)
 - 5. ANSI T1.107 - Digital Hierarchy - Format Specifications
 - 6. ANSI/ATIS- 0600315.2007- Voltage Levels for DC-Powered Equipment Used in the Telecommunications Environment
- G. TIA – Telecommunications Industry Association
 - 1. ANSI / TIA Standard - 232
 - 2. ANSI / TIA Standard - 422
- H. Federal Communications Commission:
 - 1. FCC Rules - 47 CFR Part 1.1310
 - 2. FCC Rules – 47 CFR Part 101
 - 3. FCC Rules – 47 CFR Part 15
 - 4. FCC Rules – 47 CFR Part 2
- I. IEEE – Institute of Electrical and Electronics Engineers:
 - 1. IEEE 802.3 - 10/100/1000bT Ethernet interfaces
- J. ITU – International Telecommunication Union:
 - 1. IEEE 802.3 - 10/100/1000bT Ethernet interfaces
- K. ITU – International Telecommunication Union:
 - 1. ITU G. 8032 Ethernet Ring Protection
- L. Telcordia Technologies (formerly Bellcore):
 - 1. GR-499-CORE Transport Systems Generic Requirements (TSGR) Common Requirements, Issue 4
 - 2. TR-TSY-000752 Microwave Digital Radio Systems Criteria, Issue 1, October 1989
 - 3. GR-474-CORE Network Maintenance: Alarm and Control for Network Elements, Issue 2, May 2011
 - 4. GR-63 –Core Network Equipment-Building System (NEBS) Requirements: Physical Protection, Issue 4, April 2012
 - 5. SR-332 Special Report, Reliability Prediction Procedure for Electronic Equipment, Issue 3, February 2011
 - 6. GR-1089-CORE, Electromagnetic Compatibility and Electrical Safety Generic Criteria for Network Telecommunication Equipment, Issue 6, May 2011
- M. Codes and Standards of good practice issued by the following organizations:
 - 1. National Electric Manufacturers Association (NEMA)
 - 2. National Fire Protection Association (NFPA)
 - 3. Occupational Safety Health Administration (OSHA)
 - 4. Underwriters Laboratories (UL)

1.3 SYSTEM DESCRIPTION

- A. A network map of the proposed City of Moscow Ethernet interconnection network is shown in Figure 1 below. The network is made up of both microwave radio connections and fiber connections over the City of Moscow fiber network. The microwave radios operate in the 11

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GHz and 23 GHz under Part 101 of the FCC's Rules.

The frequency band to be employed for each path is shown Figure 1 below. The geographical coordinates and other sites details are shown in Table 2 of Section 33 83 00 – Land Mobile Radio and Antenna Systems.

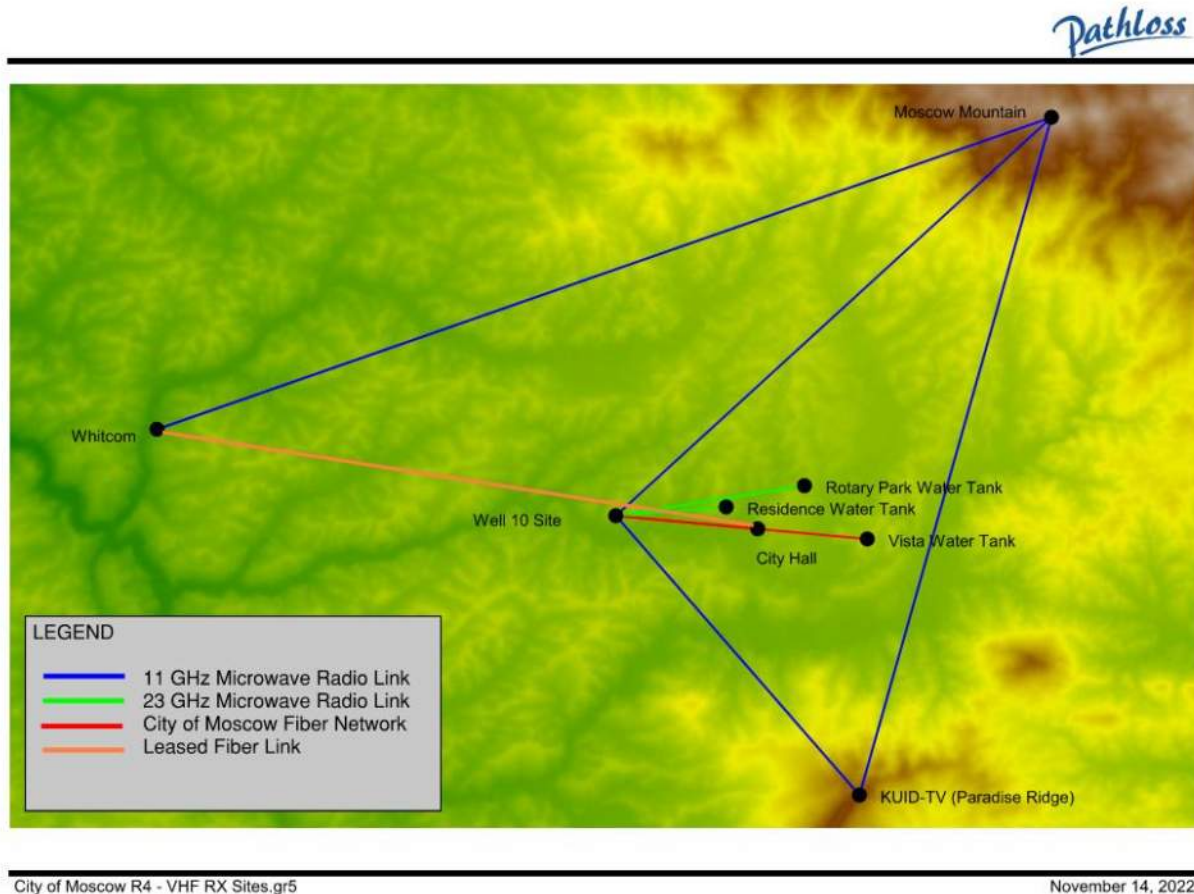


Figure 1 – Proposed City of Moscow Interconnect Network

- B. The microwave radio antennas to be provided and installed under this Section are listed in Table 1 below.
- C. Configuration of the microwave radios, including antenna mounting locations and equipment installation in equipment rack at each site is shown in the Contract Drawings.
- D. Antenna mounts compatible with the tower provided under this specification are to be provided and installed for all antennas provided under this contract, as listed in the drawings. The antenna schedule shown in the drawings includes a separate column for the antenna mounts, which shall be used to indicate the manufacturer and model/part numbers for all antenna mounts.

- E. Provide proposed system documentation and pricing for two system alternatives, as shown below.
 - 1. System Alternative #1 – Split system with indoor network interface and power supply unit and outdoor RF unit mounted on the antenna. Interconnections between indoor units and outdoor units provided with ½” coaxial cable, as specified herein. Configure radios for 1+1 MHSB operation.
 - 2. System Alternative #2 – Outdoor only system, with network interface at the RF unit mounted on the antenna. Power to radio supplied via POE interface. Configure radios for 2+0 operation with dual-polarized antennas.

1.4 PERFORMANCE REQUIREMENTS

- A. It is not the City’s intent to specify all technical requirements or to set forth those requirements adequately covered by applicable codes and standards. The Vendor's product shall meet the requirements of this specification and the applicable industry codes and standards.
- B. Upon acceptance of a purchase order based on this specification, the Vendor accepts full responsibility for engineering, design, material, and workmanship of the product and warrants that the product will satisfy the performance requirements of this specification.
- C. The work includes all items necessary for the safe, efficient and continuous operation of the equipment within the scope of this specification.
- F. The City requires that the selected vendor/integrator provide digital Microwave equipment that operates in the FCC Part 101 licensed bands in the 11 GHz and 23 GHz frequency bands. Bandwidth utilization shall be 100% packet based using Ethernet as the interface to each radio. The microwave equipment shall meet the minimum requirements outlined in this specifications document.
- G. The selected vendor/integrator shall provide all required frequency coordination and FCC licensing necessary to implement the City of Moscow interconnect system described in these Specifications.
- E. General Requirements
 - 1. All licensed microwave radios shall operate in spectrum allocated by the FCC under Part 101 as follows:
 - 11 GHz
 - 23 GHz
 - 2. Radio terminals are required to be an outdoor only or split (indoor/outdoor) product for use at 6 GHz and 11 GHz. Provide technical details and cost proposals for two alternative system configurations shown above in Section 1.3.D:
 - 3. Regardless of method of deployment of radios, the system shall be end-to-end compatible using a common packet switching, and service management platform.

4. The radio shall be capable of “nodal” operation supporting at least six (6) directions of transmission in a non-protected configuration or 3 directions in fully protected configuration.
5. Electrical interface shall be Ethernet. Ethernet layer shall be auto-negotiable at 10/100/1000 Mb/s. The Ethernet bandwidth shall be 155 Mb/s in 30 MHz channels.
6. The microwave radio equipment shall have remote access capability for diagnostics, monitoring of performance metrics and configuration data and remote configuration. The microwave radio equipment diagnostics, monitoring of configuration data and configuration shall be locally accessible via a laptop computer using a web browser.
7. Management System Support
 - a. Radio terminals shall have an Element Management System (EMS) or Microwave Craft Terminal (MCT) software for both local and remote operations, administration, maintenance and provisioning (OAM&P) of the complete radio system as a single Network Element (NE) – whether comprised of a simple terminal, and repeater, or a N-way hub.
 - b. The EMS shall be capable of end-to-end, point and click circuit provisioning of all traffic interfaces (radio and Ethernet) as well as service cross-connections.
 - c. The radio shall be capable of reporting alarm, status conditions as well as performance monitoring and diagnostic information to external Network Management System(s) via SNMPv3.
8. Indoor radio components shall be mountable in ANSI/ EIA 310 standard racks.
9. Radios shall support optional redundancy of system control and switching fabric.
11. The City will use standard Windows-based PCs for field configuration and diagnostics. Vendor shall provide a description of operating system, hardware requirements, and any additional required software.

F. General Equipment Specifications

1. Environmental and Physical Parameters
 - a. The microwave transceivers for all radio configurations shall be fully operational within the temperature range of 0° C to +50°
 - b. The baseband unit including layer 2 switch and chassis for tributary cards shall be fully operational within the temperature range of 0° C to +50° C.

- c. The indoor microwave radio equipment and all its systems and components quoted shall be fully self-contained and mount in standard ANSI/EIA 310 equipment racks.
- d. The waveguide interface for the outdoor RF units shall be the CPR type of the appropriate size for the selected frequency band. Vendor shall note if this is not the case, and shall include the required transition pieces in their proposal.
- e. The radios shall be NEBS Level 3 compliant.
- f. Vendor shall provide a certificate from a recognized laboratory of NEBS Certification. Vendor shall provide a copy of the NEBS tests and results at the request of the City.

2. Vibration

- a. The radio equipment, when mounted in an optional seismic style relay rack, shall meet the requirements of GR-63, for seismic and site vibrations. Also, the radio shall be resistant to the effects of mechanical shock (microphonic induced transmission impairments) caused by normal maintenance actions such as unit replacements.

3. Cooling

- a. The radio system shall have self-contained cooling systems to maintain continuous operation and specified performance under environmental temperatures ranging from 0° to 50° C.
- b. Fan units shall have redundant fan assemblies such that failure of an individual fan motor/blade assembly does not cause an interruption of traffic or degraded performance of the radio system. Such fan assembly failures shall also generate an alarm – both locally via contact closure as well as through the network management channel.

4. Electromagnetic Compatibility

- a. The radio equipment shall be designed to operate in a communications equipment environment installed in or near the vicinity of other types of equipment which may include other digital radio equipment, fiber optic terminal equipment, VHF/UHF base stations, and telephone signaling equipment.

5 Power Requirements

- a. The microwave radio equipment shall operate from a nominal -48 VDC power source per ANSI/T1 315.
- b. The microwave radio equipment shall allow the “hot” insertion and removal of radio transceiver, modem and tributary cards without service

interruptions or damage to themselves or other modules. The radio shall also be capable of “hot” insertion and removal of an out-of-service common equipment module.

- c. The microwave radio equipment shall restart with no loss of provisioning for interfaces upon the loss and regaining of power.

6. Alarms and Status Indications

- a. Each microwave radio equipment module shall have a visual alarm/status indication noting either “normal” or “alarm” condition. A summary remote alarm shall be available via dry contacts (Form C) indicating, as a minimum, microwave radio equipment alarm conditions for the following:

- 1. Critical Alarm
- 2. Major Alarm
- 3. Minor Alarm

G. Link and Network Topologies & Protection

- 1. The following supported configurations shall be supplied:
 - a. 1+0 (non-protected, single channel)
 - b. 1+1 Monitored Hot Standby
 - c. 2+0 (with dual-polarized antennas, for outdoor only systems)

H. RF Specifications and Features

- 1. All radios shall provide the following:
 - a. Transmitter output power (typical at 128 QAM, or 256 QAM in a 30 MHz channel and with reference to the antenna port)

Frequency Band	Minimum TX Power
11 GHz	+27.5 dBm
23 GHz	+27.5 dBm

- b. RF Switch for hot standby TX configuration
 - c. Auto-tuning when spare unit is installed
 - d. Standard transmitter-receiver filtering and combining using an integrated diplexer or separate TX and RX filters integrated into the radio’s antenna coupling unit.
- 2. Frequency Stability shall be +/- 10 ppm
- 3. Automatic Transmitter Power Control

- a. The radio shall support Automatic Transmitter Power Control with independently variable maximum, minimum, and operational threshold settings, all adjustable in 1dB steps. Range may be variable based on modulation setting, but in any case, shall be no less than 10 dB.
- 4. Compatibility with Antenna/Waveguide systems
 - a. Transmitter shall operate at full power with an Antenna/Waveguide Return Loss as high as 16 dB.

I. Packet Features & Specifications

- 1. Layer 2 Packet Switching
 - a. The radio shall employ a Layer 2 packet switch with a capacity of at least 2 Gb/s for a N-way nodal radio. The packet switch fabric shall have the option of being made redundant.
- 2. MEF 9 & 14 Compliance
 - a. The radio shall be MEF 9 and 14 compliant.
- 3. Packet Features and Options
 - a. Packet features and options shall include, but not limited to:
 - 1. VLAN
 - Port-based VLAN
 - 802.1Q Tag-based VLAN
 - VLAN steering
 - 2. QoS
 - Strict Priority, D-WRR with Bandwidth Management (Minimum rate guarantee, maximum rate limitation)
 - Classification: VLAN CoS/Diffserve
 - 3. Ethernet Protection Protocols
 - Ethernet Line Protection (G.8031), or
 - Ethernet Ring Protection (G.8032)
 - 4. Ethernet Synchronization:
 - SyncE 1588v2
- 4. Ethernet ports
 - a. For split systems with an indoor network interface unit, the core Ethernet switch shall provide a minimum of 3 Ethernet ports:
 - 1. Minimum of 3 ports with RJ45 (10/100/1000Base-T) interfaces.
 - 2. Minimum of 2 ports supporting Small Form Pluggable (SFP) SX, LX, ZX interfaces.
 - 3. The SFP and RJ45 operation may be on an exclusion basis provisioned via the EMS or craft interface terminal.

- a. For split systems with an indoor network interface unit, additional Ethernet ports may be enabled by insertion of optional Ethernet tributary cards:
 1. The Ethernet tributary card shall provide a minimum of 8 Ethernet ports:
 2. Minimum of 3 ports with RJ45 (10/100/1000Base-T) interfaces.
 3. Minimum of 2 ports supporting Small Form Pluggable (SFP) SX, LX, ZX interfaces.
 4. Ethernet tributary cards shall have their own Layer 2 switch capability with capacity of at least 2 Gb/s
 5. The radio shall be able of supporting at least 2 Ethernet tributary cards.
 6. Ethernet tributary cards shall have the option of being made 1+1 redundant, and offering full 1+1 redundancy on the Ethernet backplane and 1+1 redundancy on the SFP ports

J. Network Management

1. Network Management Interfaces

- a. The radio shall have an SNMPV3 interface for network management.
 1. SNMP Interface - The radio shall provide an SNMP network management interface capable of providing alarm data for the radio. The interface shall be compliant with version 2.0 and 3.0 of the SNMP standard. The Vendor shall state the specific alarm points supported.

2. Maintenance

- a. Normal maintenance actions that include replacements of failed or faulty redundant traffic processing units on the off-line portion of the radio shall not cause hits or impairments on the online portion of the radio.
- b. Test Points/Voltage Displays - Means shall be provided to measure or read-out critical voltage parameters within the radio. This may be satisfied through test points suitable for simple voltmeter connection or voltage reading displays using built-in devices in conjunction with a hand-held terminal or laptop PC. The following parameters, as a minimum, shall be able to be monitored in such a fashion:
 1. Station DC Voltage
 2. Direct measurement of transmitter power output and transmitter frequency via an integrated calibrated RF test port (SMA connector). An external waveguide directional coupler is not acceptable.

These shall be capable of being monitored at the far-end of the path using the remote display capability. The voltages shall be capable of being monitored at the network management center through use of the network management interface.

- c. Offline Diagnostics - Radio system shall provide diagnostic alarms and status on both online and off-line devices in redundant systems (hot-standby 1+1, frequency diversity 1:1 and space diversity receivers). As a minimum, the following parameters that shall be provided:

- 1. Transmitter – RF Transmit Power alarm
- 2. Transmitter – ATPC High Power alarm
- 3. Receiver – Radio Framing Loss alarm
- 4. Receiver – Total Bit Errors (counter, with local and remote reset capability)
- 5. Receiver – Total Errored Seconds
- 6. Receiver – Total Severely Errored Seconds
- 7. Receiver – Bit Error Rate

4. Manufacturing Process Quality

- a. In order to ensure the highest quality telecommunications equipment, the Vendor's manufacturing facility shall be TL 9000 certified.

5. Service Life

- a. The radio equipment shall be designed for a service life of at least 10 years.

6. Modulation Requirements

- a. Minimum modulation formats and channel bandwidths of 128 QAM, and 256 QAM with channel widths of 10 MHz 30 MHz are required.
- b. Optional modulation formats and channel bandwidths of QPSK, 16 QAM, 64 QAM, and 128 QAM and Bandwidths of 5 MHz are desired.

K. 6 GHz Radio System Requirements

1. Frequency Band

- a. Part 101: The radio system shall be capable of operation in the FCC Part 101 frequency bands of 5.925 – 6.425 GHz and 6.525 – 6.875 GHz.

2. Quantities & Ethernet Capacity Requirements

- a. The 11 GHz and 23 GHz radios shall be designed to provide the following minimum capacities relative to the radio channel size and modulation

Modulation	Channel Size	
	10 MHz	30 MHz
128 QAM	50 Mb/s	155 Mb/s
256 QAM	60 Mb/s	185 Mb/s

- b. Specific capacity requirements are stated in the Network Diagram shown in Figure 1 above.

3. Modulation Requirements

- a. Minimum modulation formats and channel bandwidths of 128 QAM and 256 QAM with channel widths of 10 MHz and 30 MHz are required.

4. RF Interfaces

- a. Any user-accessible physical RF connections within the radio equipment shall not employ semi-rigid coaxial cables due to problems with breaking of connectors with periodic maintenance. Only flexible RF cables may be used.
- b. External RF interface feeding to the antenna shall be CMR-137 waveguide flange interface. If a type CPR-137 flange is utilized, a CMR-137 to CPR-137 adaptor shall be provided.

5. Ethernet Provisioning Configuration

- a. The Ethernet interface shall be capable of being provisioned in the following configuration(s):

Non-protected

A & B Switched – Hot Standby

A & B Summed – Load balancing

6. Protection Configuration

- a. The radios shall be capable of being provisioned with the following protection configuration, which shall be self-contained including all protection switching equipment

1+0 (non-protected, single channel)

2+0 (with dual-polarized antennas, for outdoor only radios)

1+1 Hot Standby

L. 11 GHz Radio System Requirements

1. Frequency Band

- a. Part 101: The radio system shall be capable of operation in the FCC Part 101 frequency bands of 10.700 - 11.7 GHz

2. Quantities & Ethernet Capacity Requirements

- a. The 11 GHz radios shall be designed to provide the following minimum capacities relative to the radio channel size and modulation

Modulation	Channel Size		
	10 MHz	30 MHz	40 MHz
128 QAM	50 Mb/s	155 Mb/s	213 Mb/s
256 QAM	N/A	183 Mb/s	230 Mb/s

- b. Specific LINK capacity requirements are stated in the Network Design Specification.

3. Modulation Requirements

- a. Minimum modulation formats and channel bandwidths of 128 QAM and 256 QAM with channel widths of 10 MHz and 30 MHz are required.
- b. Optional modulation formats and channel bandwidths of 64 QAM, 128 QAM, 256 QAM and Bandwidths of 40 MHz are desired.

4. RF Interfaces

- a. Any user-accessible physical RF connections within the radio equipment shall not employ semi-rigid coaxial cables due to problems with breaking of connectors with periodic maintenance. Only flexible RF cables shall be used.
- b. External RF interface feeding to the antenna shall be a CPR- 90G waveguide flange interfaces for 11 GHz radios and. PBR-220 waveguide flange for 23 GHz radios.

5. Ethernet Provisioning Configuration

- a. The Ethernet interface shall be capable of being provisioned in the following configuration(s):

Non-protected

A & B Switched – Hot Standby

A & B Summed – Load balancing

6. Configuration

- a. The radios shall be provisioned with the following protection configuration, which shall be self-contained including all protection switching equipment

1+0 (non-protected, single channel)

1+1 Hot Standby

2+0 (with dual polarized antenna for outdoor only radios)

M. Transmission lines for Split (Indoor/Outdoor) systems.

1. All exposed antenna hardware must be S31600 stainless steel, brass, or C65100 low silicon bronze. Hot dip zinc galvanized steel meeting ASTM A-123, A-153, A-385 and B-695 may be used for mounting brackets.
2. Microwave Antenna Transmission Lines - for transmission lines from microwave radio indoor units to outdoor RF units, use Commscope LDF4-50A ½” (or approved equivalent) foam dielectric coaxial cable with Type N male connectors (or appropriate connector for microwave radio indoor units, outdoor RF units and surge arrestor).
3. All connections between transmission lines and outdoor microwave radio RF units shall be weatherproofed using the weatherproofing kit recommended by the manufacturer, Commscope 221213 (or approved equivalent).
4. Hangers used to support transmission line on transmission line bridge, transmission line ladder, and other locations where support members with mounting holes are used shall attach to support members with a bolt installed through the mounting hole and a lock washer and nut on the back side of the support member. “Snap-in” hangers are not permitted.

5. Provide Valmont Structures® waveguide entries (or approved equivalent) for the waveguides, as described in Section 33 83 00.
6. To ensure that antennas and waveguides meet specifications after installation, test transmission lines as described in Section 3.3 below. Submit a detailed test plan to City for approval in advance of these tests. Record and sign tests and present tests to City in printed format.
7. Antenna mounting structures and devices shall be mechanically compatible with the antenna support structures at each of the City of Moscow simulcast repeater sites and voting receiver sites and shall be adequate to support each antenna on the tower or other support structure.
8. Transmission lines shall have their outer conductors bonded to the tower at the antenna end, as close to the antenna as possible, to the ground bars at the base of the tower, at the building entry port, and inside the building as close to the entry port as possible, using the manufacturer's recommended grounding kit. Grounding kit wires used to connect transmission line and waveguide ground kits to tower ground lugs or ground bars shall be continuous lengths of wire supplied by the manufacturer as part of the ground kit. Splices in ground kit wires are not permitted.

N. Ethernet Cables for Outdoor Only Systems.

1. Ethernet cables for connections between outdoor-only microwave radios and Ethernet switches inside the equipment shelters shall be outdoor rated, flooded CAT6 ethernet cable (Superior Essex EnduraGain OSP Shielded 04-110-64, or approved equivalent).

Specifications for this cable are shown below:

SPECIFICATIONS	
Pair Count	4
Conductor	Solid annealed copper
AWG (mm)	23 (0.57)
Insulation	Polyolefin
Separator	Polyolefin cross-web
Shield/Armor	BBDN6A: Electrically continuous 0.008 in (0.20 mm) polymer coated smooth aluminum tape shield, applied with an overlap BBDG6A: Electrically continuous 0.005 in (0.13 mm) corrugated copper-clad steel armor, applied with an overlap
Dry Water Block	BBDN6A: SAP powder BBDG6A: SAP yarn
Jacket	Black, sunlight and weather resistant polyethylene
Characteristic Impedance Ohms	100 ± 15
Nominal Velocity of Propagation %	68
Performance Compliance	ANSI/TIA-568-C.2 ANSI/ICEA 5-107-704-2006 RoHS-compliant REACH-compliant

1.5 SUBMITTALS

- A. Shop Drawings: Indicate proposed locations and details of installation for each antenna and transmission line to be installed under this Section. Indicate proposed configuration of specific transmission line at the transmission line entry port and at the interior (radio) side of the waveguide entry. Specifically identify the antenna, tower leg, and elevation proposed to be associated with each transmission line.
- B. Product Data: Submit manufacturers cut sheets for antennas, transmission lines and associated equipment. Submit manufacturer's cut sheets for all antenna mounts, and add manufacturer and model number for antenna mounts to the antenna schedule shown in the drawings. Submit revised antenna schedule with antenna mount information included.
- C. Test Reports: Submit test reports provided by the manufacturer for each antenna and transmission line.
- D. Manufacturer's Installation Instructions: Submit manufacturer's installation instructions for all antennas, antenna support structures, transmission lines, transmission line connectors, transmission line ground kits transmission line entry ports, grounding bars and surge suppressors provided under this Section.

1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record as-built tower locations and details of installation for each antenna and waveguide installed under this Section. Record and document configuration of

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specific waveguides at the waveguide entry port and at the interior (radio) side of the entry port. Specifically identify the antenna, tower leg, and elevation associated with waveguide.

1.7 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with a minimum of five (5) years demonstrated experience in the installation of land mobile and microwave radio equipment, antennas and waveguides/transmission lines with a documented history of neat and workmanlike installation practices. Provide photo documentation of previous installation work comparable to the work called for in these specifications. Provide project references (including customer contact information) for at least three (3) previous projects with work comparable to the work called for in these specifications.

1.8 PRE-INSTALLATION MEETINGS

- A. Convene a pre-installation meeting a minimum of one week prior to commencing work of this section.
- B. Attendance is to include all parties directly affecting the work of this section.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products with adequate protection against damage.
- B. Accept antennas, waveguides, and associated equipment on site or at Contractor's local storage facility in the Honolulu area. Inspect for damage.
- C. Arrange for transportation of all equipment from local storage facility to Puu Manawahua site. Take care to assure that waveguides are protected from damage and from rain and moisture as they are transported, and once they are delivered to the job site. Keep the ends of waveguide runs capped to avoid migration of water into the waveguides during transport, storage or installation. Waveguides are especially delicate and subject to damage if they are uncoiled from their spool prior to transport or prior to actual installation on the tower. Take steps to assure that waveguides are not twisted, dented or otherwise distorted during transport and installation.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Do not install transmission line connectors or transmission line weatherproofing during inclement weather.

1.11 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.12 SEQUENCING

- A. Sequence work to coordinate with installation and alignment of microwave system antennas.

1.13 COORDINATION

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- B. Coordinate work with work of others affected by work of this section, including those performing microwave antenna and transmission line installation and alignment and those performing land mobile radio antenna and transmission line equipment.

1.14 WARRANTY

- A. Provide manufacturer's standard warranty.

PART 2 PRODUCTS

2.1 PRODUCT

- A. Product Description: the products described in this section include antennas, waveguides, grounding kits, weatherproofing materials, transmission line entry ports, other equipment required to implement the microwave systems in the Puu Manawahua new Communications Room, and microwave antenna systems on the new Puu Manawahua tower.

2.2 COMPONENTS

- A. Antennas - The antenna manufacturers and model numbers for the antennas to be mounted on the towers and other antenna support structures at the City of Moscow are show above in Table 1. No substitutions may be made for these antennas without the written consent of the City. Substitution requests are required prior to bid and must be described n the general terms and conditions (GTC).
- B. Microwave Radios – Provide and install new 155 Mbps microwave radios at the at the City of Moscow Sites, as shown in Figure 1 above. Configure radios for 1+1 MHSB (monitored hot-standby) operation (for split systems provided under Alternative 1) or 2+0 operation with dual-polarized antennas (for outdoor only systems provided under Alternative 2). Mount indoor units for split systems in the radio equipment rack at each site, as shown in the Contract Drawings. DC power for the radios is to be provided from the -48 VDC systems at each site, as shown in the drawings.
- C. For outdoor only radios, provide and install suitable POE injectors (MSTronic MIT-65G-4856 112W DC/DC Gigabit PoE Injector or approved equivalent) to provide power to the radios if they are powered over the Ethernet cable connecting them to the network Provide all interconnecting cables required to interconnect the Ethernet interface on each radio to the Ethernet switch at each City of Moscow simulcast repeater site or voting receiver site.

Specifications for the POE injectors are shown below:

1. INPUT :

Input Voltage:	40Vdc to 72Vdc Normal = 56V
Input Current:	3.6A at 40Vdc @ Full Load
	2.6 A at 56Vdc @ Full Load
	2.0 A at 72Vdc @ Full Load

2. OUTPUT :

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Output Voltage & Current:

OUTPUT	56V
Max. load	2.0A
Power	112W
Min. Load	0.01A
Load reg.	% 5%
Line reg.	% 1%
Ripple %	1%
Noise %	1%
TOTAL POWER :	112W

Note 1: Noise bandwidth is from DC to 20Mhz. Ripple & Noise is measured by Paralleling a 0.1uF metalize capacitor on the test point.

EFFICIENCY : 80% min at Full Load , 40Vdc ~ 72Vdc Input Voltage

PROTECTION

Short Circuit Protection Output Short GND Terminal will not damage the Power Supply and will Auto-Reset.

Input Fuse Protection.

Safety Standard : meet UL1950, CSA 22.2 &TUV EN60950-1.

EMC : meet FCC Class A , EN55022 Class A

Over Current : 110% ~ 130% @All DC Input F.L

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions at the City of Moscow sites before starting work.
- B. Beginning of work means installer accepts existing surface and substrate conditions.

3.2 INSTALLATION

- A. Install antennas, transmission lines, connectors, entry ports, grounding kits, and weatherproofing in accordance with manufacturer's instructions.
- B. Install transmission line hangers at 3-foot intervals on the horizontal runs across the transmission line bridge and at 3-foot intervals on vertical runs up the tower.
- C. Weatherproof grounding kits using the materials and following the procedures contained in grounding kits specified above.
- D. Microwave Antenna and Transmission Line Installation Requirements
 - 1. These requirements apply to the installer mounting the microwave antennas and installing the microwave transmission lines.

- a. Confirm correct antenna polarization and rough alignment.

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- b. Align antenna using existing signal from far end of path, using a spectrum analyzer to observe signal level.
- c. Sweep waveguides for return loss and provide sweep results to City. Sweeps for each waveguide to include waveguides terminated with an appropriate load and connected to the antenna.
- d. Make final connections to equipment and confirm correct signal levels; Contractor to make final antenna adjustments at direction of City personnel.

3.3 FIELD QUALITY CONTROL AND TESTING

A. Performance Verification & Acceptance Testing

1. Path Design & Performance

- a. Vendors shall perform their own calculations and studies, including field verification as required to achieve path reliability and system performance objectives.
- b. The annual one-way path propagation reliability for each path shall be a minimum of 99.999% based on a maximum BER of 10^{-6} .
- c. Propagation outage and reliability shall be based on the Vigants model (Ref. "Space Diversity Engineering", Bell System Technical Journal, January, 1975):

$$P = 2.5 \times 10^{-6} \times C \times f \times d^3 \times 10^{-A/10}$$

Where:

P = Fade Probability
 C = Climate/Terrain factor
 f = frequency in GHz
 d = path length in miles
 A = effective (composite) fade margin

- d. A climate factor of $C = 2$ shall be assumed.
- e. The effective or composite fade margin shall be calculated using:

$$A = -10 \times \log (10^{-DFM/10} + 10^{-TFM/10})$$

Where:

DFM = Dispersive Fade Margin
 TFM = Thermal Fade Margin

- f. If space diversity is required to meet the specified outage objectives, the following shall be used to calculate the diversity improvement factor (Vigants):

$$I_{sd} = 7 \times 10^{-5} \times f \times v^2 \times s^2 \times 10^{A/10/d}$$

Where:

v = difference in main and diversity signals

s = vertical spacing of antennas in feet

- g. Rainfall outage calculations shall assume Crane 96, Zone C2.

2. Latency Criteria

- a. Vendor shall indicate worst-case latencies for proposed MW Radio equipment; back-to-back means with effective zero transmission propagation delays between the two sets of connected equipment for the following scenarios:

1 Hop

5 Hops

And the following payloads

Ethernet: from the originating Ethernet port on the Core Switch Module to the end Ethernet port on the Core Switch Module at the far-end site.

3. The following tests shall be conducted to verify that the digital microwave 155 mbps performance meets the requirements of the specification

- a. BER (Bit Error Rate)

A 2-hour one-way (loopback) test shall be conducted and the resulting BER shall be equal to no more than 15 errored seconds during a 2-hour, one-way (loopback) test.

- b. Jitter/Wander

Jitter/Wander measurements shall indicate 150 ns for an observation time of 1000 seconds.

4. Test transmission lines with an appropriate termination after they are installed on the tower and before they are connected to the associated microwave radio to confirm that insertion loss and VSWR (Return Loss) conform to the manufacturer's specifications. Provide written results to City for each test.
5. Perform distance-to-fault measurements with the transmission line shorted at the radio end to confirm that there are no significant impedance "bumps" in each waveguide run.

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Provide written results to City for each test.

6. Test antennas before they have been connected to their associated radio by sweeping each antenna VSWR (Return Loss) over the specified bandwidth of the antenna. Provide written results for each test.
7. All test and measurement equipment utilized for installation, and testing of the system shall have been recently calibrated to the test equipment manufacturer's specifications by a recognized calibration laboratory. Contractor shall provide proof of calibration certification prior to commencing ant testing of the system to the City.

3.4 SCHEDULES

- A. Antenna schedule, See Table 1 above.

3.5 CLEANUP

- A. Upon completion of this section of work, remove debris. Repair damages due to installation of this section of work.

END OF SECTION 33 83 40

SECTION 33 83 00 LAND MOBILE RADIO SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Contractor to provide and install voice radio systems, including all component parts reasonably incidental to providing a complete system.
2. Land mobile radio systems are defined to include, but are not limited to the following components at the City of Moscow radio sites described in this Specification:

VHF Narrowband Analog radio base stations
VHF Narrowband Analog radio voting receivers
Receiver Voting Equipment
Site Controllers Required for Simulcast Operation and for Receiver Voting
Transmitter Combiners
Receiver Multicouplers
Monitoring and Alarm Systems
Ethernet switches
Equipment Racks
GPS Oscillators
Transmission Lines and Antennas
Surge Arrestors

B. Related Sections

1. Division 01 Sections.
2. Section 26 20 00 – DC Power and Alarm Systems
3. Section 33 83 40 Microwave Radio System
4. Section 16050 - Basic Electrical Materials and Methods
5. Section 16075 – Electrical Identification

1.2 REFERENCES

A. ANSI/NFPA

1. ANSI/NFPA 70 - National Electrical Code

B. Federal Communications Commission:

1. 47 CFR 1.1310 – Radiofrequency Radiation Exposure Limits

1.3 SYSTEM DESCRIPTION

A. SYSTEM OVERVIEW

This Specification contains the requirements for the procurement, installation, configuration and testing of new VHF base station radio equipment that will make up a new VHF simulcast radio system with three base station repeater sites, and three voting receiver sites. The system will have two simulcast subsystems, as described below, and a voting receiver system incorporating all of the receivers in both simulcast sub-systems.

The Contractor's responsibility shall be to provide and install, configure, test and document the radio systems at the new and existing sites described in this specification.

Radio system equipment including VHF base station radios, site controllers, transmitter combiners and receiver multicouplers, monitoring and alarm units for the VHF and microwave radios, Ethernet switches, GPS oscillators, transmission lines and antennas, surge arrestors and other equipment required to provide a complete and functional simulcast system with receiver voting will be provided and installed by the contractor, as described below.

All cabling and other ancillary equipment required to interconnect these items of equipment into fully functional systems shall be provided and installed by the contractor.

Microwave radio equipment and backup DC Power systems will also be installed under this contract, as described in Section 33 83 40 and Section 26 20 00.

Because VHF analog base stations are available from various vendors, and because some radios require -48 VDC power and some radios require 12 VDC (nominal 13.6 VDC) power, these specifications and the attached Contract Drawings show typical equipment configurations and equipment rack layouts for both -48 VDC equipment and for 12 VDC equipment. Proposers may specify a system configuration with either power supply alternative, provided that all of the radio equipment (excluding the transmitter combiner and receiver multicoupler equipment), microwave or fiber interconnect equipment and backup DC power equipment fits into a single EIA 19" equipment rack (because of equipment space limitations at some of the repeater sites). The configuration of equipment shown in the Contract Drawings is typical, and Proposers may provide a different configuration of equipment as long as it meets the space requirement described above.

Existing City of Moscow Radio System

The existing City of Moscow Radio System consists of a primary dispatch channel and a tactical channel for the Moscow Fire Department (MFD), a primary dispatch channel for the Moscow Police Department (MPD), and a primary dispatch channel for the City of Moscow Public Works Department.

Both the Fire dispatch and the Fire TAC channel have stand-alone base station repeaters at the Moscow Mountain site. The Moscow Police Department primary dispatch channel now operates from three stand-alone repeater sites within the City of Moscow: the Latah County Courthouse, the Rotary Park Water Tank, and a site at the golf course on the University of Idaho campus. The MPD users select the appropriate repeater site based on their location, using CTCSS tones in their mobile and portable radios. The Public Works channel operates from a stand-alone repeater site at the Latah County Courthouse. The MFD and MPD channels are connected to the Whitcom dispatch center, while the Public Works channel is not connected to dispatch; it is dispatched by Public Works personnel using a fixed control station operating on the Public Works channel.

Proposed New City of Moscow Radio System

The frequencies and channel names that will be used in the new system are shown below in Table 1.

City of Moscow VHF Simulcast TX Channels	
153.8000	MFD Main Dispatch Channel - TX (Moscow Mountain, KUID-TV & Well 10 Sites)
154.8900	MFD TAC Channel #1 - TX (Moscow Mountain, KUID-TV & Well 10 Sites)
155.6775	MPD Main Dispatch Channel - TX (Moscow Mountain, KUID-TV & Well 10 Sites)
154.4450	Shared TAC Channel #1 - TX (Well 10, KUID-TV and City Hall Sites)
159.2100	Shared TAC Channel #1 - TX (Well 10, KUID-TV and City Hall Sites)
City of Moscow Public Works TX Channel	
153.9800	Public Works Channelk - TX
City of Moscow VHF Simulcast RX Channels	
155.8875	MFD Main Dispatch Channel - RX (Moscow Mountain, KUID-TV & Well 10 Sites)
159.0000	MFD TAC Channel #1 - RX (Moscow Mountain, KUID-TV & Well 10 Sites)
158.9850	MPD Main Dispatch Channel - RX (Moscow Mountain, KUID-TV & Well 10 Sites)
154.7250	Shared TAC Channel #1 - TX (Well 10, KUID-TV and City Hall Sites)
154.7100	Shared TAC Channel #2 - TX (Well 10, KUID-TV and City Hall Sites)
City of Moscow Public Works RX Channel	
155.7750	Public Works Channel - RX

Table 1 – New System Frequencies and Channel Names

The configuration and locations of the sites that make up the new City of Moscow VHF simulcast radio system are shown below in Table 2. The overall system consists of two simulcast subsystems: one simulcast subsystem made up of the Moscow Mountain, KUID-TV and Well 10 repeater sites and the other simulcast subsystem make up of the City Hall, KUID-TV and Well 10. The system also includes three receive-only voting receiver sites located at the Residence Water Tower, the Rotary Park Water Tower and the Vista Water Tank, all within the City of Moscow.

The Moscow Mountain, KUID-TV and Well 10 simulcast subsystem has three channels: the MFD main dispatch channel, the MFD TAC channel and the MPD main dispatch channel.

The City Hall, KUID-TV and Well 10 simulcast subsystem has two channels: the two shared TAC channels.

The voting receivers at all of the simulcast repeater sites and at all of the voting receiver sites are to be configured as a single voting receiver subsystem, with all sites included in the receiver voting.

The Public Works repeater in the Courthouse will remain a stand-alone repeater with no connection to dispatch or to the other subsystems.

Site	Geographical Coordinates		Elevation (Feet AMSL)	Shelter Type	Antenna Support Structure
Simulcast Sub-System #1 (TX Frequencies: 153.8000 MHz, 153.8900 MHz & 155.6775 MHz)					
Moscow Mountain	46-44-14.6 N	116-59-44.6 W	4485	Existing Shelter	Existing Lattice Tower
KUID-TV	46-40-54.0 N	116-58-17.0 W	3567	Existing Shelter	Existing Lattice Tower
Well 10	46-44-06.7 N	117-02-22.9 W	2625	Existing Well House Building	New Monopole
Simulcast Sub-System #2 (TX Frequencies: 154.4450 MHz & 159.2100 MHz)					
Well 10	46-44-06.7 N	117-02-22.9 W	2625	Existing Well House Building	New Monopole
City Hall			2645	City Hall Equipment Room	TX and RX Tripod Antenna Supports on Roof
KUID-TV	46-40-54.0 N	116-58-17.0 W	3567	Existing Shelter	Existing Lattice Tower
Public Works Repeater (TX Frequency: 153.9800 MHz) Stand-Alone Repeater					
Latah County Courthouse	46-43-50.3 N	116-59-48.6	2648	Courthouse Building	Existing Guyed Tower
Voting Receiver Sites (RX Frequencies: 155.8875 MHz, 159.0000 MHz, 158.9850 MHz, 154.7250 MHz & 154.7100 MHz)					
Residence Water Tower	46 44 12.7 N	117 00 30.7 W	2678	New Outdoor Cabinet	Water Tower
Rotary Park Water Tower	46 44 26.9 N	116 59 12.1 W	2680	New Outdoor Cabinet	Water Tower
Vista Water Tank	46 43 50.5 N	116 58 8.7 W	2750	Existing Equipment Shelter	Existing Pole
NOTE: The RX frequencies shown for the Voting Receiver Sites are also voted at the simulcast sub-system sites (except 154.7250 MHz & 154.7100 MHz at the Moscow Mountain site; these channels are not present at that site.)					

Table 2 – Configuration and Location of City of Moscow Repeater and Voting Receiver Sites

The frequencies and antennas used at each site, along with antenna elevations above ground, nominal transmitter output power and Effective Radiated Power for each frequency at each repeater site are shown below in Table 3. The frequencies and antennas use at each voting receiver site are shown below in Table 4. Cut sheets for the antennas shown in Table 3 and Table 4 are shown in Appendix 2.

Repeater Site Location/Frequency	TX or RX Antenna Elevation	TX or RX Antenna Elevation	TX Combiner Output	RX Multicoupler Input	Antenna Type	Antenna Manufacturer	Antenna Model	Gain (dBd)	Orientation (° True)	Nominal	Effective	Effective	Simulcast Delay Offset (µSec)
	AGL [Feet [Base of Antenna]	AGL [Base of Antenna] (Meters)								Transmitter Output Power (Watts)	Radiated Power (Watts)	Radiated Power (dBm)	
Moscow Mountain													
TX Frequency #1 - 153.8000 MHz	55	16.8	TX Ant #1		OMNI Co-linear Whip	Sinclar	D222-SF8PASNM (6 dBd GAIN OFFSET	6.0	N/A	100.0	100.0	50.0	0
RX Frequency #1 - 155.8875 MHJz	120	36.6		RX Ant #1	OMNI Co-linear Whip	Telewave	PATTERN)	6.0	N/A	N/A	N/A	N/A	N/A
TX Frequency #2 -154.8900 MHz	55	16.8	TX Ant #1		OMNI Co-linear Whip	Sinclar	D222-SF8PASNM (6 dBd GAIN OFFSET	6.0	N/A	25.0	7.20	38.6	0
RX Frequency #2 - 159.0000 MHz	120	36.6		RX Ant #1	OMNI Co-linear Whip	Telewave	ANT150F6	6.0	N/A	N/A	N/A	N/A	N/A
TX Frequency #3 - 155.6775 MHz	55	16.8	TX Ant #1		OMNI Co-linear Whip	Sinclar	D222-SF8PASNM (6 dBd GAIN OFFSET	6.0	N/A	25.0	11.0	40.4	0
RX Frequency #3 - 158.9850 MHz	120	36.6		RX Ant #1	OMNI Co-linear Whip	Telewave	ANT150F6	6.0	N/A	N/A	N/A	N/A	N/A
KUID-TV													
TX Frequency #1 - 153.8000 MHz	37	11.3	TX Antenna 3		OMNI Co-linear Whip	Telewave	ANT150F2	2.5	N/A	50.0	23.0	43.6	7
RX Frequency #1 - 155.8875 MHJz	187	57.0		RX Antenna 2	OMNI Co-linear Whip	Telewave	ANT150F2	2.5	N/A	N/A	N/A	N/A	N/A
TX Frequency #2 -154.8900 MHz	37	11.3	TX Antenna 3		OMNI Co-linear Whip	Telewave	ANT150F2	2.5	N/A	50.0	23.0	43.6	7
RX Frequency #2 - 159.0000 MHz	187	57.0		RX Antenna 2	OMNI Co-linear Whip	Telewave	ANT150F2	2.5	N/A	N/A	N/A	N/A	N/A
TX Frequency #3 - 155.6775 MHz	37	11.3	TX Antenna 3		OMNI Co-linear Whip	Telewave	ANT150F2	2.5	N/A	50.0	23.0	43.6	7
RX Frequency #3 - 158.9850 MHz	187	57.0		RX Antenna 2	OMNI Co-linear Whip	Telewave	ANT150F2	2.5	N/A	N/A	N/A	N/A	N/A
TX Frequency #4 - 154.4450 MHz	37	11.3	TX Antenna 1		Log Periodic	Kathrein-Scala	CL7-150	7.3	320	25.0	15.0	41.8	
RX Frequency #4 - 154.7250 MHz	197	60.0		RX Antenna 1	Log Periodic	Kathrein-Scala	CL7-150	7.3	335	N/A	N/A	N/A	N/A
TX Frequency #5 - 159.2100 MHz	37	11.3	TX Antenna 2		Log Periodic	Kathrein-Scala	CL7-150	7.3	5	15.0	7.0	38.5	
RX Frequency #5 - 154.7100 MHz	187	57.0		RX Antenna 2	OMNI Co-linear Whip	Telewave	ANT150F2	2.5	N/A	N/A	N/A	N/A	N/A
Well 10													
TX Frequency #1 - 153.8000 MHz	55	16.8	TX Ant #1		External Dipole Array	Sinclair	SD222-SF8PASNM (6 dBd GAIN OFFSET PATTERN)	6.0	105		100	50.0	0
RX Frequency #1 - 155.8875 MHJz	80	24.4		RX Ant #1	OMNI Co-linear Whip	Telewave	ANT150F6	6.0	N/A	N/A	N/A	N/A	N/A
TX Frequency #2 -154.8900 MHz	55	16.8	TX Ant #1		Single TX Antenna - See 153.8000 MHz Above			6.0	105	75	75.0	48.8	0
RX Frequency #2 - 159.0000 MHz	80	24.4		RX Ant #1	Single RX Antenna - See 155.8875 MHz Above			6.0	N/A	N/A	N/A	N/A	N/A
TX Frequency #3 - 155.6775 MHz	55	16.8	TX Ant #1		Single TX Antenna - See 153.8000 MHz Above			6.0	105	100	100.0	50.0	0
RX Frequency #3 - 158.9850 MHz	80	24.4		RX Ant #1	Single RX Antenna - See 155.8875 MHz Above			6.0	N/A	N/A	N/A	N/A	N/A
TX Frequency #4 - 154.4450 MHz	55	16.8	TX Ant #1		Single TX Antenna - See 153.8000 MHz Above			6.0	105	50	40.0	46.0	0
RX Frequency #4 - 154.7250 MHz	80	24.4		RX Ant #1	Single RX Antenna - See 155.8875 MHz Above			6.0	N/A	N/A	N/A	N/A	N/A
TX Frequency #5 - 159.2100 MHz	55	16.8	TX Ant #1		Single TX Antenna - See 153.8000 MHz Above			6.0	105	75	70.0	48.5	0
RX Frequency #5 - 154.7100 MHz	80	24.4		RX Ant #1	Single RX Antenna - See 155.8875 MHz Above			6.0	N/A	N/A	N/A	N/A	N/A
City Hall													
TX Frequency #1 - 154.4450 MHz	50	15.2	TX Ant #1		OMNI Co-linear Whip	Telewave	ANT150F2	2.5	xxx	100	56.0	47.5	0
RX Frequency #1 - 154.7250 MHz	50	15.2		RX Ant #1	OMNI Co-linear Whip	Telewave	ANT150F2	2.5	N/A	N/A	N/A	N/A	N/A
TX Frequency #2 - 159.2100 MHz	50	15.2	TX Ant #1		Single TX Antenna - See 154.4450 MHz Above			6.0	xxx	100	70.0	48.5	0
RX Frequency #42- 154.7100 MHz	50	15.2		RX Ant #1	Single RX Antenna - See 154.7250 MHz Above			6.0	N/A	N/A	N/A	N/A	N/A
Courthouse													
Public Works Channel Only (Stand-Alone Repeater)													
TX Frequency #1 - 153.9800 MHz	55	16.8	Duplexer TX In		OMNI Co-linear Whip	Telewave	ANT150F6	6.0	N/A	100	100	50.0	N/A
RX Frequency #1 - 155.7750 MHz	55	16.8		Duplexer RX Out	Duplex TX/RX Antenna See 153.9800 MHz			6.0	N/A	N/A	N/A	N/A	N/A

Figure 3 – Frequencies, Antennas, Nominal TPO and Effective Radiated Power by Site – Repeater Sites

Repeater Site Location/Frequency	TX or RX Antenna Elevation AGL (Feet) [Base of Antenna]	TX or RX Antenna Elevation AGL [Base of Antenna] (Meters)	TX Combiner Output	RX Multicoupler Input	Antenna Type	Antenna Manufacturer	Antenna Model	Gain (dBd)	Orientation (° True)
Voting Receiver Sites (NW Water Tower, Orchard Avenue Water Tower, Vista Water Tank)									
RX Frequency #1 - 155.8875 MHz									
Residence Water Tower	55	16.8	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A
Rotary Park Water Tower	55	16.8	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A
Vista Water Tank	45	13.7	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A
RX Frequency #2 - 159.0000 MHz									
Residence Water Tower	55	16.8	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A
Rotary Park Water Tower	55	16.8	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A
Vista Water Tank	45	13.7	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A
RX Frequency #3 - 158.9850 MHz									
Residence Water Tower	55	16.8	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A
Rotary Park Water Tower	55	16.8	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A
Vista Water Tank	45	13.7	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A
RX Frequency #4 - 154.7250 MHz									
Residence Water Tower	55	16.8	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A
Rotary Park Water Tower	55	16.8	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A
Vista Water Tank	45	13.7	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A
RX Frequency #4 - 154.7100 MHz									
Residence Water Tower	55	16.8	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A
Rotary Park Water Tower	55	16.8	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A
Vista Water Tank	45	13.7	N/A		OMNI Co- linear Whip	Telewave	ANT150F6	6.0	N/A

Figure 4 – Frequencies and Antennas by Site – Voting Receiver Sites

The geographical coordinates of each of the simulcast repeaters sites, the voting receiver sites and the Whitcom site are shown below in Table 5.

Site name	Latitude	Longitude
Courthouse	46 43 50.23 N	116 59 48.37 W
KUID-TV (Paradise Ridge)	46 40 54.00 N	116 58 17.00 W
Moscow Mountain	46 48 40.95 N	116 55 02.94 W
NW Water Tank	46 44 12.71 N	117 00 30.70 W
Orchard Avenue Water Tank	46 44 27.55 N	116 59 12.02 W
Vista Water Tank	46 43 50.32 N	116 58 10.47 W
Well10	46 44 06.70 N	117 02 21.70 W
Whitcom	46 45 05.96 N	117 10 03.00 W

Table 5 – Site Geographical Coordinates

B. The subsystems and system components to be provided installed, configured and tested as described in this Specification include:

1. VHF Analog Narrowband radios, consisting of the following equipment:

- a.) VHF analog narrowband base station radios, configured as repeaters and programmed for operation on the frequencies and with the nominal transmit power output levels listed in Table 2 above, as follows:
- b.) Moscow Mountain Site – 3 base station repeaters
- c.) KUID-TV Site – 5 base station repeaters
- d.) Well 10 Site – 5 base station repeaters
- e.) City Hall Site – 2 base station repeaters
- f.) Courthouse Site – 1 base station repeater
- g.) General product specifications for the base station repeaters are shown below in Section 2.1.B
- h.) Install the base station repeaters in the radio equipment rack at each site, as shown in the Contract Drawings.

2. VHF RF power amplifiers consisting of the following equipment:

- a.) If external (i.e., amplifiers external to the base station radio chassis) RF power amplifiers are required to produce the nominal Transmitter Output Power shown for each frequency at each site in Table 2 above, provide and install external RF power amplifiers (Crescend Technologies P10-XEA-C7-001[100 Watts] or P5-

XDE1-C7-001 [50 Watts], where the X in the part number indicates the required input power) as follows.

- b.) Moscow Mountain Site – 1 100-Watt External RF Power Amplifier
 - c.) KUID-TV Site – 3 50-Watt External RF Power Amplifiers
 - d.) Well 10 Site - 5 100-Watt External Power Amplifiers
 - e.) City Hall Site – 2 100-Watt External Power Amplifiers
 - f.) Detailed product specifications for these external RF power amplifiers are shown below in Section 2.1.C.
 - g.) Install the external RF power amplifiers in the radio equipment rack at each site, as shown in the Contract Drawings.
3. Provide and install transmitter combining and receiver multicoupling equipment at the simulcast repeater sites, the voting receiver sites and the Courthouse site, consisting of the following equipment:
- a.) TX-RX Systems Transmitter Combiner/Receiver Multicoupler Systems
 - b.) Moscow Mountain Site – TXRX Systems 74-37-22185-A-MM VHF Transmitter Combiner/Receiver Multicoupler System (or approved equivalent)
 - c.) KUID-TV Site – TXRX Systems 74-37-22185-A-KTV VHF Transmitter Combiner/Receiver Multicoupler System (or approved equivalent)
 - d.) Well 10 Site - TXRX Systems 74-37-22185-A-W10 VHF Transmitter Combiner/Receiver Multicoupler System (or approved equivalent)
 - e.) City Hall Site - TXRX Systems 74-37-22217-A-CTH VHF Transmitter Combiner/Receiver Multicoupler System (or approved equivalent)
 - f.) Residence Water Tower Site - TXRX Systems 42-37-22204-A-CM VHF Receiver Multicoupler System (or approved equivalent)
 - g.) Rotary Park Water Tower Site - TXRX Systems 42-37-22204-A-CM VHF Receiver Multicoupler System (or approved equivalent)
 - h.) Vista Water Tank Site - TXRX Systems 42-37-22204-A-CM VHF Receiver Multicoupler System (or approved equivalent)
 - i.) Courthouse Site- Telewave TPRD 1556 VHF Duplexer (or approved equivalent)

- j.) Detailed specifications for the combining systems are shown in Appendix 1. Detailed Specifications for the duplexer are shown in Section 2.1.D below.
 - k.) Transmitter combiner/receiver multicoupler systems specified above include 19" rack-mounting for cavities and associated combining equipment.
 - l.) The contractor shall be responsible for cables from the combining system to the surge arrestors at each site and from the radio equipment to the combiner input ports and the multicoupler output ports.
 - m.) Install the combining systems and the duplexer in EIA 19" racks (either racks included with combining systems or a new rack for the duplexer), as shown in the Contract Drawings.
 - n.) Install the receiver multicoupler systems at the voting receiver sites in new outdoor enclosures, as shown in the Contract Drawings. The outdoor enclosures are described elsewhere in this specification and come with rack mounting rails for the cavities and associated receiver multicoupler equipment.
4. Provide and install a manual RF Coaxial Switch (Pasternack PE7139 or approved equivalent) and a 2-way power divider (EMR 2412-0/C or approved equivalent to allow switching of the connections between the main and backup Public Works TX and RX ports and the TX and RX ports of the VHF duplexer at the Courthouse site, as shown in the Contract Drawings.
- a.) Install the power divider and switch on a rack shelf in the equipment rack with sufficient space to allow the switch to be easily reached and changed.
 - b.) Interconnect the components with 24" Type N to Type N RG-213 jumpers (Pasternack PE3496LF-24 or approved equivalent)
 - c.) Detailed specifications for the RF coaxial switch, power divider and RF jumper cables are shown in Section 2.1.E below.
5. Provide and install GPS master oscillator equipment consisting of the following items at the four simulcast sites (Moscow Mountain, KUID-TV, Well 10 and City Hall).
- 1. GPS Master Oscillator
 - a.) Orolia SecureSync 1200-433 Master Oscillator (or approved equivalent) – Quantity – 1 per site
 - b.) Orilia Spectacom8230AJ GPS Antenna (or approved equivalent) – 1 per site
 - c.) Orilia Spectacom8226 Antenna Line Surge Suppressor (or approved equivalent) – 1 per site

- d.) Orilia Spectacom 1204-1C 10 MHz Frequency Output Option Module Card with 3 outputs per card (or approved equivalent). Quantities: 1 at City Hall and Moscow Mountain sites; 2 at Well 10 and KUID-TV sites
 - e.) Install GPS antennas as shown in the Contract Drawings.
 - f.) Provide and install 1/2" coaxial cables terminated in Type N male connectors (LMR-400 or approved equivalent) between each GPS oscillator and its associated GPS antenna.
 - g.) Detailed specifications for these GPS oscillators and associated components are shown in Section 2.xx below.
6. Provide and install new 16-port Ethernet switches (Cisco CBS250-16P-2P Stackable Managed Switch or approved equivalent) at the simulcast repeater sites, at the voting receiver sites and at the Whitcom site, as shown in the Contract Drawings. (These switches are specified because they are the same switches used in the City of Moscow IP network, so the City has an inventory of spares and City IT personnel are familiar with these units.)
- a.) Connect the AC power cord for each Ethernet switch to an outlet on the -48 VDC to 120 VAC inverter at each site. (See Section 26 20 00 – DC Power and Alarm Systems for detailed specifications for the DC-AC inverters.)
 - b.) Detailed specifications for these Ethernet switches are shown in Section 2.1.F below.
7. Provide and install new 2-bay outdoor equipment cabinets (DDB Unlimited 20D-78DDXC or approved equivalent) at the following sites, as shown in the drawings. Provide and install HVAC units for the outdoor cabinets (Pentair ACP-6000/8000-N36-110 or approved equivalent). Also provide and install a HVAC unit at the existing equipment shelter at the Vista Water Tank site. Connect the units to AC power via a new 20 Amp circuit from the electrical panel at each site.
- a.) Residence Water Tower Site
 - b.) Rotary Park Water Tower Site
 - c.) Vista Water Tank (HVAC Unit only; Existing equipment shelter will be used at this site.)
 - d.) Provide and install new conduit runs from these cabinets to the tower leg for transmission line runs up the tower and for a ground connection
 - e.) Detailed specifications for these outdoor cabinets and HVAC units are shown in Section 2.1.W below.
8. Provide and install new 19" EIA equipment racks at the following sites, as shown in the Contract drawings. Racks shall be EIA 19 inch 2-post racks [Cooper B-Line

SB506084XUYZ (or approved equivalent)] with zinc chromate finish and universal panel hole pattern, rated for Seismic Design Category B (minimum) with a 900 pound load.

- a.) Moscow Mountain – 1 rack
- b.) KUID-TV – 1 rack
- c.) Well 10 – 1 rack
- d.) City Hall – 1 rack
- e.) Whitcom – 1 rack
- f.) XU in the model number shown above indicates a universal hole pattern for the panel mounting holes; YZ in the model number shown above indicates a zinc chromate finish; Confirm with Cooper B-Line that the part number shown above is the correct part number for a 7-foot 19" rack with zinc chromate finish and universal hole pattern.
- g.) The outdoor enclosures described elsewhere in this Specification provide rack mounting rails for rack-mounted radio equipment and receiver multicoupler equipment at the voting receiver sites, so no new racks are required at those sites.
- h.) Install racks following manufacturer's installation instructions, anchor racks to floor and as shown in the drawings.
- i.) Provide a "Framework Ground Conductor System" for the equipment racks consisting of framework ground conductors that connect from the framework ground in each equipment rack directly to the Master Ground Bar ("MGB"). Implement Framework Ground System in a "tree" form. The "trunk" of the framework ground conductor starts at the Master Ground Bar and is run over the racks with a tap conductor connecting to each rack. Tap conductors are connected to the main conductor using irreversible compression "C-clip" taps. Use 1/0 AWG wire for the main conductor. Main conductor may be either bare or green jacketed (THHN) stranded copper wire. Tap conductors from each rack to the framework ground feeder are green jacketed (RHW or THHN) 6 AWG wires terminated with two-hole irreversible compression lugs.
- j.) Bond main ground conductor runs to cable tray at 3-foot intervals, as shown in the Contract Drawings.
- k.) Details of the locations and mounting details for the racks are shown in the Contract Drawings.
- l.) Detailed specifications for these equipment racks are shown in Section 2.1.H below.

9. Provide and install site/channel controllers to provide simulcast system timing and receiver voting at the following sites. (These controllers are not required if simulcast timing control and receiver voting functionality is incorporated into the base station equipment provided in response to these Specifications.)
 - a.) Moscow Mountain Simulcast Site
 - b.) KUID-TV Simulcast Site
 - c.) Well 10 Simulcast Site
 - d.) City Hall Simulcast Site
 - e.) Residence Water Tower Voting Receiver Site
 - f.) Rotary Park Water Tower Voting Receiver Site
 - g.) Vista Water Tank Voting Receiver Site
 - h.) Details specifications for the site controllers are not included in these Specifications, since the specifications for this equipment is specific to the vendor supplying the base station radio equipment.
 - i.) Install the site controllers (if required) as shown in the Contract Drawings.
10. Provide and Install transmission lines, transmission line jumpers, transmission line entry ports, surge arrestor frames and ground bars at the simulcast repeater sites and at the voting receiver sites as shown below.
 - a.) All connectors on all fixed station cables and omnidirectional antennas must be Type N or 7/16 DIN, constant impedance type connectors.
 - b.) All exposed antenna hardware must be S31600 stainless steel, brass, or C65100 low silicon bronze. Hot dip zinc galvanized steel meeting ASTM A-123, A-153, A-385 and B-695 may be used for mounting brackets.
 - c.) Transmission lines shall be Commscope AVA5P-50-C (or approved equivalent) 7/8" foam dielectric solid outer conductor coaxial cable Determine the correct transmission line lengths for each antenna. Transmission lines shall be one continuous length; splices are not allowed. All transmission lines shall be terminated at the antenna end with a Type N female connector, Commscope 78EZNF (or approved equivalent) for 7/8" transmission line, and at the surge arrestor end with a Type N male Connector, Commscope 78EZNM (or approved equivalent) for 7/8" transmission line.
 - d.) All connections between antennas and jumpers shall be weatherproofed using the cold-shrink weatherproofing kit recommended by the manufacturer, Commscope 221213 (or approved equivalent) for 1/2" and 7/8" transmission line to antenna or equipment connections].

- e.) GPS Antenna Transmission Lines - for transmission lines to the GPS antennas, use Commscope LDF4-50A 1/2" (or approved equivalent) foam dielectric coaxial cable with Type N male connectors (or appropriate connector for existing GPS antenna and surge arrestor). All connections between antennas and jumpers shall be weatherproofed using the cold-shrink weatherproofing kit recommended by the manufacturer, Commscope 221213 (or approved equivalent) for 1/2" transmission line to antenna connections].
- f.) Connections between the antenna end of each transmission line and the antenna connector shall be made using Commscope F4A-NMNM (or approved equivalent) or F4ANMDM (or approved equivalent) foam dielectric superflexible jumpers terminated with Type N connectors male connectors or 7/16" DIN connectors (as appropriate for each antenna).
- g.) Transmission Line Connectors – Transmission line connectors shall be Commscope or approved equivalent Type N connectors designed specifically to fit the cable on which the connector is installed. Connections between line sections, antennas, and jumpers shall be weatherproofed using the weatherproofing kit recommended by the manufacturer. All transmission lines shall be terminated at the antenna end with a Type N female connector, Commscope 78EZNF (or approved equivalent) for 7/8" transmission line, and at the surge arrestor end with a Type N male Connector, Commscope 78EZNM (or approved equivalent) for 7/8" transmission line. All connections between line sections and jumpers shall be weatherproofed using the weatherproofing kit recommended by the manufacturer, Commscope 221213 (or approved equivalent) for 7/8" transmission line to 1/2" jumper connections.
- h.) All connectors shall be manufactured by the same manufacturer as the transmission line. All connectors shall be installed utilizing the manufacturer's recommended tooling following manufacturer's instructions.
- i.) The use of any adapters and/or splices is prohibited, with the exception of SMA to Type N adapters or cables required to connect base station radios with SMA connectors to transmitter combiner, receiver multicoupler or duplexer ports with Type N connectors.
- j.) Grounding Kits – Provide and install transmission line grounding kits recommended by the manufacturer to bond each transmission line and waveguide to the tower ground tab at the antenna end, to the ground bar at the base of the tower, and to the ground bar on the outside of the building at the transmission line entry port. Use Commscope CSG78-12B2U (or approved equivalent) universal Grounding Kit (with 45" ground lead and two-hole lugs) for 7/8" transmission line runs. Use Commscope CSG12-06B1A (or approved equivalent) universal Grounding Kit (with 45" ground lead and two-hole lugs) for 1/2" transmission line runs.

Choose ground lead length to be appropriate for the installation situation using the shortest practical route. Ground lead cable bends shall be sweeping and have a bend radius of no less than 8 inches. Bends shall not form an included angle of less than 90 degrees. Install kit following manufacturer's instructions. Weatherproof

connections between grounding kit and transmission line using the weatherproofing materials provided with the grounding kit.

Connect ground lead at tower base ground bar and building ground bars with 2 each 5/16"x18 x1" bolt with flat washer between bolt and lug and flat washer, split lock washer and nut behind ground bar or ground plate near antenna. Hardware to be C65100 Low-Silicon Bronze. Use conductive grease between lug and ground bar or ground plate.

- k.) All transmission lines must be secured with the transmission line manufacturer's recommended stainless-steel hardware, with appropriate tower mounting hardware, and supported by transmission line bridges that will be supplied as part of this procurement. Hangers used to support transmission line on transmission line bridge, transmission line ladder, and other locations where support members with mounting holes are used shall attach to support members with a bolt installed through the mounting hole and a lock washer and nut on the back side of the support member. "Snap-in" hangers are not permitted.
- l.) Detailed specifications for the transmission lines and associated equipment shown above are shown in Section 2.1.I through 2.1.P below.
- m.) Provide and install Site Pro E1449 transmission 6-port (2 X 3) 4" transmission line entry panels (or approved equivalent) with Site Pro BA121M boot kit (or approved equivalent) for the transmission lines, as described in Section 2.xxx below, and as shown in the Contract Drawings. Install panels at the following sites:
 - 1.) Well 10
 - 2.) KUID-TV
 - 3.) Detailed specifications for these entry ports are shown in Section 2.1.Q below
- n.) Provide and install Site Pro E220 transmission 1-port (1 X 1) 4" transmission line entry panels (or approved equivalent) with Site Pro BA121M boot kit (or approved equivalent) for the transmission line at the voting receiver sites, as shown in the Contract Drawings. Install panels at the following sites:
 - 1.) Vista Water Tank Voting Receiver Site
 - 2.) Detailed specifications for this entry port are shown in Section 2.1.R. below
 - 3.) Transmission line from the outdoor enclosures to the water tower legs at the Residence Voting Receiver Site and at the Rotary Park Voting Receiver Site run through buried conduit connected to the bottom of each enclosure, as shown in the drawings.
- o.) Entry Port Grounding Assembly - Moscow Mountain, KUID-TV and Well 10 simulcast repeater sites + Vista Water Tank Voting Receiver Site,

Provide and install an Commscope AT-K306-U (or approved equivalent) grounding bar trapeze assembly to mount surge suppressors immediately inside building entry port, as shown in the drawings. Mount grounding bar trapeze assembly to both the ceiling and the wall of the building, as shown in the drawings, to assure structural stability. Connect ground bar assembly to Master Ground Bar ("MGB") using 2 AWG tinned solid copper wire with irreversible compression 2-hole lugs, as shown in drawings. Attach lugs to MGB using 2 each 3/8"x 18 x 1" bolt with flat washer between bolt and lug and flat washer, split lock washer and nut behind ground bar. Hardware to be C65100 Low-Silicon Bronze. Connect exterior ground bar to building buried ground ring using 3" wide 0.032" thick copper strap, as shown in drawings. Attach to-hole lugs from transmission line ground kits to external ground bar, using 2 each 3/8"x 18 x 1" bolt with flat washer between bolt and lug and flat washer, split lock washer and nut behind ground bar. Use conductive grease between ground kit mounting hardware and external ground bar.

Detailed Specifications for the Surge Arrestor Trapeze are shown below in Section 2.1.S below.

p.) Ground Bar - Residence Water Tank Voting Receiver Site & Rotary Park Voting Receiver Site.

Provide and install a new ground bar (Site Pro MG206U-K or approved equivalent) on the wall of the cabinet above the conduit housing the RX antenna transmission line. Connect ground bar to the bottom of the adjacent water tower leg tinned solid copper 2 AWG wire and an irreversible two-hole lug at the ground bar (Burndy YA2CL-2TC38 or approved equivalent) and exothermically weld the wire to bare metal at the base of the tower leg. Route the ground wire through a new 1-1/2" Schedule 80 PVC conduit run, as shown in the Contract Drawings. Provide 2 coats of cold galvanizing paint to the welded joint at the base of the tower.

Detailed specifications for these ground bars are shown below in Section 2.1.T below.

q.) Surge Suppressors –Provide and install surge suppressors (Polyphaser IS-B50HN-C2 or approved equivalent) on incoming transmission lines. Mount surge suppressors directly to AT-K306-U grounding bar assembly at the Moscow Mountain, KUID-TV and Well 10 simulcast repeater sites, and at the Vista voting receiver site using integral surge side Type N Connectors and appropriate lock washers and nuts and integral bulkhead flange plate with #10 stainless steel hardware.

At the Residence Water Tower voting receiver site and the Rotary Park voting receiver site, connect the surge arrestor to the incoming 7.8" transmission line and provide a green jacketed (RHW or THHN) 6 AWG wire to the ground bus bar installed inside the outdoor enclosure.

At the City Hall simulcast repeater site, re-use the existing surge suppressors mounted on the ground bus at the bottom of the transmission line run from the rooftop antennas.

Detailed specifications for these surge suppressors are shown below in Section 2.1.U below.

- r.) Cable Ladders –Provide and install cable ladders (B-Line SB17U12BYZ or approved equivalent) at the KUID-TV site, as shown in the drawings.

Detailed specifications for these cable ladders are shown below in Section 2.1.V below.

- s.) To ensure that antennas and transmission lines meet specifications after installation, test antennas and transmission lines as described in Section 2.X below. Submit a detailed test plan to City for approval in advance of these tests. Record and sign tests and present tests to City in printed format.
 - t.) Assure that antennas are mounted to minimize, as much as possible, the pattern distortion effects caused by close proximity to tower members, transmission lines, other antennas, and other metallic objects located near the antenna. Antenna mounting structures and devices shall be mechanically compatible with the antenna support structures at each site, and shall be adequate to support each antenna on the tower or other antenna support structure.
 - u.) Antennas shall meet or exceed the requirements of ANSI/EIA/TIA-329-C. Antenna bandwidths shall allow an antenna to be used for both receive or transmit for each transmit/receive frequency pair (or frequency pairs in the case of combined antennas) for VHF and UHF antennas. Pattern tilt across this band shall be minimized to the degree that this is possible.
 - v.) Transmission lines shall have their outer conductors bonded to the tower at the antenna end, as close to the antenna as possible, to the ground bars at the base of the tower and at the building entry port, using the manufacturer's recommended grounding kit. Grounding kit wires used to connect transmission line and waveguide ground kits to tower ground lugs or ground bars shall be continuous lengths of wire supplied by the manufacturer as part of the ground kit. Splices in ground kit wires are not permitted.
11. Provide and install transmit and receive antennas at all simulcast repeater sites, voting receiver sites and at the Courthouse site as listed in Table 3 above. Any substitutions with antennas equivalent to the model numbers shown in Table 3 must be approved by the City.
- a.) Mount antennas on towers, monopoles, poles or water tanks, as shown in the Contract Drawings.
 - b.) At the Courthouse site, replace the existing duplex antenna mounted on the rooftop guyed tower with the new antenna shown in Table 3.

C. Network Interconnect Configuration and Documentation

- 1) Coordinate with City IT personnel to assign IP address to the base station repeaters, voting receivers, microwave radios and site controllers (if site controllers are required) at each site. Connect base station repeaters and voting receivers to the IP backbone interconnect system via the Ethernet switches at each site. Coordinate with City IT

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personnel to connect to the City fiber backbone at the Well 10 simulcast repeater site, the City Hall simulcast repeater site, and the Vista voting receiver site.

D. Simulcast System Alignment

- 2) Adjust the launch time for each new simulcast repeater site to minimize audio distortion in the non-capture overlap zones among the new sites making up the two simulcast sub-systems, using the initial delay settings shown in Table 3, which have been determined via modeling of the simulcast delay spread and simulcast system performance in the system coverage area within and around the City of Moscow.
- 3) Provide written results of the simulcast system optimization showing final system simulcast settings to the City.

E. Voting Receiver Configuration

- 1) Configure voting receivers to select the best received signal among all the receive sites in the system, as follows:
 - a.) Moscow Mountain Simulcast Repeater Site
 - b.) KUID-TV Simulcast Repeater Site
 - c.) Well 10 Simulcast Repeater Site
 - d.) City Hall Simulcast Repeater Site
 - e.) Residence Water Tower Voting Receiver Site
 - f.) Rotary Park Water Tower Voting Receiver Site
 - g.) Vista Water Tank Voting Receiver Site

F. Mobile and Portable Radio Configuration

Program all City of Moscow portable mobile radios to operate on the new VHF simulcast system frequencies. Coordinate with the City to produce a template that includes new frequencies, CTCSS tones and Channel Names for the radio programming. Program radios to allow for a smooth cutover from the existing radio system to the new radio system.

G. Coordination with Whitcom Dispatch Center

Coordinate with the City and with the Whitcom Dispatch Center to incorporate the radio channels in the new VHF simulcast system into the dispatch consoles at Whitcom and to provide appropriate interconnections between the new system and the dispatch consoles at Whitcom.

H. Network Management System

Provide, install and configure a new network management system to provide status, alarms and monitoring of the radios and associated equipment in the radio system. City will provide a server for the Network Management System software. Coordinate with City to implement the Network Management System.

I. Cutover Plan

30 days prior to the beginning of any installation work provide a complete cutover plan, arranged by site, to the City. The cutover plan shall describe how the systems described below will be installed, configured, and tested, and how cutover from the existing configuration of systems at the existing sites to the new system configuration and new sites will be accomplished. Submit the cutover plan for approval by the City.

1.4 PERFORMANCE REQUIREMENTS

- A. Conform to all applicable code for manufacture and installation of land mobile radio systems and associated equipment and materials.
- B. Install and configure land mobile radio systems in accordance with good engineering practices.
- C. All proposed equipment shall be supported by the vendor for a minimum of seven years after product discontinuation. If necessary parts are not available before the end of the seven years, a replacement will be provided at no additional cost to the City of Moscow which meets the contractual requirements and is compatible with the system. All applicable product discontinuations shall be promptly reported to the City of Moscow. This includes the equipment manufactured by the radio vendor as well as any third-party equipment provided by the radio vendor.

1.5 WARRANTY

- A. The Vendor shall include warranty support for the first year, beginning at Final Acceptance or Beneficial Use, whichever comes first.
- B. Warranty shall include the following services:
 - 1. Depot Advanced Repair: The replacement part is to be shipped overnight to the field before the broken part is shipped to Depot Repair.
 - 2. Technical Support: 24 x 7 phone support.
- C. At the end of the warranty period, one Preventative Maintenance (PM) shall be performed by the Vendor, and all equipment shall be brought to the latest software revision.

1.6 POST-WARRANTY SUPPORT REQUIREMENTS

- A. All technical service bulletins shall be sent to the City of Moscow via email or another approved method.

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- B. All software revisions shall be provided at no cost to the City of Moscow.
- C. Any known major defect with the products supplied by the Vendor shall be corrected at no cost. A major defect is defined as a defect degrading the performance of the product below its published specifications or causing outages.

D. Proposer shall offer post-warranty services matching 1.5.B.

1.7 TRAINING

- A. The Proposer shall describe the available training related to this system.

1.8 PRICING SHEETS

- A. Pricing sheets shall be formatted as below. Line-item pricing for both the equipment at the line-item level and services pricing broken out into the categories below shall be presented. Proposals with any pricing rolled up into larger categories shall be considered non-compliant and rejected.

- B. Reference any contractual agreements being used for discounts. Pricing incentives may also be utilized. Pricing shall be valid for one year after system acceptance.

- C. Equipment Pricing

SITE	MODEL NUMBER	DESCRIPTION	QTY	LIST PRICE	DISCOUNT %	CONTRACT PRICE	EXTENDED CONTRACT PRICE
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D. Services Pricing

CATEGORY	PER HOUR	TOTAL HOURS	LABOR COST	EXPENSES	TOTAL
PROJECT MANAGEMENT					
ENGINEERING					
DOCUMENTATION					
COVERAGE TESTING					
TECHNICIAN OPTIMIZATION					
TRAINING					
WARRANTY SERVICES					
OTHER (DESCRIBE)					

POST WARRANTY SERVICE	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9	YR 10
TECHNICAL SUPPORT									
DEPOT REPAIR									
OTHER (DESCRIBE)									

1.9 SUBMITTALS

- A. Submittal Drawings: Submit shop drawings showing details and location of Radio System equipment (VHF base station repeater radios, transmitter combiners and receiver

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multicouplers, GPS oscillators, DC power systems and associated equipment) at each site. Provide rack elevation drawings for each site. Provide schematic line drawings showing configuration of radio equipment, network equipment, DC power equipment, microwave radio equipment and related equipment provided under this specification. Submit elevation drawings showing antenna mounting locations for land mobile and microwave antennas (see Section 33 83 40 Microwave Radio System for microwave antenna requirements).

- B. Manufacturer's Installation Instructions: Submit preparation requirements, and special installation instructions.
- C. Provide manuals for each type of equipment. Manuals may be provided electronically in Portable Documentation Format and/or as a hard-copy. For any manual supplied as a hard-copy, provide three copies.

1.10 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Submit as-built drawings recording actual locations, configuration, and installation details of all radio system components.
- B. Provide a detailed on-site manual with complete documentation of all installed systems for each individual site. Provide an overall system manual that includes complete documentation of all installed systems for all the sites.
- C. Provide all documentation in original .docx, .xlsx or .dwg formats, with PDF versions of each document.

1.11 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with a minimum of five (5) years demonstrated experience in the installation of land mobile and microwave radio equipment, antennas and waveguides/transmission lines with a documented history of neat and workmanlike installation practices. Provide photo documentation of previous installation work comparable to the work called for in these specifications. Provide project references (including customer contact information) for at least three (3) previous projects with work comparable to the work called for in these specifications.

1.12 KICK-OFF MEETING

- A. Vendor shall meet with City of Moscow personnel to verify the design and the Bill of Materials (BOM). The Vendor will visit each site with City personnel to confirm space, power, and other considerations needed for installation. An initial cutover plan will be developed and mutually agreed upon. From this, the Vendor shall provide the County with an installation document including but not limited to:

1. Overall system block diagram
 2. Equipment rack elevations
 3. Equipment (cabling) interconnections, with references to any cable labels as needed
 4. Power/breaker requirements
 5. System Interconnect Diagram and Interconnect System Details (see Section 33 83 40 for interconnect network requirements)
 6. Any other information required to successfully install the provided equipment
 7. Installation and User Manuals for all provided equipment
- B. Attendance is to include all parties directly affecting, or affected by work of this section, including electrical sub-contractor, and installers responsible for installation of DC power systems and microwave radio at the City of Moscow sites.
- 1.13 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect and handle products with adequate protection against damage. Avoid breakage, denting and scoring finishes. Do not install damaged equipment.
 - B. Deliver material to work site in original factory packaging.
 - C. Store radios, transmitter combiners and receiver multicouplers, GPS receivers, transceivers and site controllers, equipment racks, and other components and accessories in original cartons or shipping containers and in a clean dry space; protect from weather and construction traffic. Wet materials should be unpacked and dried before storage.
- 1.14 FIELD MEASUREMENTS
- A. Verify field measurements prior to equipment installation.
- 1.15 SEQUENCING
- A. Sequence work to allow for installation of electrical systems, cable tray systems, site grounding systems, DC power systems and other work required before installation of radio systems.
- 1.16 COORDINATION
- A. Coordinate work with sub-contractors installing electrical systems, site grounding systems, cable tray systems, tower work and site construction work.

PART 2 PRODUCTS

2.1 GENERAL

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- A. Shown below are detailed specifications for the equipment items to be provided, installed and tested by the Contractor.
- B. Specifications for base station repeater transceivers are shown below.
 - 1. Base station transceivers shall meet the following specifications as measured per the methods as described in TIA-603-E:
 - 2. Transmitters rated for continuous duty
 - 3. Maximum Transmit power 100 W (including external power amplifier if required)
 - 4. Transmitter Spurious & Harmonic Emissions Attenuation ≥ 90 dB
 - 5. FM Hum and Noise > 45 dB
 - 6. RF Output Impedance = 50Ω
 - 7. Receiver Sensitivity 12 dB SINAD $\leq 0.25 \mu V$
 - 8. Receiver Adjacent Channel Rejection ≥ 80 dB
 - 9. Receiver Intermodulation Rejection ≥ 85 dB
 - 10. Receiver Spurious and Image Rejection ≥ 100 dB
- C. Specifications for external RF power amplifiers (if required to produce required transmitter output power) are shown below:
 - 1. Crescend Technologies 100-Watt RF Power Amplifiers (or approved equivalent)

General Specifications		
Band	VHF	UHF
Frequency Range:	136-144 MHz (DA) 144-152 MHz (DB) 152-162 MHz (EA) 162-174 MHz (EB)	403-450 MHz (UL) 450-512 MHz (UH)
Current Draw:	23 Amperes (Max)	26 Amperes (Max)
Operating Voltage:	+13.8 VDC	
Duty Cycle:	100%	
Power Input:	See chart below	
Power Output:	100 Watts, set at factory	
Spurious & Harmonics:	-65 dBc	
Input/Output Impedance:	50 ohms (Nominal)	
Load VSWR Tolerance:	VSWR Protected	
Indicator LEDs:	DC On, Low Output, High VSWR, High Temp	
Alarm:	Summary Alarm Pin	
Input/Output Connector:	Type 'N' Female	
Cooling Method:	Fan Forced Air Over Heat sink	
Operating Temp. Range:	-30 ^o C to +60 ^o C	
Storage & Transport:	-40 ^o C to +70 ^o C	
Humidity:	80% at +40 ^o C (non-condensing)	
Altitude:	10,000 feet maximum	
SIZE		
Vertical Mounting:	7.0"	
Horizontal Mounting:	3.4"	
Depth:	19.0"	
Weight:	10 pounds	
POWER INPUT RANGE		
Model Description*	Required Power In	Power Output
P10-R1XX1-C7-001	100-200 mW	100 W
P10-R2XX1-C7-001	200-500 mW	100 W
P10-R5XX1-C7-001	500 mW-1 W	100 W
P10-1XX1-C7-001	1-2 W	100 W
P10-2XX1-C7-001	2-5W	100 W
P10-5XX1-C7-001	5-10 W	100 W
P10-10XX1-C7-001	10-20 W	100 W
P10-20XX1-C7-001	20-50 W	100 W
* XX-Insert the letter definition for the frequency range chosen.		

2. Crescend Technologies 50-Watt External power amplifiers (or approved equivalent)

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136-174 MHz 50 Watts Output Power

Frequency Range:	136-174 MHz (DE)
Operating Voltage:	13.8 VDC
Current Draw:	12 Amperes (Max)
Duty Cycle:	100%
Power Input:	See chart below
Power Output:	50 Watts, set at factory
Spurious & Harmonics:	Meets FCC Requirements
Input/Output Impedance:	50 ohms (Nominal)
Load VSWR Tolerance:	VSWR Protected
Indicator LEDs:	DC On, Low Output, High VSWR, High Temp
Alarm:	Summary Alarm Pin (Open Collector, LOW when Alarm)
Input/Output Connector:	Type 'N' Female
Cooling Method:	Fan Forced Air Over Heat Sink
Operating Temp. Range:	-30° C to +60° C
Storage & Transport:	-40° C to +70° C
Humidity:	80% at +40° C (non-condensing)
Altitude:	10,000 feet maximum

SIZE

Vertical Mounting:	7"
Horizontal Mounting:	3.4"
Depth:	19.0"
Weight:	10 pounds nominal

POWER INPUT RANGE

Model Description	Required Power In	Power Output
P5-R1DE1-C7-001	100-200 mW	50 W
P5-R2DE1-C7-001	200-500 mW	50 W
P5-R5DE1-C7-001	500 mW-1 W	50 W
P5-1DE1-C7-001	1-2 W	50 W
P5-2DE1-C7-001	2-5 W	50 W
P5-5DE1-C7-001	5-10 W	50 W
P5-10DE1-C7-001	10-20 W	50 W

- D. Specifications for the VHF duplexer for the Public Works base station at the Courthouse site are shown below:

ELECTRICAL SPECIFICATIONS		TPRD-1554	TPRD-1556
Tuning range		144-174 MHz	
Frequency separation (min)		600 KHz	400 KHz
Maximum input power		350 watts	
VSWR (max)		1.5:1	
Insertion loss:	TX/RX to ant.	1.5 dB	2.0 dB
RX isolation at TX frequency		77 dB at 600 KHz	100 dB at 400 KHz
TX noise suppression at RX frequency		77 dB at 600 KHz	100 dB at 400 KHz
Temperature range		-30°C to +70°C	
Cavities		(4) 5"	(6) 5"
MECHANICAL SPECIFICATIONS			
Dimensions (HWD) in. (cm)		28 x 19 x 11 (71.1 x 48 x 28)	28 x 19 x 11 (71.1 x 48 x 28)
(Including typical tuner extension)			
Cavity dimensions		5" dia x 23" L	
Mounting		19" Rack or wall mount	
Connectors		N or UHF female (opt.)	
Finish		Acrylic enamel	
Net weight lb. (kg)		19 (8.6)	27 (12.3)

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- E. The specifications for the Manual RF Switch, Power Divider and RG-213 Jumper Cables for Public Works main/backup repeater switching at Courthouse site are shown below:

1. Manual RF Coaxial Switch – Pasternack PE7139 or approved equivalent

Configuration – SPDT
Connectors – Type N Female
Frequency Band – DC-1.3 GHz
Max Power (Watts) – 500

2. VHF 2-way Power Divider (EMR 2412-0/C or approved equivalent)

Electrical Specifications

Frequency Band	150-175 MHz
Input Power (Max.)	10W as splitter, 5W as combiner
Insertion Loss (Max. / Typ.)	3.5 / 3.15 dB
VSWR (Max.)	1.5:1
Impedance (Nom.)	50 Ω
RF Connectors	N Female

Mechanical Specifications

Finish	Yellow Chem Film
Overall Size (HxWxD)	1.5" x 2.75" x 3.5" (38 x 70 x 89 mm)
Net Weight	0.35 lbs (0.2 kg)
Ship Weight	1 lbs (0.5 kg)

Environmental Specifications

Operating Temp. Range	-20 to +50 °C
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3. 24" RG-213 Jumper Cables (Pasternack PE3496LF-24 or approved equivalent)

Connector Mount Method 1	None
Connector Impedance 1	50 Ohm
Connector Series 2	N
Connector Gender 2	Male
Connector Polarity 2	Standard
Connector Angle 2	Straight
Connector Mount Method 2	None
Connector Impedance 2	50 Ohm
RF Cable Part Number	RG213/U
RF Cable Type	RG213
RF Cable Impedance	50 Ohm
Length	24 inches

- F. The specifications for the GPS oscillators at the simulcast repeater sites (Orilia Securesync 1200-433 [-48 VDC power, Rubidium Oscillator, Multi-GNSS] or approved equivalent are shown below:

1. Network Services

Timing

- NTP v2, v3, v4: Conforms with or exceeds RFC 1305 and 5905. Supports Unicast, Broadcast, Multicast, MD5 encryption, Peering, Stratum 2, Autokey
- SNTP v3, v4: Conforms with or exceeds RFC 1769, 2030, 4330, and 5905
- Time (RFC 868)
- Daytime (RFC 867)
- IEEE-1588v2 (PTP) via option card(s)
- NTP over Anycast

Management

- IPv4/IPv6: Dual stack
- DHCPv4/DHCPv6 (AUTOCONF)/SLAAC: Automatic IP address assignment
- Authentication: LDAP, RADIUS, TACACS+
- Syslog: Logging
- SNMP: Supports v1, v2c, and v3 (no auth/auth/priv) with Enterprise MIB

Communications

- HTTP: Browser-based configuration and monitoring
- Telnet: Remote configuration
- FTP Server: Access to files (logs, etc.)
- SMTP: Email

Security Features

- Enable/Block Protocols

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- Set SNMP Community Names and Network Access
- Password Protected
- Standard encryption/authentication protocols
- SSL Web-based Interface: SSL is used to secure HTTPS protocol to access configuration and status web pages.
- SSH: SSL and data compression technologies provide a secure and efficient means to control, communicate with, and transfer data to or from the time server remotely.
- SCP: Securely transfers files to and from the time server over an SSH session.
- SFTP: FTP replacement operates over an encrypted SSH transport
- SNMP v3: Remotely configure and manage over an encrypted connection
- Alert notifications via SNMP Traps and e-mail

2. GNSS Receiver

- Connector: Type N, +5V to power active antenna
- Frequency: GPS L1 (1575.42 MHz), Galileo E1 (1575.42 MHz), GLONASS L1 (1602.0 MHz), BeiDou B1 (1561.1 MHz), QZSS L1 (1575.42 MHz); optional SAASM: GPS L1 & L2 (1227.6 MHz)
- Satellite tracking: 1 to 72, T-RAIM satellite error management
- Synchronization time: Cold start < 15 minutes (includes almanac download), warm start < 5 minutes (assumes almanac download)

3. Option Module Cards

a.) Frequency Output (1, 5, 10 MHz)

The 1, 5, and 10 MHz SecureSync option cards provide three (3) sine wave BNC outputs. Outputs are phased-locked to the SecureSync's disciplined oscillator

Specifications

Frequency Output	Quantity 3 per card
Signal Type and Connector	+13 dBm (10 MHz) into 50 ohm, BNC
Spurious	-70 dBc (10 MHz)
Harmonics	-40 dBc
Maximum Number of Cards:	4 total (1 MHz, 5 MHz or 10 MHz)

4. Antenna system – Model 8230AJ

Electrical

Type: Active

Frequency: 1559 to 1606 MHz

Out-of-Band Rejection:

• < 1500 MHz: > 50 dB

• > 1650 MHz: > 50 dB

Gain: 40 dB from internal LNA

Antenna Pattern: 0 dB at zenith

15 dB or more rejection at < 30 degrees elevation

Connector: N type, female

Recommended Cable: Low Loss LMR-400 Equivalent
Maximum Cable Length: 125 meters (400 ft.) maximum with
most Orolia equipment and LMR-400 equivalent cable;
250 meters (800 ft.) maximum with Inline Amplifier - Model 8227
Power: 2.5 to 16 Volts, 19 milliamps (typical), powered by receiver

Mechanical

Size: 100 mm dia. (3.9");
101.5 mm H (4") from base to top;
127.2 mm H (5") including "N" connector
Enclosure: Radome: High Temperature UV Resistant Polycarbonate.;
Base: Zamak White Metal
Weight: 370g (13.1oz)
Compliance: IP67 and RoHS
Temperature Range: -40° to +85° C (-40° to +185° F)
Mounting: L-bracket (included) for vent pipe/pole mounting
via hose clamps (included), PVC pipe sold separately

Warranty

1-Year Limited

- G. Specifications for the 16-port Ethernet switches (Cisco CBS250-16P-2P Stackable Managed Switch or approved equivalent) at the simulcast repeater sites and at the voting receiver sites are shown below:

Network Ports	16 X 1G
Uplink Ports	2 x 1G SFP
Power over Ethernet (POE)	120 Watts
Fan	Fanless
Power Supply	Internal (120 VAC, 50/60 Hz)
Features	Layer 2 switching, VLAN support, Spanning Tree Protocol (STP), access control list (ACL), quality of service (QoS), IPv4/IPv6 static routing
Network Management	On-device UI, Cisco Business Dashboard and mobile app
Warranty	Limited lifetime warranty

- H. The specifications for the equipment racks to be installed at the base station repeater sites, as described above, are shown below. These racks are Two Post Seismic Relay Rack 19" Panel Mounting, Welded Steel (Copper B-Line SB506084XUYZ, or approved equivalent).

- a.) 84" x 20-5/16" x 15" (Height x Overall Width x Overall Depth).
- b.) Independently tested to the NEBS GR-63-CORE Seismic Zone 4 standard and rated for 900 lbs. (408kg) of equipment
- c.) Conformance to EIA/ECA-310-E.
- d.) Mounting rail spacing is adjustable from 3" (76mm) to 8" (203mm).

- e.) 45 rack mounting units.
- f.) Open top, bottom, and sides permit unlimited cable management options.
- g.) Industry standard mounting holes on sides allow attachment of vertical cable managers.
- h.) #12-24 panel mounting screw holes (universal pattern)
- i.) Top angles drilled for runway attachment.
- j.) Openings in front and rear of base for duplex receptacle mounting.
- k.) Holes for grounding provided in four locations.
- l.) Tubular steel frame provides a high degree of strength to weight ratio.
- m.) Zinc chromate finish.

I. Commscope AVA5P-50-C, HELIAX® Foam Coaxial Cable, corrugated copper, 7/8" in, black PE jacket (or approved equivalent)

Construction Materials

Jacket Material	PE
Outer Conductor Material	Corrugated copper
Dielectric Material	Foam PE
Flexibility	Standard
Inner Conductor Material	Copper tube
Outer Conductor	Corrugated Copper
Jacket Color	Black

Dimensions

Nominal Size	7/8 in
Cable Weight	0.302 lb/ft 0.45 kg/m
Diameter Over Dielectric	24.13 mm 0.950 in
Diameter Over Jacket	27.991 mm 1.102 in
Inner Conductor OD	9.449 mm 0.372 in
Outer Conductor OD	25.4 mm 1.0 in

Electrical Specifications

Cable Impedance	50 ohm ±1 ohm
Capacitance	22.25 pF/ft 73 pF/m
dc Resistance, Inner Conductor	0.473 ohms/kft 1.435 ohms/km
dc Resistance, Outer Conductor	0.340 ohms/kft 1.116 ohms/km
dc Test Voltage	6000 V
Inductance	0.184 µH/m 0.056 µH/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	8000 V
Operating Frequency Band	1 – 5000 MHz
Peak Power	91 kW

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Velocity	91%
Environmental Specifications	
Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)

Mechanical Specifications

Bending Moment	19 Nm 168.164 in lb
Flat Plate Crush Strength	72.97 lb/in 1.3 kg/mm
Minimum Bend Radius, Multiple Bends	254 mm 10 in
Minimum Bend Radius, Single Bend	127 mm 5 in
Number of Bends, minimum	15
Number of Bends, typical	30
Tensile Strength	159 kg 350.535 lb

Note

Performance Note Values typical, unless otherwise stated

Standard Conditions

Attenuation, Ambient Temperature	20 °C 68 °F
Average Power, Ambient Temperature	40 °C 104 °F
Average Power, Inner Conductor Temperature	100 °C 212 °F

Regulatory Compliance/Certifications

Agency	Classification
CENELEC	EN 50575 Compliant, Declaration of Performance (DoP) available
China RoHS	Below Maximum Concentration Value (MCV)
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

J. Commscope LDF4-50A, HELIAX® Low Density Foam Coaxial Cable, corrugated copper, 1/2 in, black PE jacket (or approved equivalent)

Construction Materials

Jacket Material	PE
Outer Conductor Material	Corrugated copper
Dielectric Material	Foam PE
Flexibility	Standard
Inner Conductor Material	Copper-clad aluminum wire
Jacket Color	Black

Dimensions

Nominal Size	1/2 in
Cable Weight	0.148 lb/ft 0.22 kg/m
Diameter Over Dielectric	12.954 mm 0.51 in
Diameter Over Jacket	15.875 mm 0.625 in
Inner Conductor OD	4.826 mm 0.190 in
Outer Conductor OD	13.97 mm 0.550 in

Electrical Specifications

Cable Impedance	50 ohm ±1 ohm
Capacitance	23.104 pF/ft 75.8 pF/m
dc Resistance, Inner Conductor	0.451 ohms/kft 1.480 ohms/km

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dc Resistance, Outer Conductor	0.820 ohms/kft 2.690 ohms/km
dc Test Voltage	4000 V
Inductance	0.190 μ H/m 0.058 μ H/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	8000 V
Operating Frequency Band	1 – 8800 MHz
Peak Power	40 kW
Velocity	88%

Environmental Specifications

Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)

Mechanical Specifications

Bending Moment	3.8 Nm 33.633 in lb
Flat Plate Crush Strength	111.995 lb/in 2.0 kg/mm
Minimum Bend Radius, Multiple Bends	127 mm 5 in
Minimum Bend Radius, Single Bend	50.8 mm 2 in
Number of Bends, minimum	15
Number of Bends, typical	50
Tensile Strength	113 kg 249.122 lb

Standard Conditions

Attenuation, Ambient Temperature	20 °C 68 °F
Average Power, Ambient Temperature	40 °C 104 °F
Average Power, Inner Conductor Temperature	100 °C 212 °F

Regulatory Compliance/Certifications

Agency	Classification
CENELEC	EN 50575 Compliant, Declaration of Performance (DoP) available
China RoHS	Below Maximum Concentration Value (MCV)
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

- K. Commscope F4A-NMNM-P (or approved equivalent) or F4ANMDM-P (or approved equivalent) foam dielectric superflexible jumpers terminated with Type N connectors male connectors or 7/16" DIN connectors

Produce Classification

Product Type	Shureflex®
Body Style	Straight
Product Series	RSJ4-50

General Specifications

Body Style – Connector A	Straight
Body Style – Connector B	Straight
Interface – Connector A	N Male
Interface – Connector B	N Male or 7-16 DIN Male
Cable Impedance	50 ohm
3rd Order IMD, Static	-112 dBm
3rd Order IMD Test Method	Two +43 dBm carriers
VSWR/Return Loss	30.04 dB

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Regulatory Compliance/Certifications

Agency	Classification
RoHS	Compliant
China-RoHS	Below Maximum Concentration Value (MCV)
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

- L. Commscope L4NF-F or L4NM-F, Type N Female or Type N Male for 1/2 in LDF4-50A cable (or approved equivalent)

General Specifications

Interface	N Female or N Male
Body Style	Straight
Brand	HELIAX®
Mounting Angle	Straight

Electrical Specifications

Connector Impedance	50 ohm
Operating Frequency Band	0 – 8800 MHz
Cable Impedance	50 ohm
3rd Order IMD, typical	-159 dBc @ 900 MHz
3rd Order IMD Test Method	Two +43 dBm carriers
RF Operating Voltage, maximum (vrms)	707 V
dc Test Voltage	2000 V
Outer Contact Resistance, maximum	0.25 mOhm
Inner Contact Resistance, maximum	1.00 mOhm
Insulation Resistance, minimum	5000 MOhm
Average Power	0.6 kW @ 900 MHz
Shielding Effectiveness	-110 dB

Mechanical Specifications

Outer Contact Attachment Method	Clamp
Inner Contact Attachment Method	Captivated
Outer Contact Plating	Trimetal
Inner Contact Plating	Silver
Interface Durability	500 cycles
Interface Durability Method	IEC 61169-16:9.5
Connector Retention Tensile Force	600 N 134.885 lbf
Connector Retention Torque	4.5 N-m 39.828 in lb

Dimensions

Nominal Size	1/2 in
Diameter	23.0 mm 0.906 in
Length	61.7 mm 2.429 in

Environmental Specifications

Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-65 °C to +125 °C (-85 °F to +257 °F)
Immersion Depth	1 m
Immersion Test Mating	Mated
Immersion Test Method	IEC 60529:2001, IP68
Mechanical Shock Test Method	IEC 60068-2-27

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Thermal Shock Test Method
Vibration Test Method
Corrosion Test Method

IEC 60068-2-14
IEC 60068-2-6
IEC 60068-2-11

Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
0-1000 MHz	1.08	28.30 - Male
0-1000 MHz	1.05	32.26 - Female

- M. Commscope 78EZ NF or 78EZNM, Type N Female or Type N Male for 7/8 in AVA5-50 cable (or approved equivalent)

General Specifications

Interface	N Female or N Male
Body Style	Straight
Brand	HELIAX®
Mounting Angle	Straight

Electrical Specifications

Connector Impedance	50 ohm
Operating Frequency Band	0 – 5000 MHz
Cable Impedance	50 ohm
3rd Order IMD, typical	-116 dBm @ 1800 MHz
3rd Order IMD Test Method	Two +43 dBm carriers
RF Operating Voltage, maximum (vrms)	707 V
dc Test Voltage	2000 V
Outer Contact Resistance, maximum	0.30 mOhm
Inner Contact Resistance, maximum	2.00 mOhm
Insulation Resistance, minimum	5000 MOhm
Peak Power, maximum	10.0 kW

Mechanical Specifications

Outer Contact Attachment Method	Clamp
Inner Contact Attachment Method	Captivated
Outer Contact Plating	Trimetal
Inner Contact Plating	Silver
Interface Durability	500 cycles
Interface Durability Method	IEC 61169-16:9.5
Connector Retention Tensile Force	1334.47 N 300 lbf
Connector Retention Torque	8.14 N-m 72.001 in lb

Dimensions

Nominal Size	7/8 in
Diameter	37.08 mm 1.46 in
Length	52.07 mm 2.05 in

Environmental Specifications

Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-65 °C to +125 °C (-85 °F to +257 °F)
Immersion Depth	1 m
Immersion Test Mating	Mated
Immersion Test Method	IEC 60529:2001, IP68
Mechanical Shock Test Method	IEC 60068-2-27
Thermal Shock Test Method	IEC 60068-2-14

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Vibration Test Method
Corrosion Test Method

IEC 60068-2-6
IEC 60068-2-11

Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
50-1000 MHz	1.02	40.09

- N. Specifications for ground kits for ½" coaxial cable (Commscope CSG12-06B1A or approved equivalent) are shown below:

General Specifications

Bonding Conductor Jacketing Material	PVC
Bonding Conductor Material	Copper
Bonding Conductor Wire Size	16 mm ²
Cable Type	Corrugated Smoothwall
Color	Black
Grounding Kit Type	Compact SureGround® Grounding Kits
Grounding Strap Material	Tinned copper
Lug Attachment	Factory attached
Lug Type	One-hole lug
Thread Size	3/8 in

Dimensions

Enclosure Width	25.4 mm 1 in
Bonding Conductor Length	609.6 mm 24 in
Enclosure Length	55.88 mm 2.2 in
Compatible Diameter, maximum	16.256 mm 0.64 in
Compatible Diameter, minimum	15.367 mm 0.605 in
Nominal Size	1/2 in

Electrical Specifications

Current Handling	Tested to withstand 100,000 amps peak current surge
Current Handling	Test Method MIL-STD-1757
Grounding, Bonding and Shielding Test Method	MIL-STD-188-124A
Lightning Protection Test Method	IEC 1024-1

Material Specifications

Locking Bail Material	Stainless steel
Rivet Material	Tinned copper

Environmental Specifications

Operating Temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Storage Temperature	-40 °C to +80 °C (-40 °F to +176 °F)
Blowing Rain Test Method	MIL-STD-810, Method 506
Corrosion Test Method	MIL-STD-1344, Method 1001
Freezing Rain/Icing Test Method	MIL-STD-810, Method 521
Humidity Test Method	MIL-STD-1344, Method 1002
Immersion Test Method	IEC 60529:2001, IP68
UV Resistance Test Method	MIL-STD-810, Method 505
Vibration Test Method	MIL-STD-202, Method 214
Weatherproofing Method	Tinned copper strap contact overmolded with EPDM rubber

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- O. Specifications for ground kits for 7/8" coaxial cable (Commscope CSG78-12B2U or approved equivalent) are shown below:

General Specifications

Bonding Conductor Jacketing Material	PVC
Bonding Conductor Material	Copper
Bonding Conductor Wire Size	6 gauge
Cable Type	Corrugated Smoothwall
Color	Black
Grounding Kit Type	Compact SureGround® Grounding Kits
Grounding Strap Material	Tinned copper
Lug Attachment	Field attached
Lug Type	Two-hole lug
Thread Size	3/8 in

Dimensions

Enclosure Width	40.64 mm 1.6 in
Bonding Conductor Length	1143 mm 45 in
Enclosure Length	63.5 mm 2.5 in
Compatible Diameter, maximum	28.372 mm 1.117 in
Compatible Diameter, minimum	27.559 mm 1.085 in
Nominal Size	7/8 in

Electrical Specifications

Current Handling	Tested to withstand 100,000 amps peak current surge
Current Handling Test Method	MIL-STD-1757
Grounding, Bonding and Shielding Test Method	MIL-STD-188-124A
Lightning Protection Test Method	IEC 1024-1

Material Specifications

Locking Bail Material	Stainless steel
Rivet Material	Tinned copper

Environmental Specifications

Operating Temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Storage Temperature	-40 °C to +80 °C (-40 °F to +176 °F)
Blowing Rain Test Method	MIL-STD-810, Method 506
Corrosion Test Method	MIL-STD-1344, Method 1001
Freezing Rain/Icing Test Method	MIL-STD-810, Method 521
Humidity Test Method	MIL-STD-1344, Method 1002
Immersion Test Method	IEC 60529:2001, IP68
UV Resistance Test Method	MIL-STD-810, Method 505
Vibration Test Method	MIL-STD-202, Method 214
Weatherproofing Method	Tinned copper strap contact overmolded with EPDM rubber

- P. Specifications for the Commscope 221213 Weatherproofing Kit (or approved equivalent) are shown below:

General Specifications

Application	Provides additional moisture seal for cable connections
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Applications per Kit	Four 1/2 in–7/8 in Twelve 1/2 in–1/2 in Twelve 1/2 in–7/8 in to device Two 1/2 in–2-1/4 in
Harmonized System (HS) Code	854420 (Coaxial cable and other coaxial electric conductors)
Dimensions	Nominal Size 1-1/4 in 1-5/8 in 1/2 in 1/4 in 2-1/4 in 3/8 in 5/8 in 7/8 in

Material Specifications

Material Type	Butyl rubber tape PVC tape
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Environmental Specifications

UV Resistance Test Method	Butyl test method in QUV weatherometer cycle of 8 hours UV at 150 °F then 4 hours of condensation at 104 °F PVC tape test method UL 510, ASTM D1000
UV Resistance, minimum with no degradation	≥1000 hours
Weather Resistance Test Method	04AS00-03.6.0 MIL-STD-1344A, Method 1002

- Q. Specifications for 6-Port transmission line entry panels (Site Pro E1449 transmission 6-port (2 X 3) 4" transmission line entry ports (or approved equivalent) with Site Pro BA121M (or approved equivalent) boots are shown below:

Port Size 4"
 Port Layout 2 x 3 • # of Ports = 6
 Overall Size 17.5" x 23"
 Wall Opening 9.5" x 15"
 Manufactured from heavy gauge T6 Aluminum.
 Baked-on powder coat finish
 Sealing caps and mounting hardware included.

Boots

of Holes 3
 Cable Size Mixed (1) 1/2" Foam Coax (2) 7/8" Coax.
 One piece design for easy installation.
 Kit includes rubber boot, insert, and hose clamps.

- R. Specifications for 1-Port transmission line entry panels (Site Pro E220 transmission 6-port (2 X 3) 4" transmission line entry panel (or approved equivalent) are shown below:

Port Size 4"
 Port Layout 1 x 1
 # of Ports 1
 Overall Size 7" x 7"
 Wall Opening 4" x 4"
 Manufactured from heavy gauge T6 Aluminum.
 Baked-on powder coat finish
 Sealing caps and mounting hardware included.

Boot

of Holes 3
 Cable Size Mixed (1) 1/2" Foam Coax (2) 7/8" Coax.
 One piece design for easy installation.
 Kit includes rubber boot, insert, and hose clamps.

- S. Specifications for the Commscope AT-K306-U Arrestor Trapeze Kit (or approved equivalent) are shown below:

Product Classification

Product Type Arrestor trapeze kit

General Specifications

Mounting Ceiling | Walls

Dimensions

Height 76.2 mm | 3 in

Width 457.2 mm | 18 in

Length 1,219.2 mm | 48 in

Material Thickness 7.62 mm | 0.3 in

- T. Specifications for the Valmont Site Pro MG206U-K (or approved equivalent) ground bar are shown below:

- 1/4" x 2" x 6" Ground Bar with Insulators & Brackets
- Weight 1.9 lb
- Accepts 3/8" Lugs
- 10 holes allow up to 5 runs with two-hole Lugs
- Universal hole pattern
- Accepts two-hole Lugs with 3/4" to 1" hole spacing
- Kits include Insulators and Stainless Steel Mounting Brackets

- U. Specifications for the Polyphaser IS-B50HN-C2 DC Block bulkhead mount surge suppressor (or approved equivalent) ground bar are shown below:

Insertion Loss:	≤ 0.1dB
Freq. Range:	125-1000 MHz
Mounting:	Bulkhead Flange
Protected Side Connector:	N Female 50Ω
RF Power:	500 Watts
Surge Side Connector:	N Female 50Ω
Throughput Energy:	≤ 800 μJ
Throughput Voltage:	≤ 12 Vpk
Unit Impedance:	50Ω
Voltage Standing Wave Ratio:	1.1:1

- V. Specifications for the cable ladders at the KUID-TV site [Eaton B-Line SB17U12BYZ (or approved equivalent)] are shown below:

Tubular Stringer Style - 1 1/2" (Boxed)

- Ladder type cable runway for communication cabling pathways
- Mounts to ceilings, walls, floors, relay racks, and electronic enclosures
- 3/8" (9mm) x 1 1/2" (38mm) x 0.049" (1.2mm) tubular steel stringers

- 3/8" (9.5mm) x 1 1/2" (38.1mm) steel tube welded rungs spaced 12" (305mm) on center
- All finishes are UL Classified as suitable as an equipment grounding conductor (File number E60548)
- Material: ASTM A513 grade 1008 steel tube
- Finish ____: Yellow zinc (YZ)

W. The specifications for the 2-bay outdoor equipment cabinets (DDB Unlimited 20D-78DDXC or approved equivalent) and their associated HVAC units (Pentair ACP-6000/8000-N36-110 (6000 BTU/hr with heating option + 110 VAC operation or approved equivalent) are shown below:

20D-78DDXC Enclosure

General

**Approximate Weight*

- 555 Lbs. assembled
- 705 Lbs. shipping weight

Doors

- 4, secured by three point locking system
- Locks via customer supplied padlocks
- Sealed with 3/8" aluminum filled gaskets
- 4 Auto door stops standard

Material

- .125" Alumiflex™
- Finish: Painted cream
- RF properties: Non-ferrous

Vents

- 30 bottom louvers per door
- 20 top louvers – In top cover, under Alumishield™
- One removable filter panel per door
- 20 fixed filter pads in top cover

Handles

Zinc Die Powder-coated Black EMKA Three Point Padlocking Handles

Lifting Hooks

- 8, standard

Racking Specifications

Rails

- Four sets standard (for additional rails see accessories)
- Alodine coated
- Holes tapped for 10-32 threads
- Each rail supported by three R-STRUTS™
- .125" Material (Alumiflex™)

Spacing

- 19" or 23" Racking standard

Inside Clearance - Less Rails

Height

- 77.98"

Width

- 27.625" each side

Depth

- 35.75"

Ratings

NEMA Class Types available

- NEMA 3R (Vented), NEMA 4 (closed loop-a/c), NEMA 4X

Paint Tested

- 1000 Hour salt spray (textured)
- 1000 Hour immersion

Door Opening Clearance

Height

- 74"

Width

- 23.5"

Exterior Cabinet Dimensions

Main Body

- Height: 78.23"
- Width: 59"
- Depth: 42"

Alumishield™

- Hang down height: 1.71"
- Width: 61.96"
- Depth: 44.67"

Handles

- Protrude 2.2"

Total Space Occupied

- Height: 78.85"
- Width: 65"
- Depth: 46.4"

FEATURES

- Narrow design accommodates 12-in. (300-mm) deep cabinets
- Energy efficient reciprocating compressor on N28 models
- Energy efficient rotary compressor on N36 and N43 models
- R407c and R134a earth-friendly refrigerants
- Models for 115, 230 and 400/460 3-phase VAC power input
- UL Listed to save customers time and money with agency approvals
- Outdoor model operating temperature range from -40 F/-40 C to 131 F/55 C (125 F/52 C on N28 Series)
- Attractive industrial design with minimal use of visible fasteners
- Reliable mechanical thermostat on enclosure side of the unit
- Galvanized sheet-metal cover for rugged factory and outdoor environments
- Easy-mount flanges for simple installation
- Cut-out adapter options for enclosures with GENESIS® air conditioners enable users to easily transition to the new unit
- Dust-resistant condenser coil allows the unit to be run filterless in most applications
- Cleanable, reusable aluminum mesh filter protects coils for maximum cooling performance
- Mounting hardware, gaskets and user manual furnished with the unit
- Every unit functionally tested before shipping
- Standard Indoor Air Conditioner models also include:
 - Power-off relay for door switch and other system requirements

INDUSTRY STANDARDS

UL/cUL Listed; Type 12, 3R, 4; 4X optional; File No. SA6453

CE
IP 56 Internal Loop
IP 34 on External Loop
Telcordia GR-487 capable (Outdoor)

APPLICATION

- Industrial automation
- Waste water treatment systems
- Package handling equipment
- Security and defense systems

SPECIFICATIONS

- Nominal cooling capacity:
N36 6000 & 8000 BTU/Hr. (1758 and 2344 W)
Outdoor model operating temperature range from -40 F/-40 C to 131 F/55 C (125 F/52 C on N28 Series)

FINISH

- RAL 7035 light-gray, semi-textured powder-coat paint
- Other colors and textures available

CATALOG NUMBER	
Indoor Model	N360616G050
Indoor Model Stainless Steel Type 4X	N360616G051
Indoor Model with Remote Access Control*	N360616G060
Outdoor Model without Heat Pkg.	N360616G100
Outdoor Model without Heat Pkg. Stainless Steel Type 4X	N360616G102
Outdoor Model with Heat Pkg.	N360616G150
Outdoor Model with Heat Pkg. Stainless Steel Type 4X	N360616G151
COOLING PERFORMANCE	
Nominal:	
BTU/Hr.	5400 / 6000
Watts	1581 / 1757
At 131 F / 131 F [55 C / 55 C]:	
BTU/Hr. [50 / 60 Hz]	5585 / 6180
Watts [50 / 60 Hz]	1637 / 1811
At 95 F / 95 F [35 C / 35 C]:	
BTU/Hr. [50 / 60 Hz]	4909 / 5485
Watts [50 / 60 Hz]	1439 / 1607
Refrigerant	R134a
Refrigerant Charge [ounces/grams]	20 / 567
Operating Temperature Range:	
Maximum [°F / °C]	131 / 55
Minimum [°F / °C]	-40 / -40
Air Flow at 0 Static Pressure:	
Internal loop 50 Hz (CFM / M ³ /Hr.)	251 / 426
External loop 50 Hz (CFM / M ³ /Hr.)	284 / 483
Internal loop 60 Hz (CFM / M ³ /Hr.)	261 / 443
External loop 60 Hz (CFM / M ³ /Hr.)	311 / 528
Max. Heater W [Outdoor Models]	1300
ELECTRICAL DATA	
Rated Voltage	115
Frequency (Hz)	50 / 60
Operating Range	+/-10%
Max. Power Consumption (Watts at 50 / 60 Hz)	911 / 1108
Max. Nominal Current (Amps at 50 / 60 Hz)	9.1 / 10.1
Starting Current (Amps)	39.2
Agency Approvals	
Power Input Description	
ENCLOSURE PROTECTION	
UL Type	
CONTROLLER	
Description	
Thermostat Location	
Factory Thermostat Setting [°F / °C]	
SOUND LEVEL	
At 1.5 Meters	66.9 dBA
UNIT CONSTRUCTION	
Material	Galvanized sheet metal standard Stainless steel optional
Finish	RAL 7035 light-gray, semi-textured powder-coat pain standard Other colors available
ACCESSORIES	
EASYSWAP Adaptor Plenum [GENESIS™ M36]	
UNIT DIMENSIONS	
Height (in. / mm)	36.00 / 914.4
Width (in. / mm)	11.50 / 292.1
Depth (in. / mm)	14.00 / 355.6
Weight (lb. / kg)	100 / 45

RADIO SYTSTEM UPGRADE
CITY OF MOSCOW, IDAHO

LAND MOBILE RADIO SYSTEMS
[33 83 00]

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

- A. Install equipment racks, VHF base station radios, transmitter combiner and receiver multicoupler systems, GPS oscillators and other radio system equipment as described in this specification and as shown in the Contract Drawings. Install all required interconnecting cable in compliance with all applicable electrical codes.
- B. Coordinate installation radio system equipment with other electrical and DC power system work as necessary to properly integrate installation of radio system work with other work.

3.3 PROJECT MANAGEMENT

- A. The Vendor shall create a Work Breakdown Structure (WBS). From the WBS, the Vendor shall derive a Schedule, Risk Management Plan, Quality Management Plan, and Communication Plan to be delivered and approved by Con Fire. The WBS shall describe which party has which responsibilities for each task.
 - 1. The schedule should be in PERT form and be updated as needed.
 - 2. A Risk Registry should be updated and maintained.
 - 3. Updates to the Schedule and Risk Registry should be communicated at each status update meeting as well as a list of issues that require resolution.
 - 4. Periodic Status meetings shall be included in the Communication Plan. The Vendor may suggest the frequency of these calls, the frequency is allowed to vary based on the project activity.
- B. Change Orders: Either Party may request changes within the general scope of this Agreement. If a requested change causes an increase or decrease in the cost or time required to perform this Agreement, the Parties will agree to an equitable adjustment of the Contract Price, Performance Schedule, or both, and will reflect the adjustment in a change order. Neither Party is obligated to perform requested changes unless both Parties execute a written change order.

The Change Order Form shall describe the details of the change of scope, the reason why the change is needed, and the cost of the change broken out by materials and time and expenses for each discipline (PM, engineering, technician, etc), and any other applicable costs on a line item bases with any labor costs showing both hours, travel, and total cost. Delays causes include but are not limited to; Acts of God, site issues, and supply chain delays shall not be a reason for a Change Order other than to update the Project Schedule.

RADIO SYTSTEM UPGRADE
CITY OF MOSCOW, IDAHO

LAND MOBILE RADIO SYSTEMS
[33 83 00]

3.4 FIELD QUALITY CONTROL AND ACCEPTANCE TESTING

A. SYSTEM AND COVERAGE ACCEPTANCE TESTING

- 1) In order to confirm proper adjustment and operation of the City of Moscow VHF simulcast system the radio system coverage tests described below will be based on an evaluation of the DAQ ("Delivered Audio Quality") provided at test locations throughout the City of Moscow.
- 2) Prior to the commencement of the Coverage Acceptance Tests, the Contractor shall provide the City with a documentation of field tests performed on the installed radio system, including:
 - a.) Measured Base Station Transmitter Output Power (Watts/dBm)
 - b.) Measured Base Station Receiver 12 dB SINAD Sensitivity (dBm)

(Perform this measurement through an ISO-T or coupler with the input to the coupler terminated in a 50 ohm load and with the input connected to the receiver multicoupler.)
 - c.) Measured transmitter combiner and receiver multicoupler insertion loss for each channel.
 - d.) Calculated Effective Radiated Power for each channel at each site (which should correspond to the values shown in Table 3 for each channel at each site).
 - e.) Provide these measurement results to the City as a System Field Testing Report.
- 3) DAQ Tests will be performed on an unused channel that is part of the 3-site simulcast subsystem that includes the Moscow Mountain, KUID-TV and Well 10 sites. The most likely channel for the tests is the MFD Tac Channel (154.8900 MHz/159.0000 MHz). DAQ tests will also be performed on one of the two Shared Tactical Channels that make up the 3-site simulcast system that includes the Well 10, KUID-TV and City Hall sites.
- 4) DAQ Tests will be performed within each area defined by the rectangular grid laid over the Moscow city limits. Each square in this grid defines an area within which a DAQ test must be performed as part of the coverage testing. A map showing this grid (which is based on squares 500 meters on a side) is shown in Drawing R38.
- 5) DAQ tests shall be performed on-board a City of Moscow vehicle equipped with a mobile radio with outboard speakers installed by the contractor to allow the evaluation team members to hear the audio produced by the system well enough to provide a reasonable evaluation of its quality. The configuration of the mobile radio shall include 15 dB of attenuation between the antenna and the mobile radio to simulate a portable radio operating at belt level.
- 6) The evaluation team will be made up of at least 5 members, at least three of whom shall be City of Moscow representatives.

- 7) At each test location, a test team member located at the Whitcom dispatch center with audio access to the channel being tested shall read a random selection from the Harvard Sentences (shown in Appendix 3), and each evaluation team member on the vehicle shall rate the audio quality of the received transmission on a DAQ scale from DAQ 1 to DAQ 5, based on the descriptions of these DAQ levels shown in Table 2 below (from *TSB 88.1-C, Wireless Communications Systems Performance in Noise Limited Situations; Part 1 – Recommended Methods for Technology Independent Performance Modeling; February 2008*):

Table 2 Delivered Audio Quality

DAQ Delivered Audio Quality	Faded Subjective Performance Description	Static SINAD equivalent intelligibility^{1,2}
1	Unusable, Speech present but unreadable	<8 dB
2	Understandable with considerable effort. Frequent repetition due to Noise/Distortion	12 ± 4 dB
3	Speech understandable with slight effort. Occasional repetition necessary due to Noise/Distortion	17 ± 5 dB
3.4	Speech understandable with repetition only rarely needed. Some Noise/Distortion	20 ± 5 dB ³
4	Speech easily understood. Occasional Noise/Distortion	25 ± 5 dB
4.5	Speech easily understood. Infrequent Noise/Distortion	30 ± 5 dB
5	Speech easily understood.	>33 dB

- 8) One of the evaluation team members shall record the results provided by each team member at each measurement location, as well as the location of each DAQ test. An example of the test sheet used in the similar tests to record results is shown in Appendix 3. Perform a DAQ test on each of the simulcast subsystems (described above) at each test grid location.
- 9) An average result for each measurement location shall be determined by discarding the highest and lowest results and taking the average of the remaining results. Both this weighted average and the average of all five results shall be shown in the table of results.
- 10) The results of these tests shall be compiled into a coverage test map showing the coverage grids tested and using color –coding to depict the coverage results obtained in each grid, as follows:
- GREEN Good Coverage - DAQ 3.5 to DAQ 5.0
YELLOW Marginal Coverage – DAQ 2.5-DAQ 3.0
RED Poor Coverage - Below DAQ 2.5
- 11) The contractor shall produce DAQ test result sheets, DAQ tabulated measurement result sheets, and DAQ measurement maps and shall provide them to the City in the form of a final coverage DAQ test report.

3.1 CLEANING

RADIO SYTSTEM UPGRADE
CITY OF MOSCOW, IDAHO

LAND MOBILE RADIO SYSTEMS
[33 83 00]

- A. Upon completion of this section of work, remove protective wraps and debris. Repair damages due to installation of this section of work.

3.2 PROTECTION OF FINISHED WORK

- A. Protect radio systems work from damage after installation.

END OF SECTION 33 83 00

APPENDIX 1

TRANSMITTER COMBINERS
AND RECEIVER MULTICOUPLERS

RADIO SYTSTEM UPGRADE
CITY OF MOSCOW, IDAHO

LAND MOBILE RADIO SYSTEMS
[33 83 00]



Design package

74-37-22185-A-MM

Custom VHF TXRX T-Pass Combiner/Multicoupler

Hatfield & Dawson Consulting Engineers

City of Moscow

Moscow Mountain

Sheet

1 (2)

DP No.

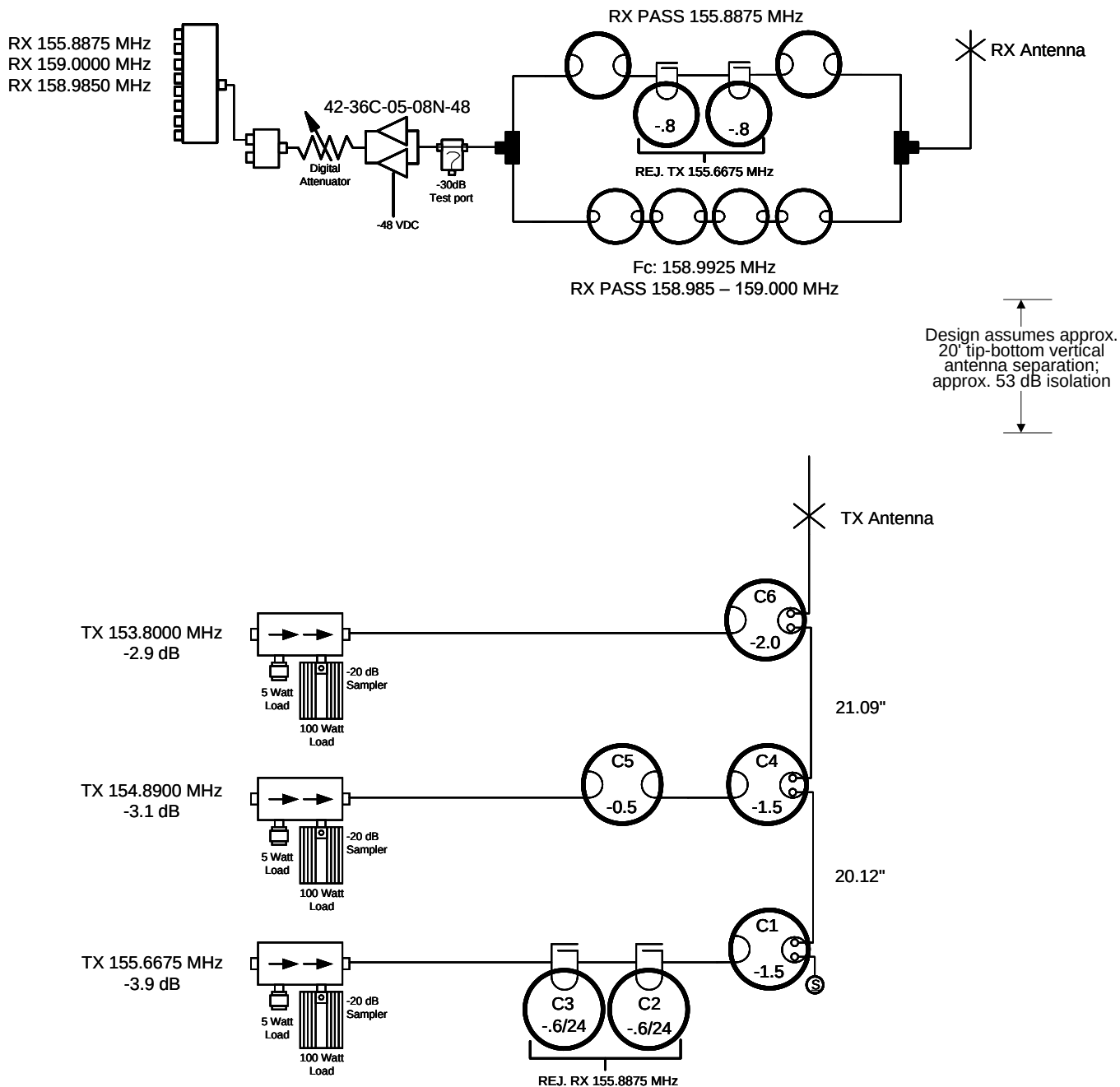
DP037926

Designer

MwL

Tool Kit No.

TK36487



DUPLEXERS * CAVITY FILTERS * MULTICOUPLER SYSTEMS * RF SYSTEM PRODUCTS



TX RX SYSTEMS INC. 8625 INDUSTRIAL PARKWAY, ANGOLA, NY 14006-9696

TELEPHONE 716-549-4700 FAX 716-549-4772 (24 HRS.)



74-37-22185-A-MM
Custom VHF TXXR T-Pass Combiner/Multicoupler
Hatfield & Dawson Consulting Engineers
City of Moscow
Moscow Mountain

Sheet:
2 (2)

DP No.
DP037926

Specifications		
Item	Requirements	As designed
TX to RX ANTENNA ISOLATION	-53 dB	-53 dB
TX to RX ISOLATION	-97 dB	≥ -113 dB
RX to TX ISOLATION	-97 dB	≥ -97 dB
INSERTION LOSS		
See drawing for designed channel loss		
EXTRA OPTIONS		

1.0 ELECTRICAL SPECIFICATIONS

- 1.1 Number of channels: TX: 03; RX: 03
- 1.2 Return Loss: TX inputs: 18 dB (min)
RX outputs: 14 dB (min)
- 1.3 Insertion Loss: TX IL may vary by +0.5/-1.0 dB between the design and the actual measurements.
IL noted on the drawing does not include the transmitter extension cables or antenna cable.
- 1.4 TX Input Power: 150 W/Ch CW (max)
- 1.5 Noise Figure: Amplifier NF: 1.5 dB (max) (x) 42-36C-05-08N-48; 2.7 dB (max) () 42-XXXX-05-X
System NF: 5.1 dB
- 1.6 RX System Gain (design goal): NET 3-5dB
- 1.7 3rd Order Output Intercept (Amplifier Only): 40 dBm (typ)
- 1.8 Main Power Requirements: -48 VDC
50 W (max)
- 1.9 Alarm terminals: 2 Form-C contacts. Alarms are for 42-XX-05-X only. (x)

2.0 MECHANICAL SPECIFICATIONS

- 2.1 Racks: 8-6409 19" Relay Rack(s) 1 PEGRACK(s) 0.
- 2.2 Overall dimensions per rack (subject to change at time of assembly):
Height: 80 inches (typ)
Width: 20 inches (typ)
- 2.3 Cavity Information: 6.625" T-Pass, Bandpass, Vari-Notch ¼ Wavelength, 4" Bandpass, Vari-Notch ¼ Wavelength
- 2.4 Connectors: TX Inputs: N-female
RX Outputs: BNC-female (), N-female (x)
RX ANT Port: N-female
TX ANT Port: N-female

3.0 REVISIONS

Date: 08/24/2022 TK number: 36487 Reason: Original

4.0 DESIGNER: Mitchell Laing

DUPLEXERS * CAVITY FILTERS * MULTICOUPLER SYSTEMS * RF SYSTEM PRODUCTS
TX RX SYSTEMS INC. 8625 INDUSTRIAL PARKWAY, ANGOLA, NY 14006-9696
TELEPHONE 716-549-4700 FAX 716-549-4772 (24 HRS.)

TX RX SYSTEMS, INC.
T-PASS MULTICOUPLER SYSTEM DESIGN
132-174 MHz, 6.625" 1/4-WAVE CAVITIES

Customer: Hatfield & Dawson Consulting Engineers TX Antenna
Multicoupler: 74-37-22185-A-MM Moscow Mountain

By: MwL
Date: 08/24/2022
Serial No:
File: TK36487

Cable: RG-393 (Teflon) T-Pass Loop P/N: 3-2890

Ch. No.	CHANNEL DATA		Comp Losses (dB)			Channel Loss (dB)		Cnnctr dL(in)	Length Adjust	Old TL Cable	Input (Watts)	Output (Watts)
	Type/ID	Frequency	Cav.	Isol.	Other	Estimated	Measured			New TL Cable		
20			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
19			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
18			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
17			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
16			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
15			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
14			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
13			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
12			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
11			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
10			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
9			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
8			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
7			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
6			-1.50	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
5			-1.50	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
4			-1.50	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
3	TX	153.8000	-2.00	-0.80	0.00	-2.94	-2.94	3-1754	0.00	*	100.00	50.76
	dF:	1.0900	Model:					+0.084		L 3 = 21.09		
2	TX	154.8900	-1.50	-0.80	-0.60	-3.05	-3.05	3-1754	0.00	*	100.00	49.49
	dF:	0.7775	Model:					+0.084		L 2 = 20.12		
1	TX	155.6675	-1.50	-0.80	-1.40	-3.86	-3.86			*	100.00	41.16
			Model:							Short Circuit		
										L 1 = 0.60		



Intermod Study Report

Transmit Frequencies

Name	Freq.	Antenna	Bw	Exclude
	153.80000	TX	12.50	
	154.89000	TX	12.50	
	155.66750	TX	12.50	

Receive Frequencies

Name	Freq.	Antenna	Bw	Exclude
	155.88750	RX	12.50	
	159.00000	RX	12.50	
	158.98500	RX	12.50	



System Wide Intermod Results Including External TX & External RX

$Q \cdot F$ (0) - No hits for this equation set

$F1 + F2 + F3$ (0) - No hits for this equation set

$F1 + F2 - F3$ (0) - No hits for this equation set

$Q1 \cdot F1 + Q2 \cdot F2$ (0) - No hits for this equation set

$Q1 \cdot F1 - Q2 \cdot F2$ (0) - No hits for this equation set



Design package

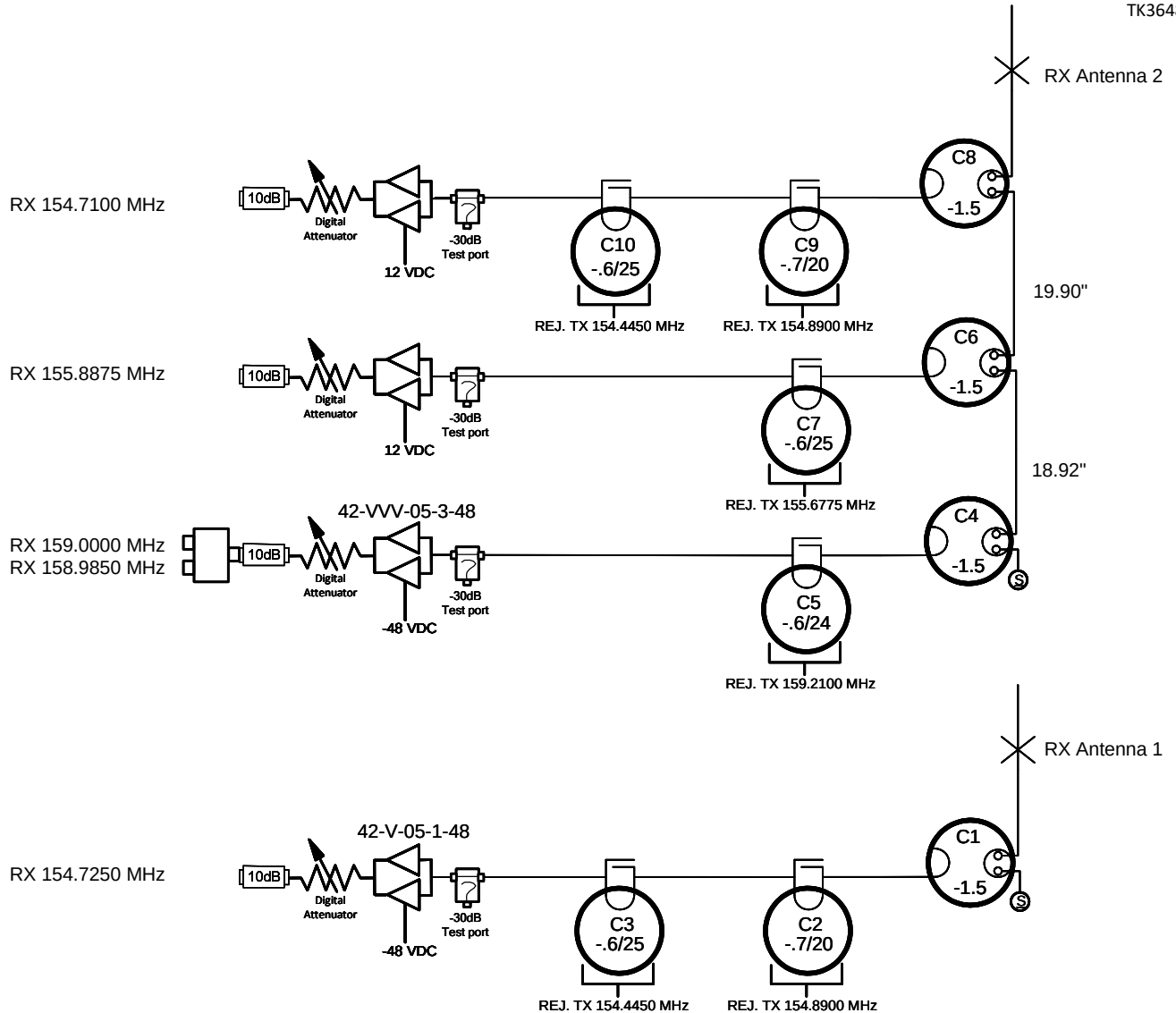
74-37-22185-A-KTV
Custom VHF TXXR T-Pass Combiner/Multicoupler
Hatfield & Dawson Consulting Engineers
City of Moscow
KUID-TV Site

Sheet
1 (3)

DP No.
DP037939

Designer
MwL

Tool Kit No.
TK36488



Specifications

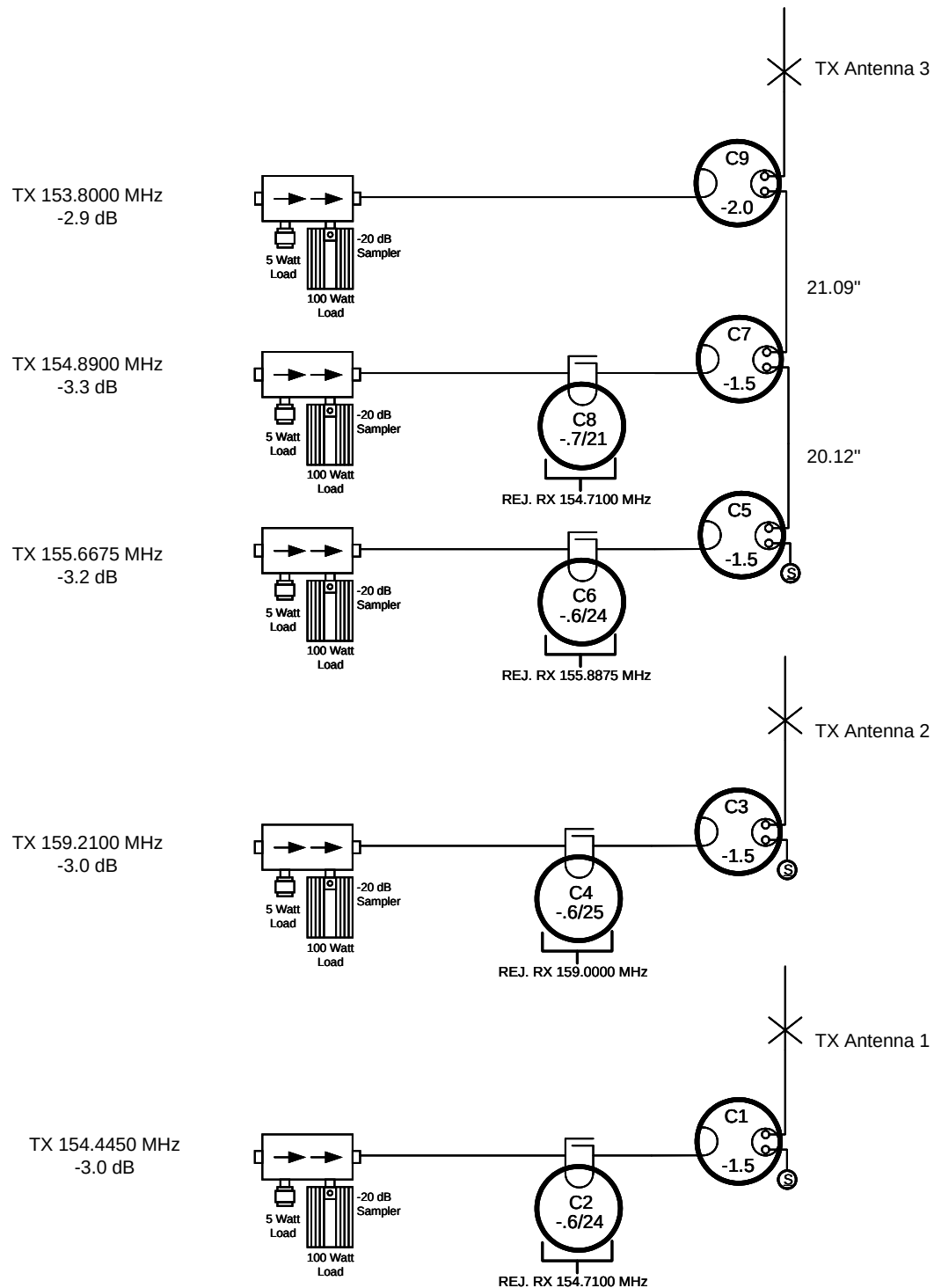
Item	Requirements	As designed
TX to RX ANTENNA ISOLATION	-70 dB	-70 dB
TX to RX ISOLATION	-100 dB	≥ -101 dB
RX to TX ISOLATION	-99 dB	≥ -101 dB
INSERTION LOSS		
See drawing for designed channel loss		
EXTRA OPTIONS		



74-37-22185-A-KTV
Custom VHF TXXR T-Pass Combiner/Multicoupler
Hatfield & Dawson Consulting Engineers
City of Moscow
KUID-TV Site

Sheet:
2 (3)

DP No.
DP037939



DUPLEXERS * CAVITY FILTERS * MULTICOUPLER SYSTEMS * RF SYSTEM PRODUCTS

TX RX SYSTEMS INC. 8625 INDUSTRIAL PARKWAY, ANGOLA, NY 14006-9696
TELEPHONE 716-549-4700 FAX 716-549-4772 (24 HRS.)



74-37-22185-A-KTV
Custom VHF TXRX T-Pass Combiner/Multicoupler
Hatfield & Dawson Consulting Engineers
City of Moscow
KUID-TV Site

Sheet:
3 (3)

DP No.
DP037939

1.0 ELECTRICAL SPECIFICATIONS

- 1.1 Number of channels: TX: 05; RX: 05
- 1.2 Return Loss: TX inputs: 18 dB (min)
RX outputs: 14 dB (min)
- 1.3 Insertion Loss: TX IL may vary by +0.5/-1.0 dB between the design and the actual measurements.
IL noted on the drawing does not include the transmitter extension cables or antenna cable.
- 1.4 TX Input Power: 150 W/Ch CW (max)
- 1.5 Noise Figure: Amplifier NF: 1.5 dB (max) () 42-XX-05-X; 2.7 dB (max) (x) 42-XXXX-05-X
System NF: 5.8 dB
- 1.6 RX System Gain (design goal):
NET 3-5dB
- 1.7 3rd Order Output Intercept (Amplifier Only):
40 dBm (typ)
- 1.8 Main Power Requirements:
-48 VDC
50 W (max)
- 1.9 Alarm terminals:
2 Form-C contacts. Alarms are for 42-XX-05-X only.()

2.0 MECHANICAL SPECIFICATIONS

- 2.1 Racks: 8-6409
19" Relay Rack(s) 2 PEGRACK(s) 0 .
- 2.2 Overall dimensions per rack (subject to change at time of assembly):
Height: 80 inches (typ)
Width: 20 inches (typ)
- 2.3 Cavity Information:
6.625" T-Pass, Vari-Notch 1/4 Wavelength
- 2.4 Connectors:
TX Inputs: N-female
RX Outputs: BNC-female (), N-female (x)
RX ANT Port: N-female
TX ANT Port: N-female

3.0 REVISIONS

Date: 08/26/2022 TK number: 36488 Reason: Original

4.0 DESIGNER: Mitchell Laing

TX RX SYSTEMS, INC.
T-PASS MULTICOUPLER SYSTEM DESIGN
132-174 MHz, 6.625" 1/4-WAVE CAVITIES

Customer: Hatfield & Dawson Consulting Engineers TX Antenna 1
Multicoupler: 74-37-22185-A-KTV KUID-TV Site

By: Mwl
Date: 08/26/2022
Serial No:
File: TK36488

Cable: RG-393 (Teflon) **T-Pass Loop P/N:** 3-2890

Ch. No.	CHANNEL DATA		Comp Losses (dB)			Channel Loss (dB)		Cnnctr dL(in)	Length Adjust	Old TL Cable	Input (Watts)	Output (Watts)
	Type/ID	Frequency	Cav.	Isol.	Other	Estimated	Measured			New TL Cable		
20			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
19			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
18			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
17			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
16			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
15			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
14			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
13			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
12			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
11			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
10			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
9			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
8			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
7			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
6			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
5			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
4			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
3			-2.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
2			-1.50	-0.80	-0.80			3-1754 +0.084	0.00			
			Model:									
1	TX	154.4450	-1.50	-0.80	-0.70	-3.00	-3.00		*	Short Circuit L 1 = 0.60	100.00	50.12
			Model:									

TX RX SYSTEMS, INC.
T-PASS MULTICOUPLER SYSTEM DESIGN
132-174 MHz, 6.625" 1/4-WAVE CAVITIES

Customer: Hatfield & Dawson Consulting Engineers TX Antenna 2
Multicoupler: 74-37-22185-A-KTV KUID-TV Site

By: Mwl
Date: 08/26/2022
Serial No:
File: TK36488

Cable: RG-393 (Teflon) **T-Pass Loop P/N:** 3-2890

Ch. No.	CHANNEL DATA		Comp Losses (dB)			Channel Loss (dB)		Cnnctr dL(in)	Length Adjust	Old TL Cable	Input (Watts)	Output (Watts)
	Type/ID	Frequency	Cav.	Isol.	Other	Estimated	Measured			New TL Cable		
20			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
19			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
18			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
17			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
16			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
15			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
14			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
13			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
12			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
11			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
10			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
9			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
8			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
7			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
6			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
5			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
4			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
3			-2.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
2			-1.50	-0.80	-0.80			3-1754 +0.084	0.00			
			Model:									
1	TX	159.2100	-1.50	-0.80	-0.70	-3.00	-3.00		*	Short Circuit L 1 = 0.60	100.00	50.12
			Model:									

TX RX SYSTEMS, INC.
T-PASS MULTICOUPLER SYSTEM DESIGN
132-174 MHz, 6.625" 1/4-WAVE CAVITIES

Customer: Hatfield & Dawson Consulting Engineers TX Antenna 3
Multicoupler: 74-37-22185-A-KTV KUID-TV Site

By: Mwl
Date: 08/26/2022
Serial No:
File: TK36488

Cable: RG-393 (Teflon) **T-Pass Loop P/N:** 3-2890

Ch. No.	CHANNEL DATA		Comp Losses (dB)			Channel Loss (dB)		Cnnctr dL(in)	Length Adjust	Old TL Cable	Input (Watts)	Output (Watts)
	Type/ID	Frequency	Cav.	Isol.	Other	Estimated	Measured			New TL Cable		
20			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
19			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
18			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
17			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
16			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
15			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
14			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
13			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
12			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
11			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
10			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
9			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
8			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
7			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
6			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
5			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
4			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
3	TX	153.8000	-2.00	-0.80	0.00	-2.94	-2.94	3-1754 +0.084	0.00 *		100.00	50.76
	dF:	1.0900	Model:							L 3 = 21.09		
2	TX	154.8900	-1.50	-0.80	-0.80	-3.25	-3.25	3-1754 +0.084	0.00 *		100.00	47.26
	dF:	0.7775	Model:							L 2 = 20.12		
1	TX	155.6675	-1.50	-0.80	-0.70	-3.16	-3.16		*	Short Circuit	100.00	48.36
			Model:							L 1 = 0.60		

TX RX SYSTEMS, INC.
T-PASS MULTICOUPLER SYSTEM DESIGN
132-174 MHz, 6.625" 1/4-WAVE CAVITIES

Customer: Hatfield & Dawson Consulting Engineers TX Antenna 1
Multicoupler: 74-37-22185-A-KTV KUID-TV Site

By: Mwl
Date: 08/26/2022
Serial No:
File: TK36488

Cable: RG-393 (Teflon) **T-Pass Loop P/N:** 3-2890

Ch. No.	CHANNEL DATA		Comp Losses (dB)			Channel Loss (dB)		Cnnctr dL(in)	Length Adjust	Old TL Cable	Input (Watts)	Output (Watts)
	Type/ID	Frequency	Cav.	Isol.	Other	Estimated	Measured			New TL Cable		
20			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
19			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
18			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
17			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
16			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
15			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
14			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
13			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
12			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
11			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
10			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
9			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
8			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
7			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
6			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
5			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
4			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
3			-2.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
2			-1.50	-0.80	-0.80			3-1754 +0.084	0.00			
			Model:									
1	TX	154.4450	-1.50	-0.80	-0.70	-3.00	-3.00		*	Short Circuit L 1 = 0.60	100.00	50.12
			Model:									

TX RX SYSTEMS, INC.
T-PASS MULTICOUPLER SYSTEM DESIGN
132-174 MHz, 6.625" 1/4-WAVE CAVITIES

Customer: Hatfield & Dawson Consulting Engineers TX Antenna 2
Multicoupler: 74-37-22185-A-KTV KUID-TV Site

By: MwL
Date: 08/26/2022
Serial No:
File: TK36488

Cable: RG-393 (Teflon) **T-Pass Loop P/N:** 3-2890

Ch. No.	CHANNEL DATA		Comp Losses (dB)			Channel Loss (dB)		Cnnctr dL(in)	Length Adjust	Old TL Cable	Input (Watts)	Output (Watts)
	Type/ID	Frequency	Cav.	Isol.	Other	Estimated	Measured			New TL Cable		
20			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
19			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
18			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
17			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
16			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
15			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
14			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
13			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
12			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
11			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
10			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
9			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
8			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
7			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
6			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
5			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
4			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
3			-2.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
2			-1.50	-0.80	-0.80			3-1754 +0.084	0.00			
			Model:									
1	TX	159.2100	-1.50	-0.80	-0.70	-3.00	-3.00		*	Short Circuit L 1 = 0.60	100.00	50.12
			Model:									



Intermod Study Report

Transmit Frequencies

Name	Freq.	Antenna	Bw	Exclude
	153.80000	TX3	12.50	
	154.89000	TX3	12.50	
	155.67750	TX3	12.50	
	154.44500	TX1	12.50	
	159.21000	TX2	12.50	

Receive Frequencies

Name	Freq.	Antenna	Bw	Exclude
	155.88750	RX2	12.50	
	159.00000	RX2	12.50	
	158.98500	RX2	12.50	
	154.72500	RX1	12.50	
	154.71000	RX2	12.50	



System Wide Intermod Results Including External TX & External RX

$Q \cdot F$ (0) - No hits for this equation set

$F1 + F2 + F3$ (0) - No hits for this equation set

$F1 + F2 - F3$ (0) - No hits for this equation set

$Q1 \cdot F1 + Q2 \cdot F2$ (0) - No hits for this equation set

$Q1 \cdot F1 - Q2 \cdot F2$ (0) - No hits for this equation set



Design package

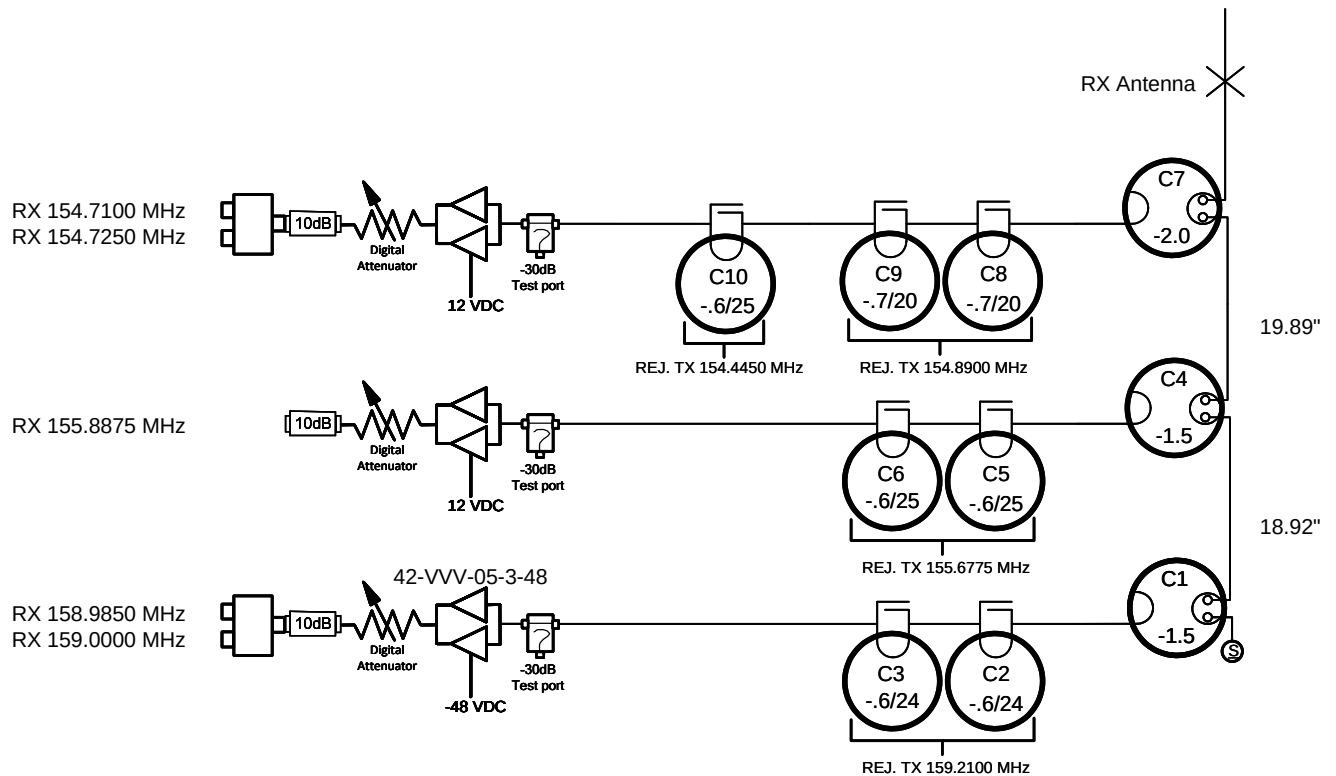
74-37-22185-A-W10
Custom VHF TXXR T-Pass Combiner/Multicoupler
Hatfield & Dawson Consulting Engineers
City of Moscow
Well 10 Site

Sheet
1 (3)

DP No.
DP037940

Designer
MwL

Tool Kit No.
TK36489



Specifications

Item	Requirements	As designed
TX to RX ANTENNA ISOLATION	-53 dB	-53 dB
TX to RX ISOLATION	-100 dB	≥ -106 dB
RX to TX ISOLATION	-100 dB	≥ -108 dB
INSERTION LOSS		
See drawing for designed channel loss		
EXTRA OPTIONS		

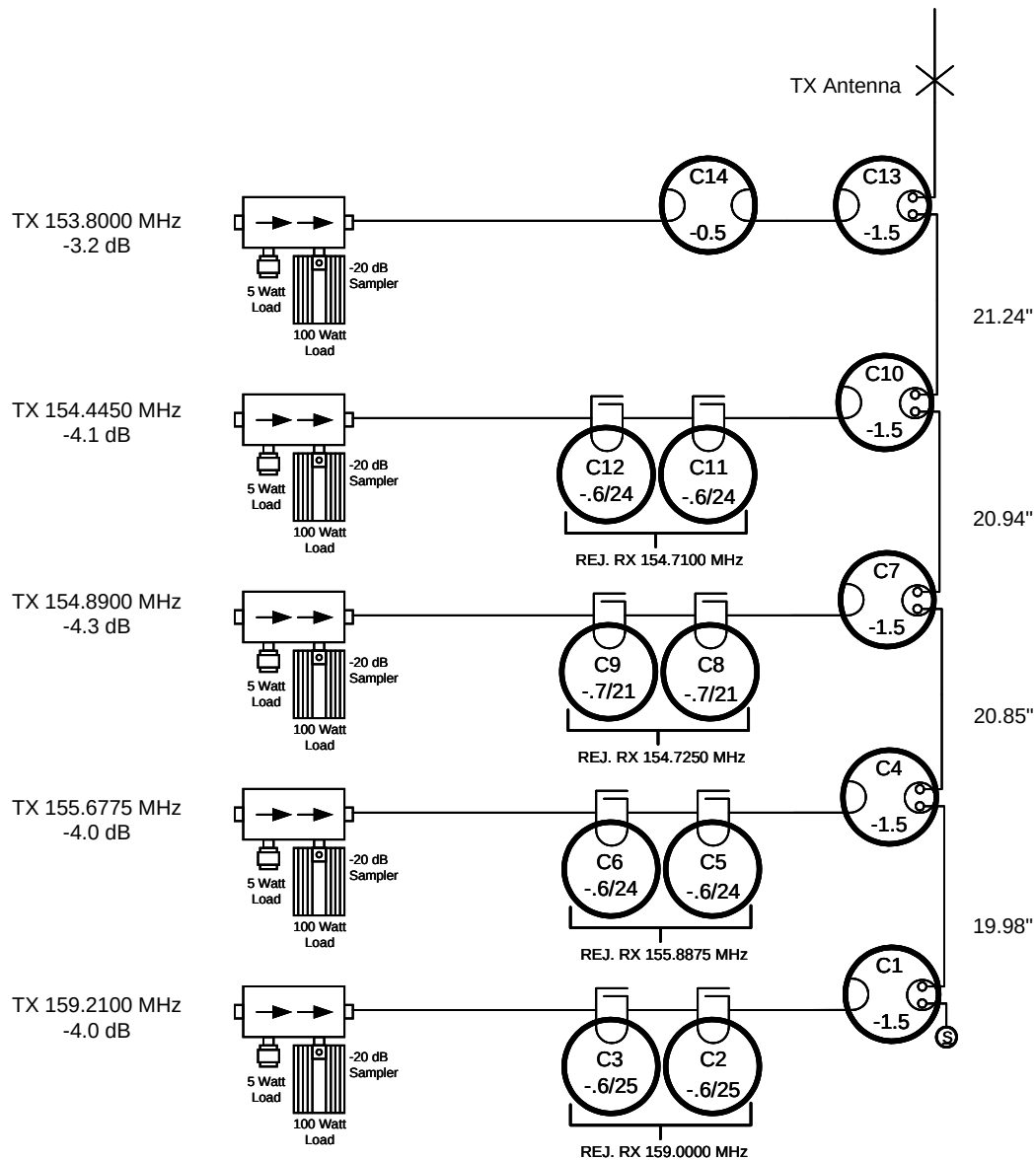
Design assumes approx.
20' tip-bottom vertical
antenna separation;
approx. 53 dB isolation



74-37-22185-A-W10
Custom VHF TXXR T-Pass Combiner/Multicoupler
Hatfield & Dawson Consulting Engineers
City of Moscow
Well 10 Site

Sheet:
2 (3)

DP No.
DP037940





74-37-22185-A-W10
Custom VHF TXRX T-Pass Combiner/Multicoupler
Hatfield & Dawson Consulting Engineers
City of Moscow
Well 10 Site

Sheet:
3 (3)

DP No.
DP037940

1.0 ELECTRICAL SPECIFICATIONS

- 1.1 Number of channels: TX: 05; RX: 05
- 1.2 Return Loss:
TX inputs: 18 dB (min)
RX outputs: 14 dB (min)
- 1.3 Insertion Loss:
TX IL may vary by +0.5/-1.0 dB between the design and the actual measurements.
IL noted on the drawing does not include the transmitter extension cables or antenna cable.
- 1.4 TX Input Power:
150 W/Ch CW (max)
- 1.5 Noise Figure:
Amplifier NF: 1.5 dB (max) () 42-XX-05-X; 2.7 dB (max) (x) 42-VVV-05-3-48
System NF: 6.6 dB
- 1.6 RX System Gain (design goal):
NET 3-5dB
- 1.7 3rd Order Output Intercept (Amplifier Only):
40 dBm (typ)
- 1.8 Main Power Requirements:
-48 VDC
50 W (max)
- 1.9 Alarm terminals:
2 Form-C contacts. Alarms are for 42-XX-05-X only.()

2.0 MECHANICAL SPECIFICATIONS

- 2.1 Racks: 8-6409
19" Relay Rack(s) 2 PEGRACK(s) 0
- 2.2 Overall dimensions per rack (subject to change at time of assembly):
Height: 80 inches (typ)
Width: 20 inches (typ)
- 2.3 Cavity Information:
6.625" T-Pass, Bandpass, Vari-Notch ¼ Wavelength
- 2.4 Connectors:
TX Inputs: N-female
RX Outputs: BNC-female (), N-female (x)
RX ANT Port: N-female
TX ANT Port: N-female

3.0 REVISIONS

Date: 08/29/2022 TK number: 36489 Reason: Original

4.0 DESIGNER: Mitchell Laing

TX RX SYSTEMS, INC.
T-PASS MULTICOUPLER SYSTEM DESIGN
132-174 MHz, 6.625" 1/4-WAVE CAVITIES

Customer: Hatfield & Dawson Consulting Engineers TX Antenna
Multicoupler: 74-37-22185-A-W10 Well 10 Site

By: Mwl
Date: 08/26/2022
Serial No:
File: TK36489

Cable: RG-393 (Teflon) **T-Pass Loop P/N:** 3-2890

Ch. No.	CHANNEL DATA		Comp Losses (dB)			Channel Loss (dB)		Cnnctr dL(in)	Length Adjust	Old TL Cable	Input (Watts)	Output (Watts)
	Type/ID	Frequency	Cav.	Isol.	Other	Estimated	Measured			New TL Cable		
20			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
19			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
18			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
17			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
16			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
15			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
14			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
13			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
12			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
11			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
10			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
9			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
8			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
7			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
6			-1.50	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
5	TX	153.8000	-1.50	-0.80	-0.60	-3.22	-3.22	3-1754	0.00	*	100.00	47.63
	dF:	0.6450	Model:					+0.084		L 5 = 21.24		
4	TX	154.4450	-1.50	-0.80	-1.40	-4.10	-4.10	3-1754	0.00	*	100.00	38.89
	dF:	0.4450	Model:					+0.084		L 4 = 20.94		
3	TX	154.8900	-1.50	-0.80	-1.60	-4.29	-4.29	3-1754	0.00	*	100.00	37.23
	dF:	0.7875	Model:					+0.084		L 3 = 20.85		
2	TX	155.6775	-1.50	-0.80	-1.40	-3.99	-3.99	3-1754	0.00	*	100.00	39.89
	dF:	3.5325	Model:					+0.084		L 2 = 19.98		
1	TX	159.2100	-1.50	-0.80	-1.40	-3.97	-3.97			*	100.00	40.07
			Model:							Short Circuit		
										L 1 = 0.60		

TX RX SYSTEMS, INC.
T-PASS MULTICOUPLER SYSTEM DESIGN
132-174 MHz, 6.625" 1/4-WAVE CAVITIES

Customer: Hatfield & Dawson Consulting Engineers RX Antenna
Multicoupler: 74-37-22185-A-W10 Well 10 Site

By: MWL
Date: 08/26/2022
Serial No:
File: TK36489

Cable: RG-214 (Poly) **T-Pass Loop P/N:** 3-2890

Ch. No.	CHANNEL DATA		Comp Losses (dB)			Channel Loss (dB)		Cnnctr dL(in)	Length Adjust	Old TL Cable	Input (Watts)	Output (Watts)
	Type/ID	Frequency	Cav.	Isol.	Other	Estimated	Measured			New TL Cable		
20			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
19			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
18			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
17			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
16			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
15			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
14			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
13			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
12			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
11			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
10			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
9			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
8			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
7			0.00	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
6			-1.50	-0.80	0.00			3-1754	0.00			
			Model:					+0.084				
5			-1.50	-0.80	-0.60			3-1754	0.00			
			Model:					+0.084				
4			-1.50	-0.80	-1.40			3-1754	0.00			
			Model:					+0.084				
3	RX	154.7175	-1.50	0.00	-2.30	-3.94	-3.94	3-1754	0.00	*		0.00
	dF:	1.1700	Model: Mean of: 154.710 & 154.725 MHz					+0.084		L 3 = 19.89		
2	RX	155.8875	-1.50	0.00	-1.40	-3.04	-3.04	3-1754	0.00	*		0.00
	dF:	3.1050	Model:					+0.084		L 2 = 18.92		
1	RX	158.9925	-1.50	0.00	-1.40	-3.03	-3.03			*	Short Circuit	0.00
			Model: Mean of: 158.985 & 159.000 MHz							L 1 = 0.60		



Intermod Study Report

Transmit Frequencies

Name	Freq.	Antenna	Bw	Exclude
	153.80000	TX	12.50	
	154.89000	TX	12.50	
	155.67750	TX	12.50	
	154.44500	TX	12.50	
	159.21000	TX	12.50	

Receive Frequencies

Name	Freq.	Antenna	Bw	Exclude
	155.88750	RX	12.50	
	159.00000	RX	12.50	
	158.98500	RX	12.50	
	154.72500	RX	12.50	
	154.71000	RX	12.50	



System Wide Intermod Results Including External TX & External RX

$Q \cdot F$ (0) - No hits for this equation set

$F1 + F2 + F3$ (0) - No hits for this equation set

$F1 + F2 - F3$ (0) - No hits for this equation set

$Q1 \cdot F1 + Q2 \cdot F2$ (0) - No hits for this equation set

$Q1 \cdot F1 - Q2 \cdot F2$ (0) - No hits for this equation set



Design package

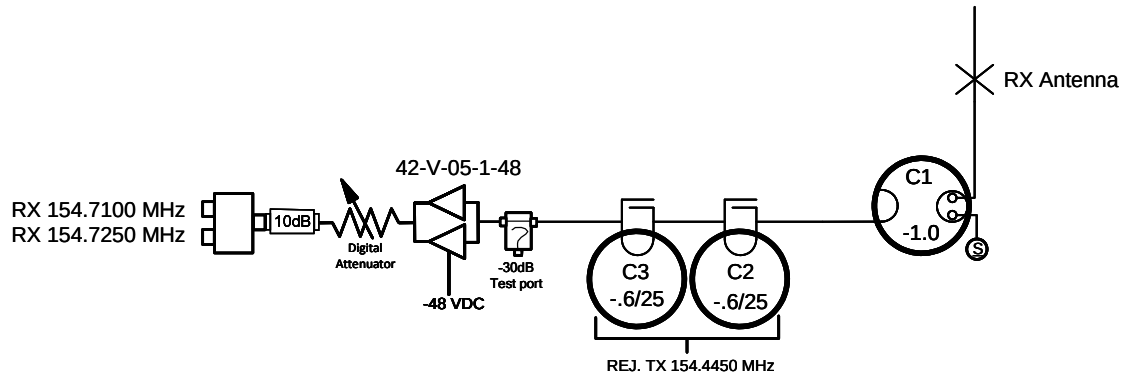
74-37-22217-A-CTH
Custom VHF TXXR T-Pass Combiner/Multicoupler
Hatfield & Dawson Consulting Engineers
City of Moscow
City Hall Site

Sheet
1 (2)

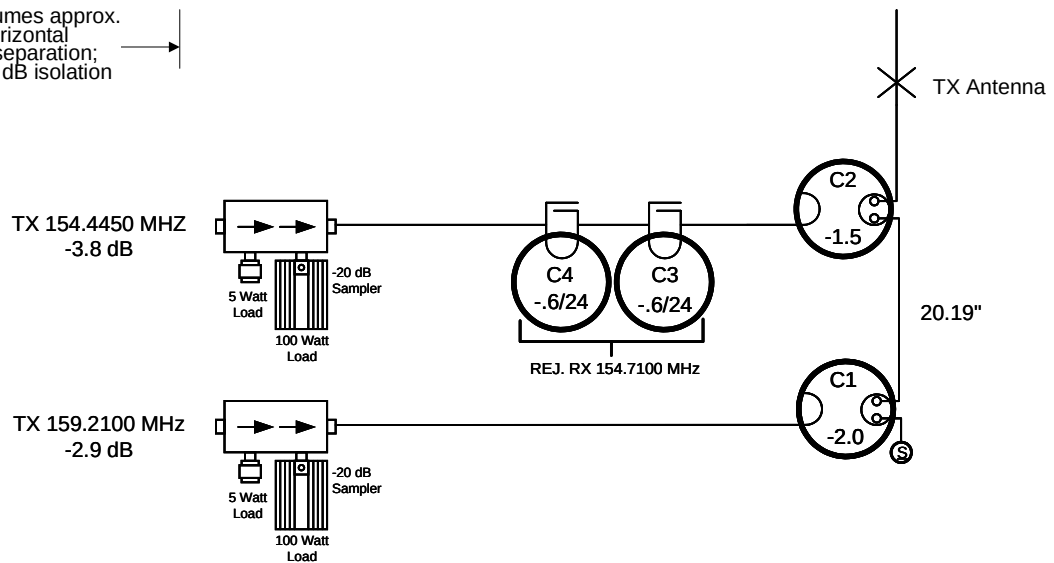
DP No.
DP038162

Designer
MwL

Tool Kit No.
TK36643



Design assumes approx.
40' Horizontal
antenna separation;
approx. 36 dB isolation



Specifications

Item	Requirements	As designed
TX to RX ANTENNA ISOLATION	-36 dB	-36 dB
TX to RX ISOLATION	-95 dB	≥ -98 dB
RX to TX ISOLATION	-95 dB	≥ -95 dB
INSERTION LOSS		
See drawing for designed channel loss		
EXTRA OPTIONS		



74-37-22217-A-CTH
Custom VHF TXXR T-Pass Combiner/Multicoupler
Hatfield & Dawson Consulting Engineers
City of Moscow
City Hall Site

Sheet:
2 (2)

DP No.
DP038162

1.0 ELECTRICAL SPECIFICATIONS

- 1.1 Number of channels: TX: 02; RX: 02
- 1.2 Return Loss: TX inputs: 18 dB (min)
RX outputs: 14 dB (min)
- 1.3 Insertion Loss: TX IL may vary by +0.5/-1.0 dB between the design and the actual measurements.
IL noted on the drawing does not include the transmitter extension cables or antenna cable.
- 1.4 TX Input Power: 150 W/Ch CW (max)
- 1.5 Noise Figure: Amplifier NF: 1.5 dB (max) () 42-XX-05-X; 2.7 dB (max) (x) 42-V-05-1-48
System NF: 5.1 dB
- 1.6 RX System Gain (design goal):
NET 3-5dB
- 1.7 3rd Order Output Intercept (Amplifier Only):
40 dBm (typ)
- 1.8 Main Power Requirements:
-48 VDC
50 W (max)
- 1.9 Alarm terminals:
2 Form-C contacts. Alarms are for 42-XX-05-X only.()

2.0 MECHANICAL SPECIFICATIONS

- 2.1 Racks: 2-Post 19" Rack: 8-6409
19" Relay Rack(s) 1 PEGRACK(s) 0
- 2.2 Overall dimensions per rack (subject to change at time of assembly):
Height: 80 inches (typ)
Width: 20 inches (typ)
- 2.3 Cavity Information: 6.625" T-Pass, Vari-Notch 1/4 Wavelength
- 2.4 Connectors:
TX Inputs: N-female
RX Outputs: BNC-female (), N-female (x)
RX ANT Port: N-female
TX ANT Port: N-female

3.0 REVISIONS

Date: 10/14/2022 TK number: 36643 Reason: Original

4.0 DESIGNER: Mitchell Laing

TX RX SYSTEMS, INC.
T-PASS MULTICOUPLER SYSTEM DESIGN
132-174 MHz, 6.625" 1/4-WAVE CAVITIES

Customer: Hatfield & Dawson Consulting Engineers City Hall Site
Multicoupler: 74-37-22217-A-CTH TX Antenna

By: MwL
Date: 10/14/2022
Serial No:
File: TK36643

Cable: RG-393 (Teflon) T-Pass Loop P/N: 3-2890

Ch. No.	CHANNEL DATA		Comp Losses (dB)			Channel Loss (dB)		Cnnctr dL(in)	Length Adjust	Old TL Cable	Input (Watts)	Output (Watts)
	Type/ID	Frequency	Cav.	Isol.	Other	Estimated	Measured			New TL Cable		
20			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
19			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
18			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
17			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
16			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
15			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
14			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
13			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
12			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
11			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
10			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
9			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
8			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
7			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
6			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
5			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
4			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
3			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
2	TX	154.4450	-1.50	-0.80	-1.40	-3.77	-3.77	3-1754 +0.084	0.00 *		100.00	42.01
	dF:	4.7650	Model:							L 2 = 20.19		
1	TX	159.2100	-2.00	-0.80	0.00	-2.87	-2.87		*	Short Circuit	100.00	51.68
			Model:							L 1 = 0.60		

TX RX SYSTEMS, INC.
T-PASS MULTICOUPLER SYSTEM DESIGN
132-174 MHz, 6.625" 1/4-WAVE CAVITIES

Customer: Hatfield & Dawson Consulting Engineers City Hall Site
Multicoupler: 74-37-22217-A-CTH RX Antenna

By: MwL
Date: 10/14/2022
Serial No:
File: TK36643

Cable: RG-214 (Poly) **T-Pass Loop P/N:** 3-2890

Ch. No.	CHANNEL DATA		Comp Losses (dB)			Channel Loss (dB)		Cnnctr dL(in)	Length Adjust	Old TL Cable	Input (Watts)	Output (Watts)
	Type/ID	Frequency	Cav.	Isol.	Other	Estimated	Measured			New TL Cable		
20			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
19			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
18			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
17			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
16			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
15			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
14			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
13			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
12			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
11			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
10			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
9			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
8			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
7			0.00	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
6			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
5			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
4			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
3			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
2			-1.50	-0.80	0.00			3-1754 +0.084	0.00			
			Model:									
1	RX	154.7175	-1.00	0.00	-1.40	-2.40	-2.40		*	Short Circuit L 1 = 0.60		0.00
			Model: Mean of: 154.7100, 154.7250									



Intermod Study Report

Transmit Frequencies

Name	Freq.	Antenna	Bw	Exclude
	154.44500	TX	12.50	
	159.21000	TX	12.50	

Receive Frequencies

Name	Freq.	Antenna	Bw	Exclude
	154.72500	RX	12.50	
	154.71000	RX	12.50	



System Wide Intermod Results Including External TX & External RX

$Q * F$ (0) - No hits for this equation set

$F1 + F2 + F3$ (0) - No hits for this equation set

$F1 + F2 - F3$ (0) - No hits for this equation set

$Q1 * F1 + Q2 * F2$ (0) - No hits for this equation set

$Q1 * F1 - Q2 * F2$ (0) - No hits for this equation set



Design package

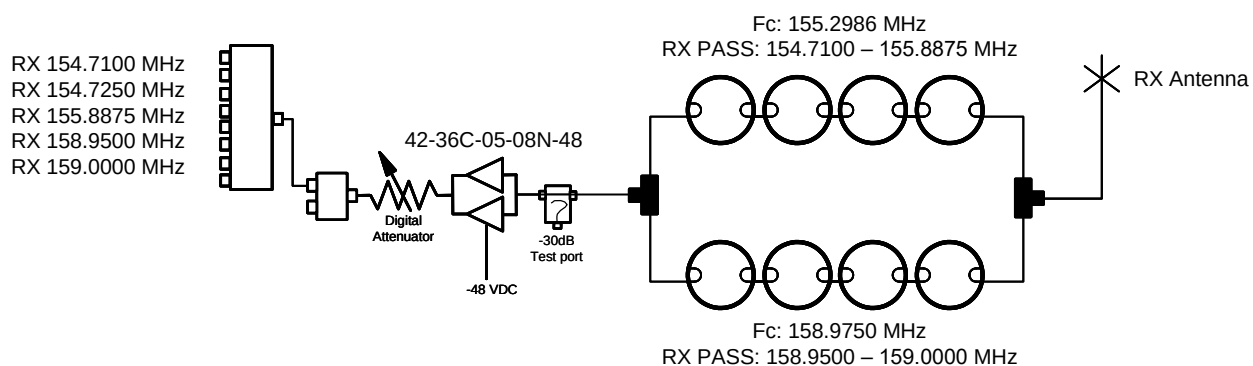
42-37-22204-A-CM
Custom TX/RX VHF Multicoupler
Hatfield & Dawson Consulting Engineers
City of Moscow
Northwest Water Tower
Oak Avenue Water Tower
Vista Water Tank.

Sheet
1 (2)

DP No.
DP038057

Designer
MwL

Tool Kit No.
TK36555
Rev.1





42-37-22204-A-CM
Custom TX/RX VHF Multicoupler
Hatfield & Dawson Consulting Engineers
City of Moscow
Northwest Water Tower
Oak Avenue Water Tower
Vista Water Tank.

Sheet:
2 (2)

DP No.
DP038057

1.0 ELECTRICAL SPECIFICATIONS

- 1.1 Number of channels: TX: **00**; RX: **05**
- 1.2 Return Loss: TX inputs: 18 dB (min)
RX outputs: 14 dB (min)
- 1.3 Insertion Loss: TX IL may vary by +0.5/-1.0 dB between the design and the actual measurements.
IL noted on the drawing does not include the transmitter extension cables or antenna cable.
- 1.4 TX Input Power: 150 W/Ch CW (max)
- 1.5 Noise Figure: Amplifier NF: 1.5 dB (max) (x) 42-36C-05-08N-48; 2.7 dB (max) () 42-XXXX-05-X
System NF: **2.9** dB
- 1.6 RX System Gain (design goal):
NET 3-5dB
- 1.7 3rd Order Output Intercept (Amplifier Only):
40 dBm (typ)
- 1.8 Main Power Requirements:
-48 VDC
50 W (max)
- 1.9 Alarm terminals:
2 Form-C contacts. Alarms are for 42-XX-05-X only. (x)

2.0 MECHANICAL SPECIFICATIONS

- 2.1 Racks: **19" Rack Mountable**
19" Relay Rack(s) 0 PEGRACK(s) 0.
- 2.2 Overall dimensions per rack (subject to change at time of assembly):
Height: **XX** inches (typ)
Width: **XX** inches (typ)
- 2.3 Cavity Information:
4" Bandpass 1/4 Wavelength
- 2.4 Connectors:
TX Inputs: N-female
RX Outputs: BNC-female (), N-female (x)
RX ANT Port: N-female
TX ANT Port: N-female

3.0 REVISIONS

Date: **09/21/2022** TK number: **36555** Reason: **Original**
09/21/2022 **Rev.1** **Remove rack from design**

4.0 DESIGNER: Mitchell Laing

APPENDIX 2

TX AND RX ANTENNA CUT SHEETS

RADIO SYTSTEM UPGRADE
CITY OF MOSCOW, IDAHO

LAND MOBILE RADIO SYSTEMS
[33 83 00]

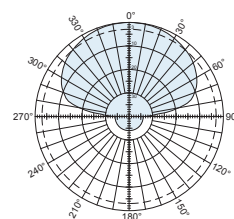
The Scala CL7-150 broadband log-periodic antenna is intended for use in professional fixed-station applications in the 147—174 MHz band. It features:

- Heavy-duty construction.
- Anodized, double-laminated heavy wall aluminum tubing elements.
- Easy element replacement.
- Double-boom of two-inch square aluminum tube.
- High front-to-back and front-to-side ratios, without minor lobes.
- Excellent performance, even in icing conditions.

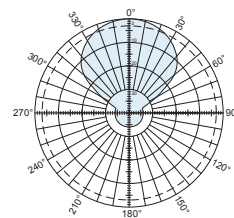


Specifications	
Frequency range	147—174 MHz
Gain	7.3 dBd (9.45 dBi)
Impedance	50 ohms
VSWR	<1.5:1
Polarization	Horizontal or vertical
Front-to-back ratio	>25 dB
Maximum input power	250 watts (at 50°C)
H-plane beamwidth	82 degrees (half-power)
E-plane beamwidth	48 degrees (half-power)
Connector	N female
Weight	25 lb (11.4 kg)
Dimensions	53.3 x 40.3 inches (maximum) (1353 x 1022 mm)
Wind load at 100 mph (161 kph)	
Front	63 lbf (280 N)
Wind survival rating*	120 mph (193 kph)
Shipping dimensions	59 x 9 x 8 inches (1499 x 229 x 203 mm)
Shipping weight	30.0 lb (13.6 kg)
Mounting	For masts of 2.375 inch (60 mm) OD.
CL7-150/HCM	Horizontal center-mount
CL7-150/URM	Horizontal or vertical rear-mount

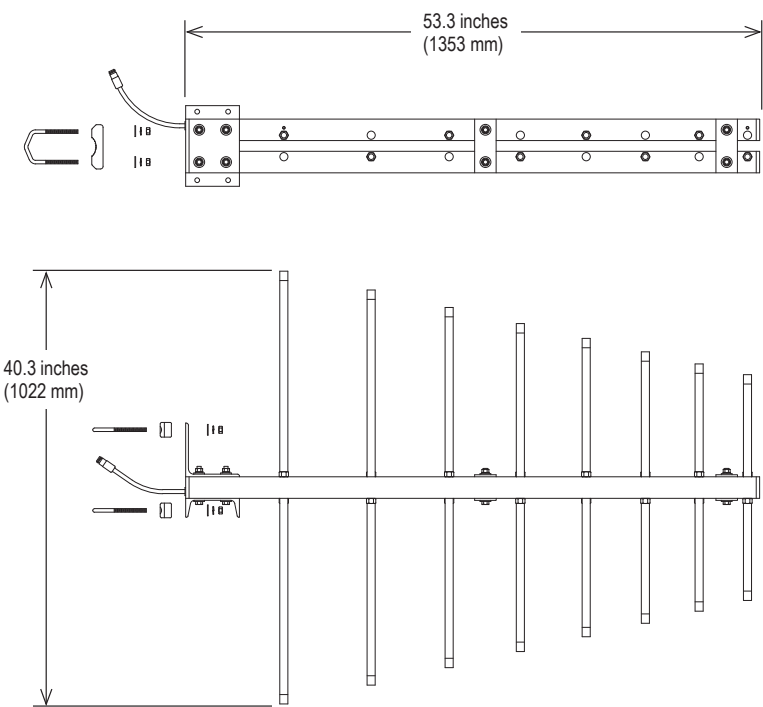
* Mechanical design is based on environmental conditions as stipulated in TIA-222-G-2 (December 2009) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. Contact KBU for further details.



H-plane
Horizontal pattern — V-polarization
Vertical pattern — H-polarization



E-plane
Horizontal pattern — H-polarization
Vertical pattern — V-polarization



CL7-150/URM
(Shown vertically polarized)

Order information

Model	Description
CL7-150/HCM	Horizontal center-mount antenna
CL7-150/URM	Horizontal or vertical rear-mount antenna

30004a subject to alteration

SD222-SF8PASNM Exposed dipole, 3 dBd omni/ 6 dBd offset, field adjustable, N-Male, 150-160 MHz

- External harness allows field adjustment for omni-directional or offset coverage
- 3 dBd in omni-directional configuration, 6 dBd in offset configuration
- 10 MHz bandwidth, covering 150-160 MHz

Recommend SMK-125-A3 or SMK-125-A7 when side mounting. Available from Sinclair separately.

The SD222 is a broadband gain antenna that is field adjustable to provide an omni-directional or offset coverage pattern.

Because external cabling is used, the antenna pattern is easily changed in the field. Field adjustment guidelines are provided.

The SD222 provides 6dBd gain in the offset configuration, and 3dBd gain in the omni-directional configuration.

This antenna covers the 132-174MHz band in 7 band splits. Each band split covers 10MHz.

Application Notes

- The field adjustable SD222 series is designed for use where either an omni-directional pattern or a higher gain offset pattern may be required.
- The SD222 series covers 132-174 MHz in 11 band splits: 132-142 MHz (F1), 137-147 MHz (F2), 142-152 MHz (F3), 147-157 MHz (F4), 152-162 MHz (F5), 158-168 MHz (F6), 163-174 MHz (F7), 150-160 MHz (F8), 160-170 MHz (F9), 215-225 MHz (F10), 139-149 MHz (F11).



Region	United States	Europe, Middle East, and Africa	Canada, Caribbean, and Latin America	Asia-Pacific
Telephone	1 800 263 3275	+44 (0) 1487 84 28 19	Canada: 1 800 263 3275 International: +1 905 726 7676	+1 905 727 0165
E-mail	salesusa@sinctech.com	salesuk@sinctech.com	salescan@sinctech.com	salesasia@sinctech.com

Electrical Specifications

Frequency Range	MHz	150 to 160	
Bandwidth	MHz	10	
Connector		N-Male	
Input VSWR (max)		1.5:1	
Polarization		vertical	
Impedance	Ω	50	
Pattern		Omni or Offset, Adjustable	
Horizontal beamwidth (typ)	degrees	0	*1
Vertical beamwidth (typ)	degrees	34	
Average Input Power (max)	W	300	
Lightning protection		DC ground	

Notes

- *1 : 170 degrees when in Offset configuration.
- *2 : Qty 2 included
- *3 : For Omni pattern, bottom mount. For offset, side mount.

Mechanical Specifications

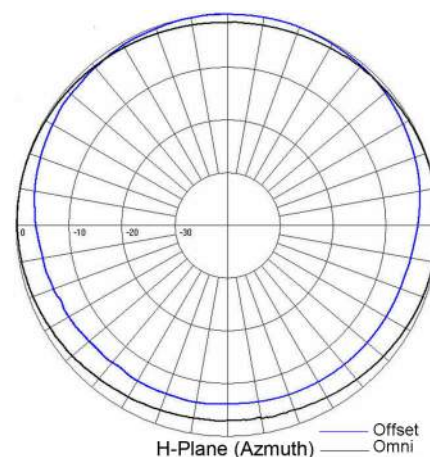
Width	in (mm)	12 (305)	
Length/ Height	in (mm)	114 (2896)	
Base pipe diameter	in (mm)	1.5 (38)	
Base pipe mounting length	in (mm)	15 (381)	
Radiating element material		aluminum	
Base pipe material		aluminum	
Weight	lbs (kg)	17 (7.72)	
Mounting Hardware (Included)		Clamp120	*2
Recommended For Offset Side Mount:		SMK-125-A3 or SMK-125-A7	
Mounting configurations		Universal Mount	*3
Actual shipping weight	lbs (kg)	25 (11.35)	
Shipping dimensions	in (mm)	117x4x13.5 (2972x102x343)	

Ordering Information

Mounting hardware included.

Environmental Specifications

Temperature range	°F (°C)	-40 to +140 (-40 to +60)
Wind Loading Area (Flat Plate Equivalent)	ft² (m²)	1.13 (0.1)
Wind Loading Area (1/2" ice)	ft² (m²)	2.45 (0.23)
Rated wind velocity (no ice)	mph (km/h)	120 (193)
Rated wind velocity (1/2" radial ice)	mph (km/h)	80 (129)
Lateral Thrust (100 mph No Ice)	lbs (N)	65.1 (289.6)
Bending moment (100 mph No Ice)	ft-lbs (Nm)	12.8 (17.3)



Region	United States	Europe, Middle East, and Africa	Canada, Caribbean, and Latin America	Asia-Pacific
Telephone	1 800 263 3275	+44 (0) 1487 84 28 19	Canada: 1 800 263 3275 International: +1 905 726 7676	+1 905 727 0165
E-mail	salesusa@sinctech.com	salesuk@sinctech.com	salescan@sinctech.com	salesasia@sinctech.com

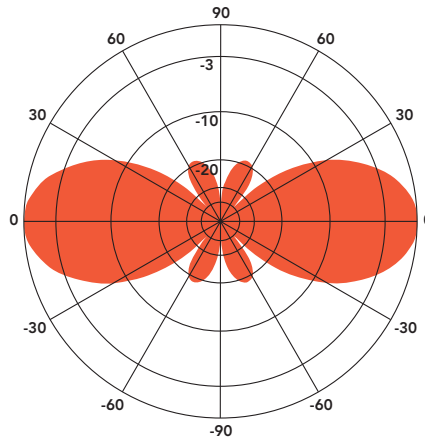
ANT150F2

FIBERGLASS COLLINEAR ANTENNA 2.5 dBd

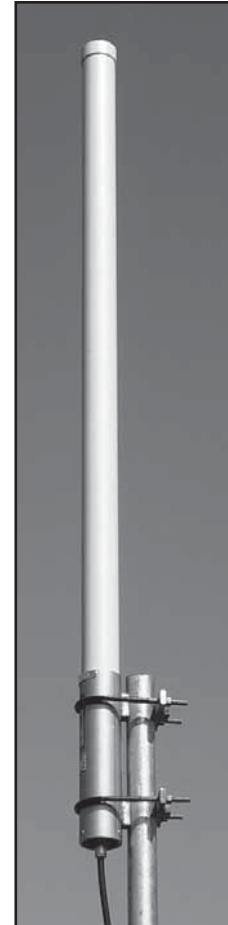
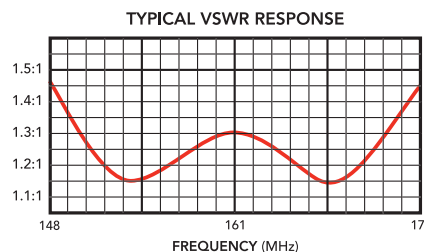
The Telewave ANT150F2 is an extremely rugged collinear antenna, with moderate gain and wide vertical beamwidth. This compact antenna produces 2.5 dBd gain, and is designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, with a path to DC ground for lightning impulse protection.

All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a rugged, high-tech radome to ensure survivability in the worst environments. The "Cool Blue" radome provides maximum protection from corrosive gases, ultraviolet radiation, icing, salt spray, acid rain, and wind blown abrasives.

The ANT150F2 includes the ANTC485 dual clamp set for mounting to a 1.5" to 3" O.D. support pipe, and a 24" removable RG-213 N-Male jumper.



ANT150F2 156 MHz
Vertical Plane
Gain = 2.55 dBd



SPECIFICATIONS

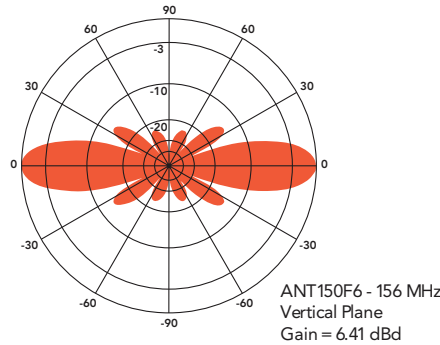
Frequency (continuous)	148-174 MHz	Dimensions (L x base diam.) in.	60 x 2.75
Gain	2.5 dBd	Tower weight (antenna + clamps)	12 lb.
Power rating (typ.)	500 watts	Shipping weight	16 lb.
Impedance	50 ohms	Wind rating / with 0.5" ice	200 / 150 MPH
VSWR	1.5:1 or less	Maximum exposed area	1.3 ft. ²
Pattern	Omnidirectional	Lateral thrust at 100 MPH	50 lb.
Vertical beamwidth	38°	Bending moment at top clamp	67 ft. lb.
Termination	Recessed N Female 7-16 DIN-F opt.	(100 MPH, 40 PSF flat plate equiv.)	

ANT150F6 SERIES

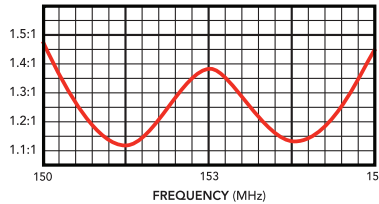
FIBERGLASS COLLINEAR ANTENNA 6 dBd

The Telewave ANT150F6 is an extremely rugged, medium-gain, fiberglass collinear antenna, designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, connected at DC ground potential for lightning impulse protection. All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a high-tech, flexible radome to ensure survivability in the worst environments. IP24

The ANT150F6 includes an ANT482 dual clamp set for mounting to a 1.5" to 3.5" O.D. support pipe, and a 24" removable RG-213 N-Male jumper. Stand-off and top mounts are also available.



TYPICAL VSWR RESPONSE



FREQUENCY RANGES	
ANT150F6-A	155 - 163 MHz
ANT150F6-B	145 - 151 MHz
ANT150F6-C	151.5 - 157.5 MHz
ANT150F6-D	166 - 173 MHz
ANT150F6-E	165 - 172 MHz
ANT150F6-F	143 - 148 MHz
ANT150F6-G	154 - 162 MHz
ANT150F6-SF	153 - 161 MHz
ANT150F6-L	173.1 MHz

FREQUENCY RANGES	
ANT150F6-1	138 - 144 MHz
ANT150F6-2	144 - 151 MHz
ANT150F6-3	150 - 157 MHz
ANT150F6-4	156 - 164 MHz
ANT150F6-5	158 - 166 MHz
ANT150F6-6	161 - 168 MHz
ANT150F6-7	167 - 172.5 MHz
ANT150F6-8	171 - 175 MHz



SPECIFICATION		138-151MHz	150-175MHz
Frequency (continuous)	138-175 MHz (8 bands)	Dimensions (L x base diam.)	256" x 2.75"244" x 2.75"
Gain	6 dBd	Tower weight (antenna + clamps)	43 lb.43 lb.
Power Rating (Type.)	500 watts	Shipping weight	65 lb.65 lb.
Impedance	50 ohms	Wind rating/ with 0.5" ice	150 / 125 MPH
VSWR	1.5:1 or less	Maximum exposed area	4.05 ft.²4.05 ft.²
Pattern	Omnidirectional	Lateral thrust at 100 MPH	162 lb.159 lb.
Vertical beamwidth	20°	Bending moment at top clamp	1090 ft. lb.1010ft. lb.
Termination	Recessed N Female (7-16 DIN-F opt)	(100MPH, 40 PSF flat plate equiv.)	
Temperature	-40 to 140 Degrees F -40 to 60 Degrees C		

APPENDIX 3

HARVARD SENTENCES

RADIO SYTSTEM UPGRADE
CITY OF MOSCOW, IDAHO

LAND MOBILE RADIO SYSTEMS
[33 83 00]

Harvard Sentences

From the appendix of: IEEE Subcommittee on Subjective Measurements IEEE Recommended Practices for Speech Quality Measurements. *IEEE Transactions on Audio and Electroacoustics*. vol 17, 227-46, 1969. Also found at [CMU site](#).

List 1

1. The birch canoe slid on the smooth planks.
2. Glue the sheet to the dark blue background.
3. It's easy to tell the depth of a well.
4. These days a chicken leg is a rare dish.
5. Rice is often served in round bowls.
6. The juice of lemons makes fine punch.
7. The box was thrown beside the parked truck.
8. The hogs were fed chopped corn and garbage.
9. Four hours of steady work faced us.
10. Large size in stockings is hard to sell.

List 2

1. The boy was there when the sun rose.
2. A rod is used to catch pink salmon.
3. The source of the huge river is the clear spring.
4. Kick the ball straight and follow through.
5. Help the woman get back to her feet.
6. A pot of tea helps to pass the evening.
7. Smoky fires lack flame and heat.
8. The soft cushion broke the man's fall.
9. The salt breeze came across from the sea.
10. The girl at the booth sold fifty bonds.

List 3

1. The small pup gnawed a hole in the sock.
2. The fish twisted and turned on the bent hook.
3. Press the pants and sew a button on the vest.
4. The swan dive was far short of perfect.
5. The beauty of the view stunned the young boy.
6. Two blue fish swam in the tank.
7. Her purse was full of useless trash.
8. The colt reared and threw the tall rider.
9. It snowed, rained, and hailed the same morning.
10. Read verse out loud for pleasure.

List 4

1. Hoist the load to your left shoulder.
2. Take the winding path to reach the lake.
3. Note closely the size of the gas tank.
4. Wipe the grease off his dirty face.
5. Mend the coat before you go out.
6. The wrist was badly strained and hung limp.
7. The stray cat gave birth to kittens.
8. The young girl gave no clear response.
9. The meal was cooked before the bell rang.
10. What joy there is in living.

List 5

1. A king ruled the state in the early days.
2. The ship was torn apart on the sharp reef.
3. Sickness kept him home the third week.
4. The wide road shimmered in the hot sun.
5. The lazy cow lay in the cool grass.
6. Lift the square stone over the fence.
7. The rope will bind the seven books at once.
8. Hop over the fence and plunge in.
9. The friendly gang left the drug store.
10. Mesh mire keeps chicks inside.

List 6

1. The frosty air passed through the coat.
2. The crooked maze failed to fool the mouse.
3. Adding fast leads to wrong sums.
4. The show was a flop from the very start.
5. A saw is a tool used for making boards.
6. The wagon moved on well oiled wheels.
7. March the soldiers past the next hill.
8. A cup of sugar makes sweet fudge.
9. Place a rosebush near the porch steps.
10. Both lost their lives in the raging storm.

List 7

1. We talked of the slide show in the circus.
2. Use a pencil to write the first draft.
3. He ran half way to the hardware store.
4. The clock struck to mark the third period.
5. A small creek cut across the field.
6. Cars and busses stalled in snow drifts.
7. The set of china hit, the floor with a crash.
8. This is a grand season for hikes on the road.
9. The dune rose from the edge of the water.
10. Those words were the cue for the actor to leave.

List 8

1. A yacht slid around the point into the bay.
2. The two met while playing on the sand.
3. The ink stain dried on the finished page.
4. The walled town was seized without a fight.
5. The lease ran out in sixteen weeks.
6. A tame squirrel makes a nice pet.
7. The horn of the car woke the sleeping cop.
8. The heart beat strongly and with firm strokes.
9. The pearl was worn in a thin silver ring.
10. The fruit peel was cut in thick slices.

List 9

1. The Navy attacked the big task force.
2. See the cat glaring at the scared mouse.
3. There are more than two factors here.
4. The hat brim was wide and too droopy.
5. The lawyer tried to lose his case.
6. The grass curled around the fence post.
7. Cut the pie into large parts.
8. Men strive but seldom get rich.
9. Always close the barn door tight.
10. He lay prone and hardly moved a limb.

List 10

1. The slush lay deep along the street.
2. A wisp of cloud hung in the blue air.
3. A pound of sugar costs more than eggs.
4. The fin was sharp and cut the clear water.
5. The play seems dull and quite stupid.
6. Bail the boat, to stop it from sinking.
7. The term ended in late June that year.
8. A tusk is used to make costly gifts.
9. Ten pins were set in order.
10. The bill as paid every third week.

List 11

1. Oak is strong and also gives shade.
2. Cats and dogs each hate the other.
3. The pipe began to rust while new.
4. Open the crate but don't break the glass.
5. Add the sum to the product of these three.
6. Thieves who rob friends deserve jail.
7. The ripe taste of cheese improves with age.

8. Act on these orders with great speed.
9. The hog crawled under the high fence.
10. Move the vat over the hot fire.

List 12

1. The bark of the pine tree was shiny and dark.
2. Leaves turn brown and yellow in the fall.
3. The pennant waved when the wind blew.
4. Split the log with a quick, sharp blow.
5. Burn peat after the logs give out.
6. He ordered peach pie with ice cream.
7. Weave the carpet on the right hand side.
8. Hemp is a weed found in parts of the tropics.
9. A lame back kept his score low.
10. We find joy in the simplest things.

List 13

1. Type out three lists of orders.
2. The harder he tried the less he got done.
3. The boss ran the show with a watchful eye.
4. The cup cracked and spilled its contents.
5. Paste can cleanse the most dirty brass.
6. The slang word for raw whiskey is booze.
7. It caught its hind paw in a rusty trap.
8. The wharf could be seen at the farther shore.
9. Feel the heat of the weak dying flame.
10. The tiny girl took off her hat.

List 14

1. A cramp is no small danger on a swim.
2. He said the same phrase thirty times.
3. Pluck the bright rose without leaves.
4. Two plus seven is less than ten.
5. The glow deepened in the eyes of the sweet girl.
6. Bring your problems to the wise chief.
7. Write a fond note to the friend you cherish.
8. Clothes and lodging are free to new men.
9. We frown when events take a bad turn.
10. Port is a strong wine with s smoky taste.

List 15

1. The young kid jumped the rusty gate.
2. Guess the results from the first scores.
3. A salt pickle tastes fine with ham.

4. The just claim got the right verdict.
5. These thistles bend in a high wind.
6. Pure bred poodles have curls.
7. The tree top waved in a graceful way.
8. The spot on the blotter was made by green ink.
9. Mud was spattered on the front of his white shirt.
10. The cigar burned a hole in the desk top.

List 16

1. The empty flask stood on the tin tray.
2. A speedy man can beat this track mark.
3. He broke a new shoelace that day.
4. The coffee stand is too high for the couch.
5. The urge to write short stories is rare.
6. The pencils have all been used.
7. The pirates seized the crew of the lost ship.
8. We tried to replace the coin but failed.
9. She sewed the torn coat quite neatly.
10. The sofa cushion is red and of light weight.

List 17

1. The jacket hung on the back of the wide chair.
2. At that high level the air is pure.
3. Drop the two when you add the figures.
4. A filing case is now hard to buy.
5. An abrupt start does not win the prize.
6. Wood is best for making toys and blocks.
7. The office paint was a dull sad tan.
8. He knew the skill of the great young actress.
9. A rag will soak up spilled water.
10. A shower of dirt fell from the hot pipes.

List 18

1. Steam hissed from the broken valve.
2. The child almost hurt the small dog.
3. There was a sound of dry leaves outside.
4. The sky that morning was clear and bright blue.
5. Torn scraps littered the stone floor.
6. Sunday is the best part of the week.
7. The doctor cured him with these pills.
8. The new girl was fired today at noon.
9. They felt gay when the ship arrived in port.
10. Add the store's account to the last cent.

List 19

1. Acid burns holes in wool cloth.
2. Fairy tales should be fun to write.
3. Eight miles of woodland burned to waste.
4. The third act was dull and tired the players.
5. A young child should not suffer fright.
6. Add the column and put the sum here.
7. We admire and love a good cook.
8. There the flood mark is ten inches.
9. He carved a head from the round block of marble.
10. She has st smart way of wearing clothes.

List 20

1. The fruit of a fig tree is apple-shaped.
2. Corn cobs can be used to kindle a fire.
3. Where were they when the noise started.
4. The paper box is full of thumb tacks.
5. Sell your gift to a buyer at a good gain.
6. The tongs lay beside the ice pail.
7. The petals fall with the next puff of wind.
8. Bring your best compass to the third class.
9. They could laugh although they were sad.
10. Farmers came in to thresh the oat crop.

List 21

1. The brown house was on fire to the attic.
2. The lure is used to catch trout and flounder.
3. Float the soap on top of the bath water.
4. A blue crane is a tall wading bird.
5. A fresh start will work such wonders.
6. The club rented the rink for the fifth night.
7. After the dance they went straight home.
8. The hostess taught the new maid to serve.
9. He wrote his last novel there at the inn.
10. Even the worst will beat his low score.

List 22

1. The cement had dried when he moved it.
2. The loss of the second ship was hard to take.
3. The fly made its way along the wall.
4. Do that with a wooden stick.
5. Lire wires should be kept covered.
6. The large house had hot water taps.
7. It is hard to erase blue or red ink.
8. Write at once or you may forget it.
9. The doorknob was made of bright clean brass.
10. The wreck occurred by the bank on Main Street.

List 23

1. A pencil with black lead writes best.
2. Coax a young calf to drink from a bucket.
3. Schools for ladies teach charm and grace.
4. The lamp shone with a steady green flame.
5. They took the axe and the saw to the forest.
6. The ancient coin was quite dull and worn.
7. The shaky barn fell with a loud crash.
8. Jazz and swing fans like fast music.
9. Rake the rubbish up and then burn it.
10. Slash the gold cloth into fine ribbons.

List 24

1. Try to have the court decide the case.
2. They are pushed back each time they attack.
3. He broke his ties with groups of former friends.
4. They floated on the raft to sun their white backs.
5. The map had an X that meant nothing.
6. Whittings are small fish caught in nets.
7. Some ads serve to cheat buyers.
8. Jerk the rope and the bell rings weakly.
9. A waxed floor makes us lose balance.
10. Madam, this is the best brand of corn.

List 25

1. On the islands the sea breeze is soft and mild.
2. The play began as soon as we sat down.
3. This will lead the world to more sound and fury
4. Add salt before you fry the egg.
5. The rush for funds reached its peak Tuesday.
6. The birch looked stark white and lonesome.
7. The box is held by a bright red snapper.
8. To make pure ice, you freeze water.
9. The first worm gets snapped early.
10. Jump the fence and hurry up the bank.

List 26

1. Yell and clap as the curtain slides back.
2. They are men who walk the middle of the road.
3. Both brothers wear the same size.
4. In some forin or other we need fun.
5. The prince ordered his head chopped off.
6. The houses are built of red clay bricks.
7. Ducks fly north but lack a compass.

8. Fruit flavors are used in fizz drinks.
9. These pills do less good than others.
10. Canned pears lack full flavor.

List 27

1. The dark pot hung in the front closet.
2. Carry the pail to the wall and spill it there.
3. The train brought our hero to the big town.
4. We are sure that one war is enough.
5. Gray paint stretched for miles around.
6. The rude laugh filled the empty room.
7. High seats are best for football fans.
8. Tea served from the brown jug is tasty.
9. A dash of pepper spoils beef stew.
10. A zestful food is the hot-cross bun.

List 28

1. The horse trotted around the field at a brisk pace.
2. Find the twin who stole the pearl necklace.
3. Cut the cord that binds the box tightly.
4. The red tape bound the smuggled food.
5. Look in the corner to find the tan shirt.
6. The cold drizzle will halt the bond drive.
7. Nine men were hired to dig the ruins.
8. The junk yard had a mouldy smell.
9. The flint sputtered and lit a pine torch.
10. Soak the cloth and drown the sharp odor.

List 29

1. The shelves were bare of both jam or crackers.
2. A joy to every child is the swan boat.
3. All sat frozen and watched the screen.
4. A cloud of dust stung his tender eyes.
5. To reach the end he needs much courage.
6. Shape the clay gently into block form.
7. The ridge on a smooth surface is a bump or flaw.
8. Hedge apples may stain your hands green.
9. Quench your thirst, then eat the crackers.
10. Tight curls get limp on rainy days.

List 30

1. The mute muffled the high tones of the horn.
2. The gold ring fits only a pierced ear.
3. The old pan was covered with hard fudge.

4. Watch the log float in the wide river.
5. The node on the stalk of wheat grew daily.
6. The heap of fallen leaves was set on fire.
7. Write fast, if you want to finish early.
8. His shirt was clean but one button was gone.
9. The barrel of beer was a brew of malt and hops.
10. Tin cans are absent from store shelves.

List 31

1. Slide the box into that empty space.
2. The plant grew large and green in the window.
3. The beam dropped down on the workmen's head.
4. Pink clouds floated with the breeze.
5. She danced like a swan, tall and graceful.
6. The tube was blown and the tire flat and useless.
7. It is late morning on the old wall clock.
8. Let's all join as we sing the last chorus.
9. The last switch cannot be turned off.
10. The fight will end in just six minutes.

List 32

1. The store walls were lined with colored frocks.
2. The peace league met to discuss their plans.
3. The rise to fame of a person takes luck.
4. Paper is scarce, so write with much care.
5. The quick fox jumped on the sleeping cat.
6. The nozzle of the fire hose was bright brass.
7. Screw the round cap on as tight as needed.
8. Time brings us many changes.
9. The purple tie was ten years old.
10. Men think and plan and sometimes act.

List 33

1. Fill the ink jar with sticky glue.
2. He smoke a big pipe with strong contents.
3. We need grain to keep our mules healthy.
4. Pack the records in a neat thin case.
5. The crunch of feet in the snow was the only sound.
6. The copper bowl shone in the sun's rays.
7. Boards will warp unless kept dry.
8. The plush chair leaned against the wall.
9. Glass will clink when struck by metal.
10. Bathe and relax in the cool green grass.

List 34

1. Nine rows of soldiers stood in line.
2. The beach is dry and shallow at low tide.
3. The idea is to sew both edges straight.
4. The kitten chased the dog down the street.
5. Pages bound in cloth make a book.
6. Try to trace the fine lines of the painting.
7. Women form less than half of the group.
8. The zones merge in the central part of town.
9. A gem in the rough needs work to polish.
10. Code is used when secrets are sent.

List 35

1. Most of the new is easy for us to hear.
2. He used the lathe to make brass objects.
3. The vane on top of the pole revolved in the wind.
4. Mince pie is a dish served to children.
5. The clan gathered on each dull night.
6. Let it burn, it gives us warmth and comfort.
7. A castle built from sand fails to endure.
8. A child's wit saved the day for us.
9. Tack the strip of carpet to the worn floor.
10. Next Tuesday we must vote.

List 36

1. Pour the stew from the pot into the plate.
2. Each penny shone like new.
3. The man went to the woods to gather sticks.
4. The dirt piles were lines along the road.
5. The logs fell and tumbled into the clear stream.
6. Just hoist it up and take it away,
7. A ripe plum is fit for a king's palate.
8. Our plans right now are hazy.
9. Brass rings are sold by these natives.
10. It takes a good trap to capture a bear.

List 37

1. Feed the white mouse some flower seeds.
2. The thaw came early and freed the stream.
3. He took the lead and kept it the whole distance.
4. The key you designed will fit the lock.
5. Plead to the council to free the poor thief.
6. Better hash is made of rare beef.
7. This plank was made for walking on.
8. The lake sparkled in the red hot sun.
9. He crawled with care along the ledge.
10. Tend the sheep while the dog wanders.

List 38

1. It takes a lot of help to finish these.
2. Mark the spot with a sign painted red.
3. Take two shares as a fair profit.
4. The fur of cats goes by many names.
5. North winds bring colds and fevers.
6. He asks no person to vouch for him.
7. Go now and come here later.
8. A sash of gold silk will trim her dress.
9. Soap can wash most dirt away.
10. That move means the game is over.

List 39

1. He wrote down a long list of items.
2. A siege will crack the strong defense.
3. Grape juice and water mix well.
4. Roads are paved with sticky tar.
5. Fake & ones shine but cost little.
6. The drip of the rain made a pleasant sound.
7. Smoke poured out of every crack.
8. Serve the hot rum to the tired heroes.
9. Much of the story makes good sense.
10. The sun came up to light the eastern sky.

List 40

1. Heave the line over the port side.
2. A lathe cuts and trims any wood.
3. It's a dense crowd in two distinct ways.
4. His hip struck the knee of the next player.
5. The stale smell of old beer lingers.
6. The desk was firm on the shaky floor.
7. It takes heat to bring out the odor.
8. Beef is scarcer than some lamb.
9. Raise the sail and steer the ship northward.
10. The cone costs five cents on Mondays.

List 41

1. A pod is what peas always grow in.
2. Jerk the dart from the cork target.
3. No cement will hold hard wood.
4. We now have a new base for shipping.
5. The list of names is carved around the base.
6. The sheep were led home by a dog.
7. Three for a dime, the young peddler cried.

8. The sense of smell is better than that of touch.
9. No hardship seemed to keep him sad.
10. Grace makes up for lack of beauty.

List 42

1. Nudge gently but wake her now.
2. The news struck doubt into restless minds.
3. Once we stood beside the shore.
4. A chink in the wall allowed a draft to blow.
5. Fasten two pins on each side.
6. A cold dip restores health and zest.
7. He takes the oath of office each March.
8. The sand drifts over the sill of the old house.
9. The point of the steel pen was bent and twisted.
10. There is a lag between thought and act.

List 43

1. Seed is needed to plant the spring corn.
2. Draw the chart with heavy black lines.
3. The boy owed his pal thirty cents.
4. The chap slipped into the crowd and was lost.
5. Hats are worn to tea and not to dinner.
6. The ramp led up to the wide highway.
7. Beat the dust from the rug onto the lawn.
8. Say it slowly but make it ring clear.
9. The straw nest housed five robins.
10. Screen the porch with woven straw mats.

List 44

1. This horse will nose his way to the finish.
2. The dry wax protects the deep scratch.
3. He picked up the dice for a second roll.
4. These coins will be needed to pay his debt.
5. The nag pulled the frail cart along.
6. Twist the valve and release hot steam.
7. The vamp of the shoe had a gold buckle.
8. The smell of burned rags itches my nose.
9. Xew pants lack cuffs and pockets.
10. The marsh will freeze when cold enough.

List 45

1. They slice the sausage thin with a knife.
2. The bloom of the rose lasts a few days.
3. A gray mare walked before the colt.

4. Breakfast buns are fine with a hot drink.
5. Bottles hold four kinds of rum.
6. The man wore a feather in his felt hat.
7. He wheeled the bike past. the winding road.
8. Drop the ashes on the worn old rug.
9. The desk and both chairs were painted tan.
10. Throw out the used paper cup and plate.

List 46

1. A clean neck means a neat collar.
2. The couch cover and hall drapes were blue.
3. The stems of the tall glasses cracked and broke.
4. The wall phone rang loud and often.
5. The clothes dried on a thin wooden rack.
6. Turn on the lantern which gives us light.
7. The cleat sank deeply into the soft turf.
8. The bills were mailed promptly on the tenth of the month.
9. To have is better than to wait and hope.
10. The price is fair for a good antique clock.

List 47

1. The music played on while they talked.
2. Dispense with a vest on a day like this.
3. The bunch of grapes was pressed into wine.
4. He sent the figs, but kept the ripe cherries.
5. The hinge on the door creaked with old age.
6. The screen before the fire kept in the sparks.
7. Fly by night, and you waste little time.
8. Thick glasses helped him read the print.
9. Birth and death mark the limits of life.
10. The chair looked strong but had no bottom.

List 48

1. The kite flew wildly in the high wind.
2. A fur muff is stylish once more.
3. The tin box held priceless stones.
4. We need an end of all such matter.
5. The case was puzzling to the old and wise.
6. The bright lanterns were gay on the dark lawn.
7. We don't get much money but we have fun.
8. The youth drove with zest, but little skill.
9. Five years he lived with a shaggy dog.
10. A fence cuts through the corner lot.

List 49

1. The way to save money is not to spend much.
2. Shut the hatch before the waves push it in.
3. The odor of spring makes young hearts jump.
4. Crack the walnut with your sharp side teeth.
5. He offered proof in the form of a lsrge chart.
6. Send the stuff in a thick paper bag.
7. A quart of milk is water for the most part.
8. They told wild tales to frighten him.
9. The three story house was built of stone.
10. In the rear of the ground floor was a large passage.

List 50

1. A man in a blue sweater sat at the desk.
2. Oats are a food eaten by horse and man.
3. Their eyelids droop for want. of sleep.
4. The sip of tea revives his tired friend.
5. There are many ways to do these things.
6. Tuck the sheet under the edge of the mat.
7. A force equal to that would move the earth.
8. We like to see clear weather.
9. The work of the tailor is seen on each side.
10. Take a chance and win a china doll.

List 51

1. Shake the dust from your shoes, stranger.
2. She was kind to sick old people.
3. The dusty bench stood by the stone wall.
4. The square wooden crate was packed to be shipped.
5. We dress to suit the weather of most days.
6. Smile when you say nasty words.
7. A bowl of rice is free with chicken stew.
8. The water in this well is a source of good health.
9. Take shelter in this tent, but keep still.
10. That guy is the writer of a few banned books.

List 52

1. The little tales they tell are false.
2. The door was barred, locked, and bolted as well.
3. Ripe pears are fit for a queen's table.
4. A big wet stain was on the round carpet.
5. The kite dipped and swayed, but stayed aloft.
6. The pleasant hours fly by much too soon.
7. The room was crowded with a wild mob.
8. This strong arm shall shield your honor.
9. She blushed when he gave her a white orchid.
10. The beetle droned in the hot June sun.

List 53

1. Press the pedal with your left foot.
2. Neat plans fail without luck.
3. The black trunk fell from the landing.
4. The bank pressed for payment of the debt.
5. The theft of the pearl pin was kept secret.
6. Shake hands with this friendly child.
7. The vast space stretched into the far distance.
8. A rich farm is rare in this sandy waste.
9. His wide grin earned many friends.
10. Flax makes a fine brand of paper.

List 54

1. Hurdle the pit with the aid of a long pole.
2. A strong bid may scare your partner stiff.
3. Even a just cause needs power to win.
4. Peep under the tent and see the clowns.
5. The leaf drifts along with a slow spin.
6. Cheap clothes are flashy but don't last.
7. A thing of small note can cause despair.
8. Flood the mails with requests for this book.
9. A thick coat of black paint covered all.
10. The pencil was cut to be sharp at both ends.

List 55

1. Those last words were a strong statement.
2. He wrote his name boldly at the top of tile sheet.
3. Dill pickles are sour but taste fine.
4. Down that road is the way to the grain farmer.
5. Either mud or dust are found at all times.
6. The best method is to fix it in place with clips.
7. If you mumble your speech will be lost.
8. At night the alarm roused him from a deep sleep.
9. Read just what the meter says.
10. Fill your pack with bright trinkets for the poor.

List 56

1. The small red neon lamp went out.
2. Clams are small, round, soft, and tasty.
3. The fan whirled its round blades softly.
4. The line where the edges join was clean.
5. Breathe deep and smell the piny air.
6. It matters not if he reads these words or those.
7. A brown leather bag hung from its strap.

8. A toad and a frog are hard to tell apart.
9. A white silk jacket goes with any shoes.
10. A break in the dam almost caused a flood.

List 57

1. Paint the sockets in the wall dull green.
2. The child crawled into the dense grass.
3. Bribes fail where honest men work.
4. Trample the spark, else the flames will spread.
5. The hilt. of the sword was carved with fine designs.
6. A round hole was drilled through the thin board.
7. Footprints showed the path he took up the beach.
8. She was waiting at my front lawn.
9. A vent near the edge brought in fresh air.
10. Prod the old mule with a crooked stick.

List 58

1. It is a band of steel three inches wide.
2. The pipe ran almost the length of the ditch.
3. It was hidden from sight by a mass of leaves and shrubs.
4. The weight. of the package was seen on the high scale.
5. Wake and rise, and step into the green outdoors.
6. The green light in the brown box flickered.
7. The brass tube circled the high wall.
8. The lobes of her ears were pierced to hold rings.
9. Hold the hammer near the end to drive the nail.
10. Next Sunday is the twelfth of the month.

List 59

1. Every word and phrase he speaks is true.
2. He put his last cartridge into the gun and fired.
3. They took their kids from the public school.
4. Drive the screw straight into the wood.
5. Keep the hatch tight and the watch constant.
6. Sever the twine with a quick snip of the knife.
7. Paper will dry out when wet.
8. Slide the catch back and open the desk.
9. Help the weak to preserve their strength.
10. A sullen smile gets few friends.

List 60

1. Stop whistling and watch the boys march.
2. Jerk the cord, and out tumbles the gold.
3. Slide the tray across the glass top.

4. The cloud moved in a stately way and was gone.
5. Light maple makes for a swell room.
6. Set the piece here and say nothing.
7. Dull stories make her laugh.
8. A stiff cord will do to fasten your shoe.
9. Get the trust fund to the bank early.
10. Choose between the high road and the low.

List 61

1. A plea for funds seems to come again.
2. He lent his coat to the tall gaunt stranger.
3. There is a strong chance it will happen once more.
4. The duke left the park in a silver coach.
5. Greet the new guests and leave quickly.
6. When the frost has come it is time for turkey.
7. Sweet words work better than fierce.
8. A thin stripe runs down the middle.
9. A six comes up more often than a ten.
10. Lush fern grow on the lofty rocks.

List 62

1. The ram scared the school children off.
2. The team with the best timing looks good.
3. The farmer swapped his horse for a brown ox.
4. Sit on the perch and tell the others what to do.
5. A steep trail is painful for our feet.
6. The early phase of life moves fast.
7. Green moss grows on the northern side.
8. Tea in thin china has a sweet taste.
9. Pitch the straw through the door of the stable.
10. The latch on the beck gate needed a nail.

List 63

1. The goose was brought straight from the old market.
2. The sink is the thing in which we pile dishes.
3. A whiff of it will cure the most stubborn cold.
4. The facts don't always show who is right.
5. She flaps her cape as she parades the street.
6. The loss of the cruiser was a blow to the fleet.
7. Loop the braid to the left and then over.
8. Plead with the lawyer to drop the lost cause.
9. Calves thrive on tender spring grass.
10. Post no bills on this office wall.

List 64

1. Tear a thin sheet from the yellow pad.
2. A cruise in warm waters in a sleek yacht is fun.
3. A streak of color ran down the left edge.
4. It was done before the boy could see it.
5. Crouch before you jump or miss the mark.
6. Pack the kits and don't forget the salt.
7. The square peg will settle in the round hole.
8. Fine soap saves tender skin.
9. Poached eggs and tea must suffice.
10. Bad nerves are jangled by a door slam.

List 65

1. Ship maps are different from those for planes.
2. Dimes showered down from all sides.
3. They sang the same tunes at each party.
4. The sky in the west is tinged with orange red.
5. The pods of peas ferment in bare fields.
6. The horse balked and threw the tall rider.
7. The hitch between the horse and cart broke.
8. Pile the coal high in the shed corner.
9. The gold vase is both rare and costly.
10. The knife was hung inside its bright sheath.

List 66

1. The rarest spice comes from the far East.
2. The roof should be tilted at a sharp slant.
3. A smatter of French is worse than none.
4. The mule trod the treadmill day and night.
5. The aim of the contest is to raise a great fund.
6. To send it, now in large amounts is bad.
7. There is a fine hard tang in salty air.
8. Cod is the main business of the north shore.
9. The slab was hewn from heavy blocks of slat'e.
10. Dunk the stale biscuits into strong drink.

List 67

1. Hang tinsel from both branches.
2. Cap the jar with a tight brass cover.
3. The poor boy missed the boat again.
4. Be sure to set the lamp firmly in the hole.
5. Pick a card and slip it, under the pack.
6. A round mat will cover the dull spot.
7. The first part of the plan needs changing.
8. The good book informs of what we ought to know.
9. The mail comes in three batches per day.
10. You cannot brew tea in a cold pot.

List 68

1. Dots of light betrayed the black cat.
2. Put the chart on the mantel and tack it down.
3. The night shift men rate extra pay.
4. The red paper brightened the dim stage.
5. See the player scoot to third base.
6. Slide the bill between the two leaves.
7. Many hands help get the job done.
8. We don't like to admit our small faults.
9. No doubt about the way the wind blows.
10. Dig deep in the earth for pirate's gold.

List 69

1. The steady drip is worse than a drenching rain.
2. A flat pack takes less luggage space.
3. Green ice frosted the punch bowl.
4. A stuffed chair slipped from the moving van.
5. The stitch will serve but needs to be shortened.
6. A thin book fits in the side pocket.
7. The gloss on top made it unfit to read.
8. The hail pattered on the burnt brown grass.
9. Seven seals were stamped on great sheets.
10. Our troops are set to strike heavy blows.

List 70

1. The store was jammed before the sale could start.
2. It was a bad error on the part of the new judge.
3. One step more and the board will collapse.
4. Take the match and strike it against your shoe.
5. The pot boiled, but the contents failed to jell.
6. The baby puts his right foot in his mouth.
7. The bombs left most of the town in ruins.
8. Stop and stare at the hard working man.
9. The streets are narrow and full of sharp turns.
10. The pup jerked the leash as he saw a feline shape.

List 71

1. Open your book to the first page.
2. Fish evade the net, and swim off.
3. Dip the pail once and let it settle.
4. Will you please answer that phone.
5. The big red apple fell to the ground.
6. The curtain rose and the show was on.
7. The young prince became heir to the throne.

8. He sent the boy on a short errand.
9. Leave now and you will arrive on time.
10. The corner store was robbed last night.

List 72

1. A gold ring will please most any girl.
2. The long journey home took a year.
3. She saw a cat in the neighbor's house.
4. A pink shell was found on the sandy beach.
5. Small children came to see him.
6. The grass and bushes were wet with dew.
7. The blind man counted his old coins.
8. A severe storm tore down the barn.
9. She called his name many times.
10. When you hear the bell, come quickly.

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Electrical equipment coordination and installation.
 - 2. Sleeves for raceways and cables.
 - 3. Sleeve seals.
 - 4. Common electrical installation requirements.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

1.4 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- D. Cut sleeves to length for mounting flush with both surfaces of walls.
- E. Extend sleeves installed in floors 2 inches above finished floor level.
- F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require a different clearance.

- G. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- H. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials.
- I. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.3 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

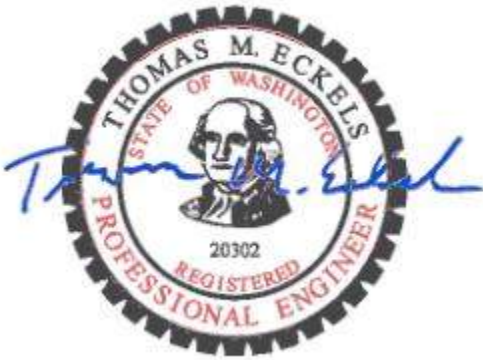
END OF SECTION 16050

Statement of Engineer

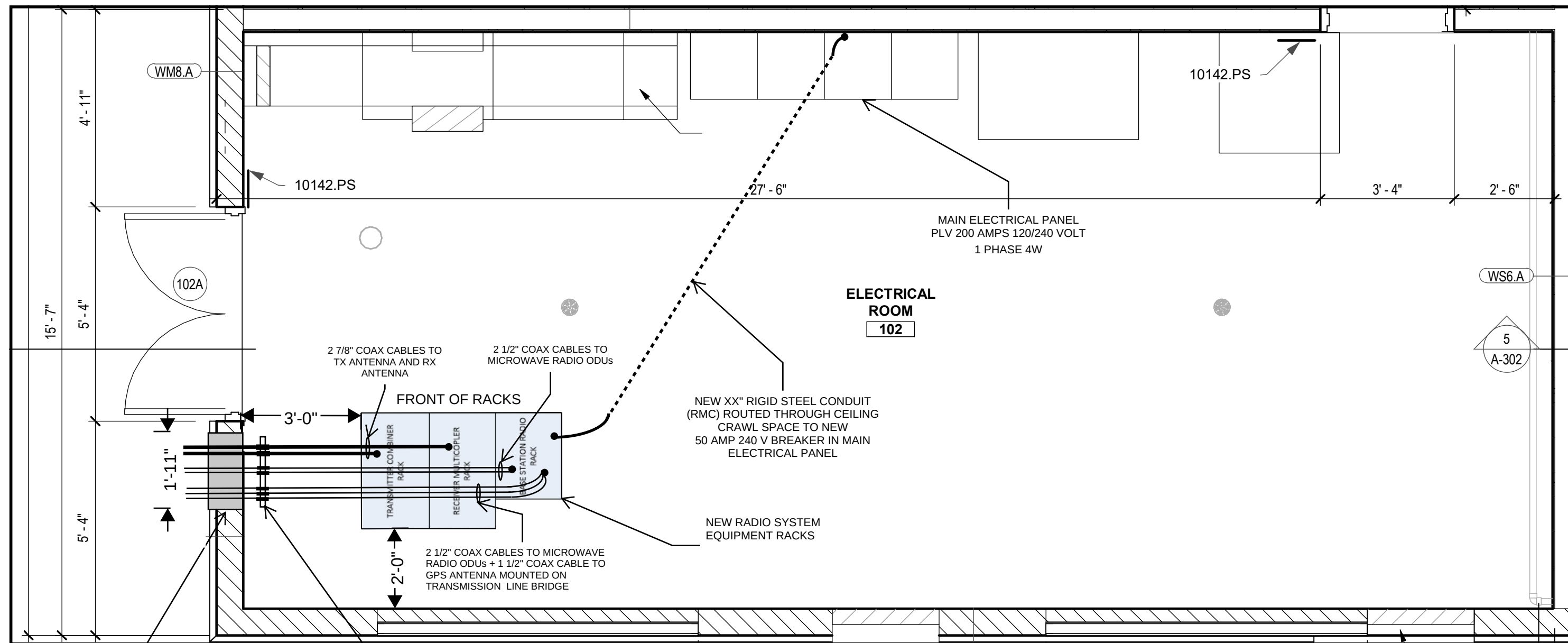
The attached drawings and specifications have been prepared by the undersigned.

I am a Registered Professional Engineer in the States of Washington, Colorado and Hawaii and have more than 30 years of experience in the design and implementation of public safety land mobile and microwave radio systems.

June 22, 2023



Thomas M. Eckels, P.E.



NEW 6-PORT (3 x 2) ENTRY PANEL
MOUNT ABOVE HVAC VENTS (LOWER EDGE
OF PANEL ~15' ABOVE FINISHED FLOOR)

SURGE ARRESTOR FRAME WITH COAX
SURGE ARRESTORS
MOUNTED FROM CEILING (SEE DRAWING
R37)

2 7/8" COAX CABLES TO
TX ANTENNA AND RX
ANTENNA

2 1/2" COAX CABLES TO
MICROWAVE RADIO ODUs

FRONT OF RACKS

TRANSMITTER COMBINER
RACK

RECEIVER MULTICOPLER
RACK

BASE STATION RADIO
RACK

2 1/2" COAX CABLES TO MICROWAVE
RADIO ODUs + 1 1/2" COAX CABLE TO
GPS ANTENNA MOUNTED ON
TRANSMISSION LINE BRIDGE

NEW XX" RIGID STEEL CONDUIT
(RMC) ROUTED THROUGH CEILING
CRAWL SPACE TO NEW
50 AMP 240 V BREAKER IN MAIN
ELECTRICAL PANEL

NEW RADIO SYSTEM
EQUIPMENT RACKS

3'-0"

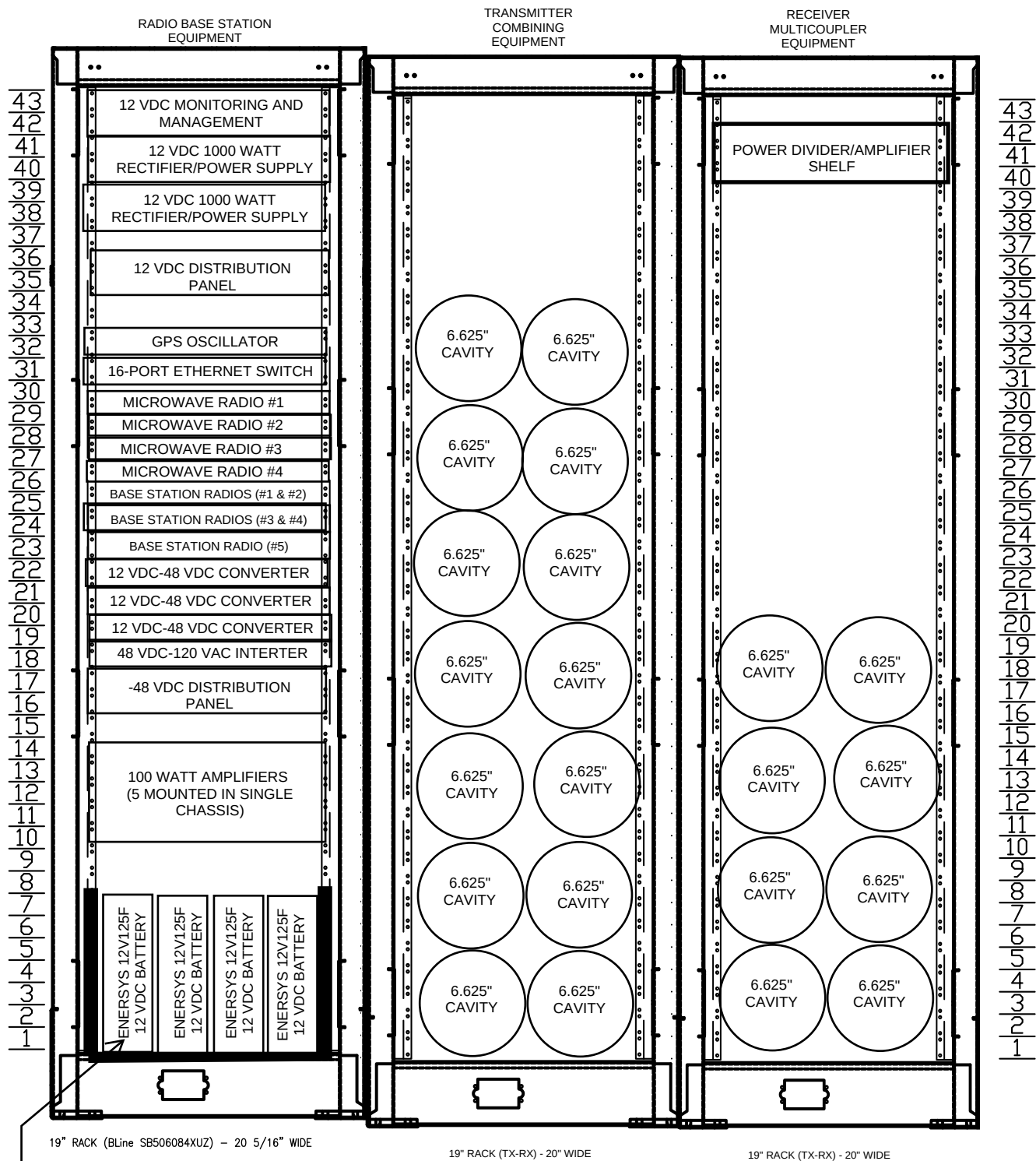
DRAWING SCALE

HATFIELD & DAWSON
CONSULTING ENGINEERS

FLOOR PLAN AND RACK LAYOUT
WELL 10 SITE

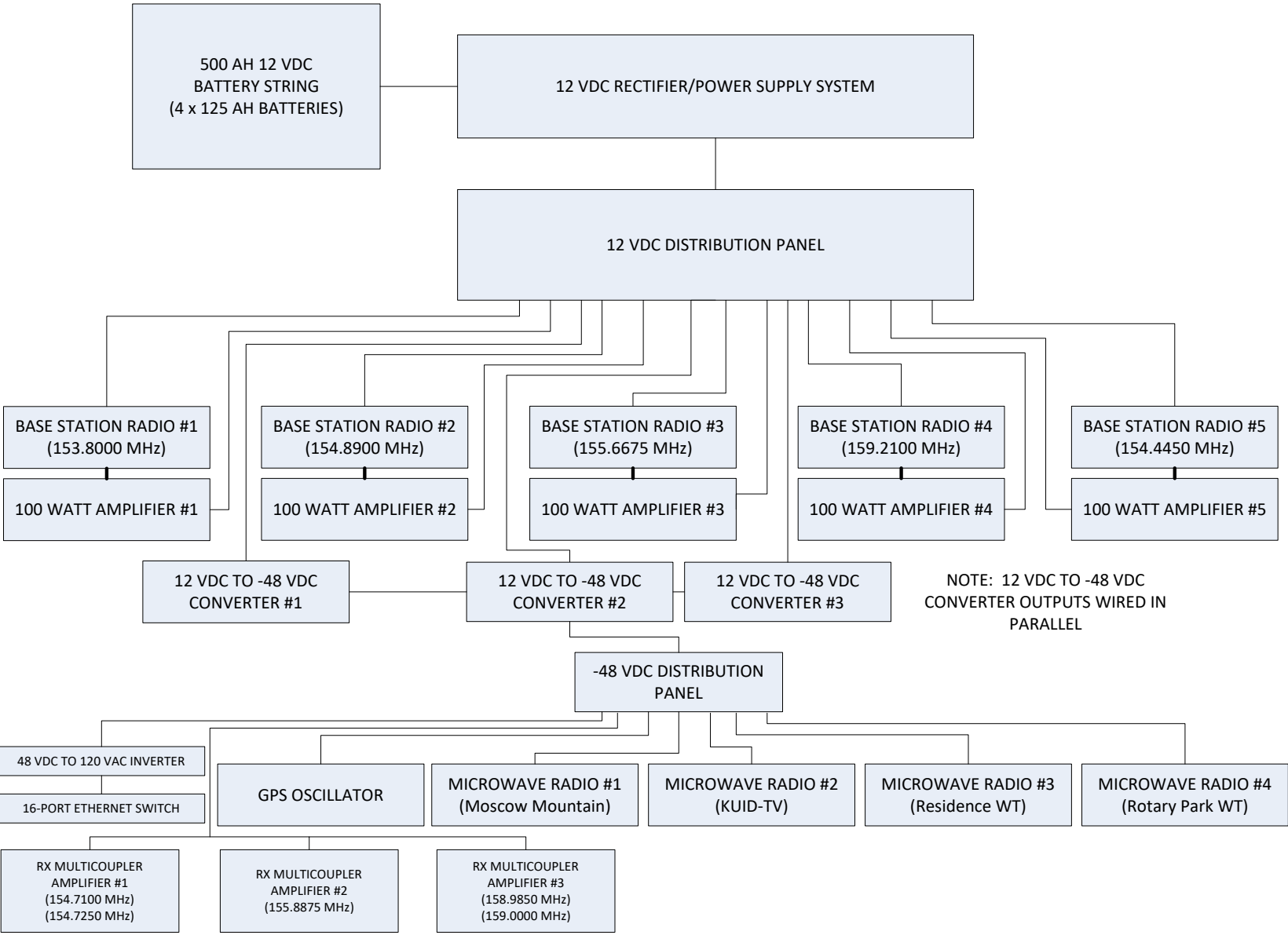
RADIO SYSTEM UPGRADE PROJECT
CITY OF MOSCOW, IDAHO

SIZE	DATE	DWG NO	REV
	November 2022	R001	1
SCALE		SHEET	1 OF 1

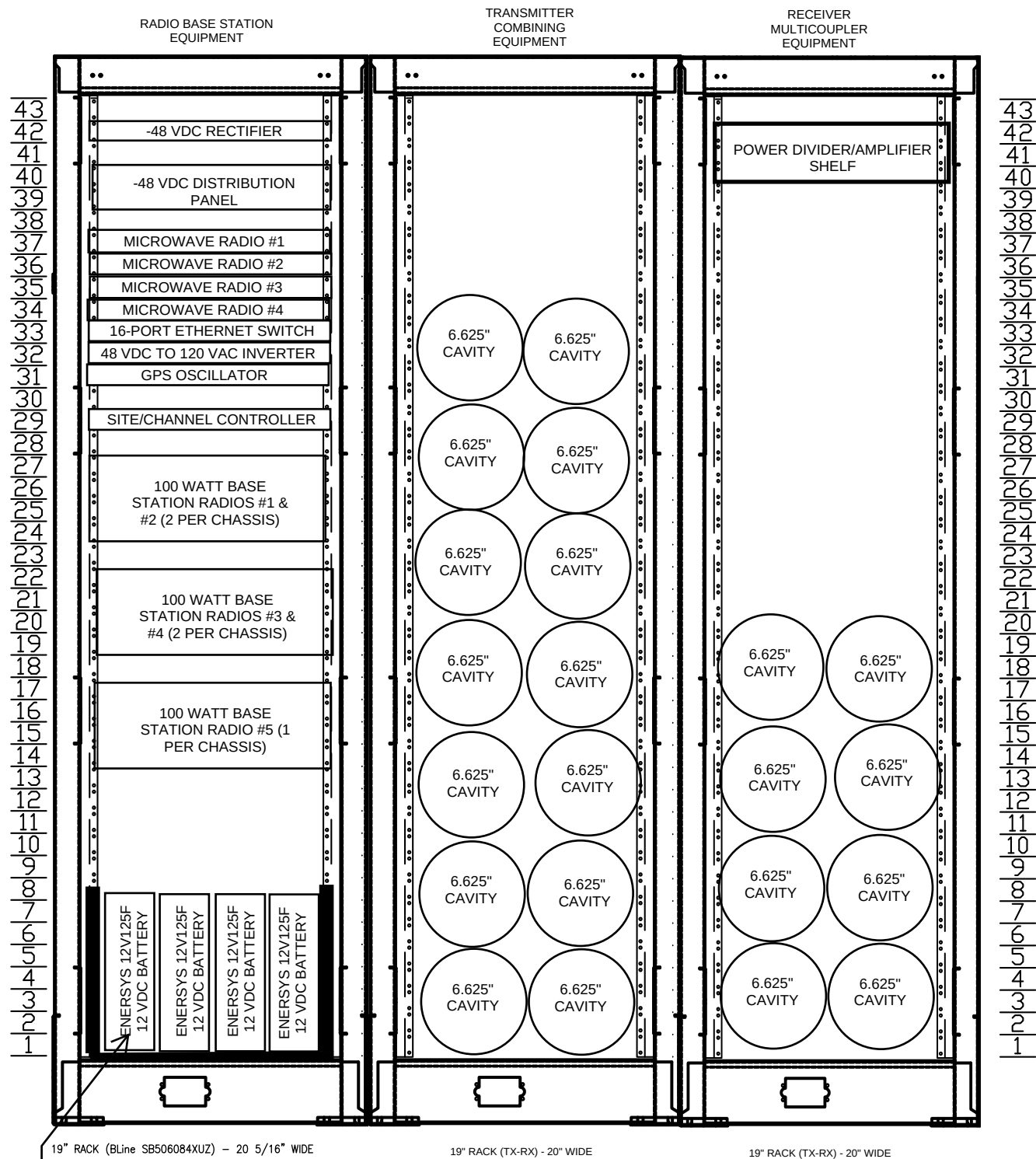


NOTE 1

NOTE 1 ENERSYS POWERSAFE 12V125F 12 VDC BATTERIES WIRED IN PARALLEL TO PROVIDE 500 AH 12 VDC BATTERY SYSTEM. BACKUP TIME TO 1.75 Vpc @ 77 DEGREES ~ 4.5 HOURS

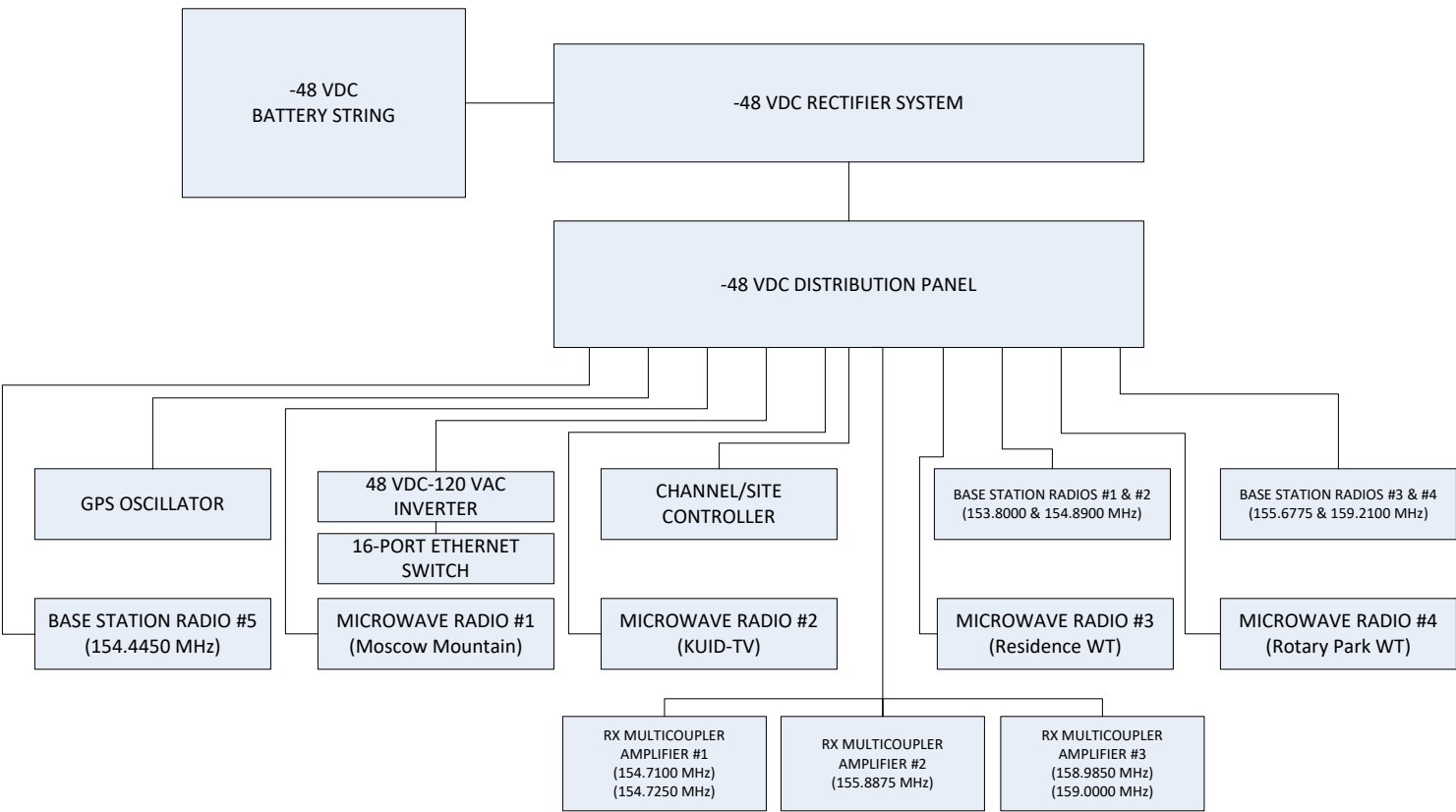


HATFIELD & DAWSON CONSULTING ENGINEERS	TYPICAL RACK ELEVATION AND POWER SUPPLY SYSTEM CONFIGURATION (12 VDC POWER SUPPLY) WELL 10 SITE			
	RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO			
	SIZE	DATE	DWG NO	REV
		November 2022	R002	1
	SCALE	1 : 1	SHEET	1 OF 1



NOTE 1

NOTE 1 ENERSYS POWERSAFE 12V125F 12 VDC BATTERIES WIRED IN SERIES TO PROVIDE -48 VDC. BACKUP TIME TO 1.75 Vpc @ 77 DEGREES ~ 2.5 HOURS



HATFIELD & DAWSON CONSULTING ENGINEERS	TYPICAL RACK ELEVATION AND POWER SUPPLY CONFIGURATION (-48 VDC POWER SUPPLY) WELL 10 SITE			
	RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO			
	SIZE	DATE	DWG NO	REV
		November 2022	R003	1
	SCALE	1 : 1	SHEET	1 OF 1

TABLE 1 - Well 10 Microwave Dish Antennas					
Path	Azimuth (Degrees True)	Antenna Model #	Frequency Band (GHz)	Dish Size (feet)	Elevation On Tower (feet)
Moscow Mountain	47.7	RFS SC3-W100B	11	3.0	70
Residence Water Tower	85.5	RFS SC1-220A	23	1.0	83.5
Rotary Park Water Tank	80.9	RFS SC2-220C	23	2.0	83.5
KUID-TV Site (Paradise Ridge)	138.8	RFS SC3-W100B	11	3.0	70

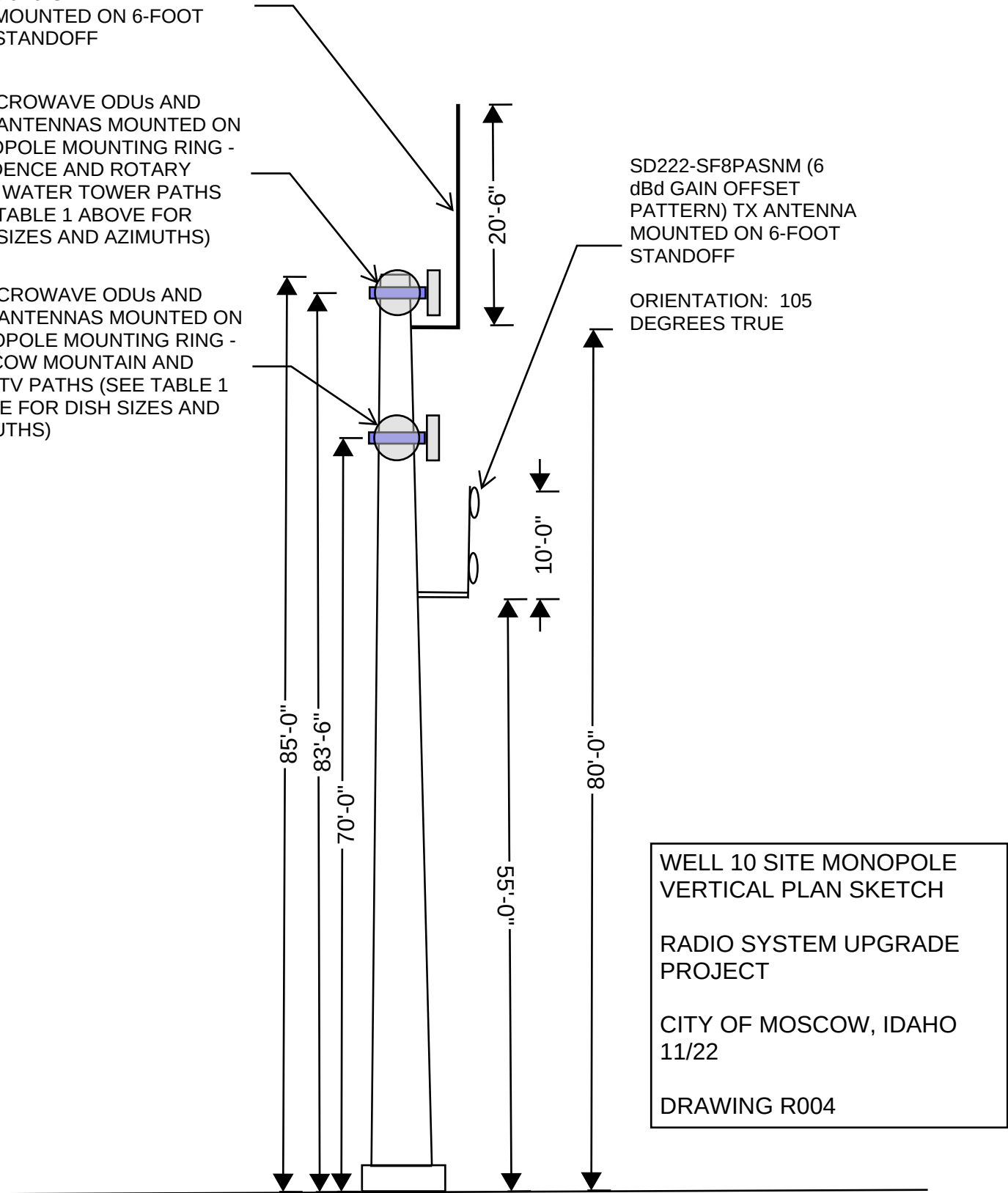
TELEWAVE ANT150F6
6 dBd GAIN RX ANTENNA
MOUNTED ON 6-FOOT
STANDOFF

(2) MICROWAVE ODUs AND
DISH ANTENNAS MOUNTED ON
MONOPOLE MOUNTING RING -
RESIDENCE AND ROTARY
PARK WATER TOWER PATHS
(SEE TABLE 1 ABOVE FOR
DISH SIZES AND AZIMUTHS)

(2) MICROWAVE ODUs AND
DISH ANTENNAS MOUNTED ON
MONOPOLE MOUNTING RING -
MOSCOW MOUNTAIN AND
KUID-TV PATHS (SEE TABLE 1
ABOVE FOR DISH SIZES AND
AZIMUTHS)

SD222-SF8PASNM (6
dBd GAIN OFFSET
PATTERN) TX ANTENNA
MOUNTED ON 6-FOOT
STANDOFF

ORIENTATION: 105
DEGREES TRUE



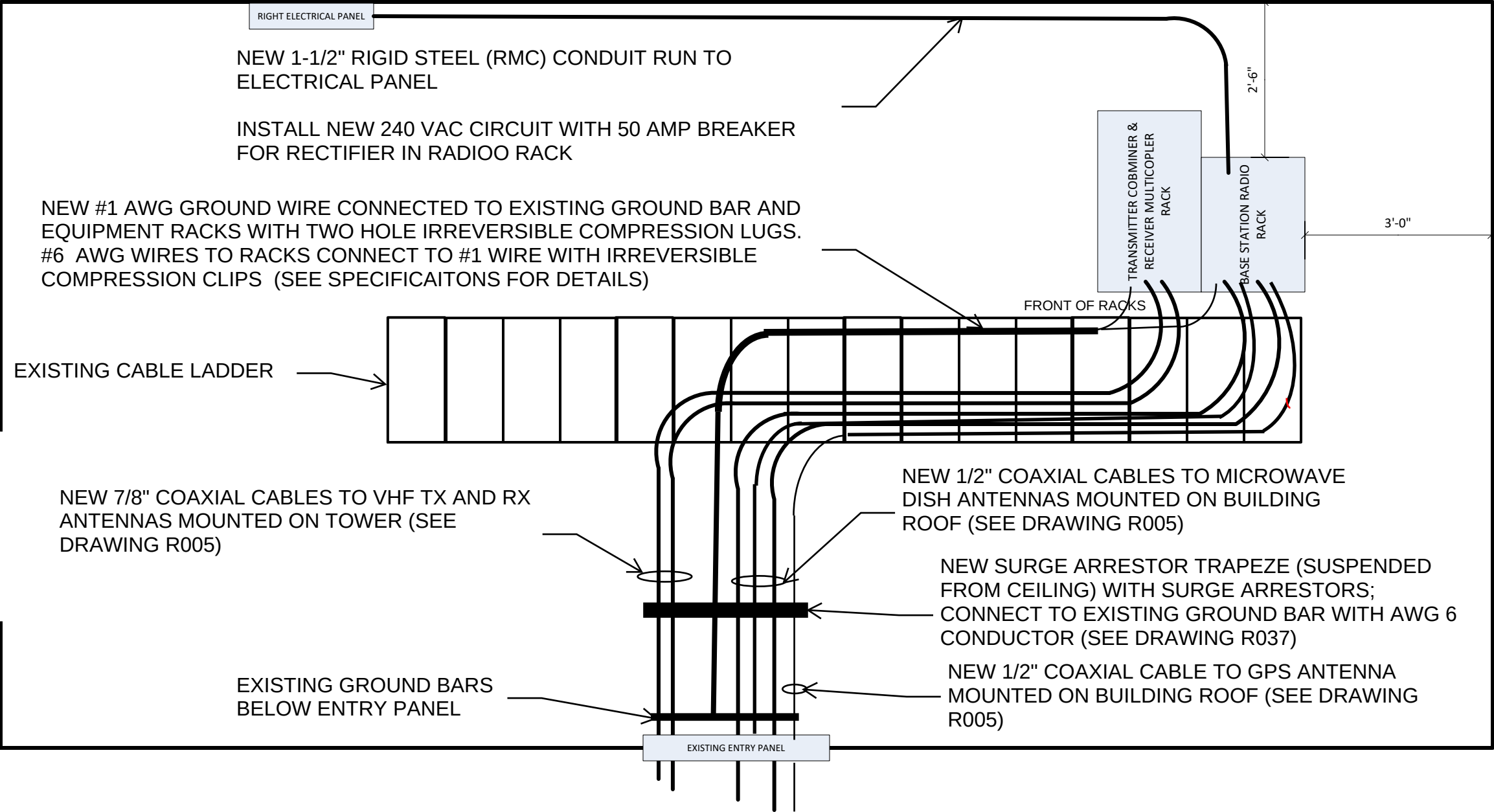
WELL 10 SITE MONOPOLE
VERTICAL PLAN SKETCH

RADIO SYSTEM UPGRADE
PROJECT

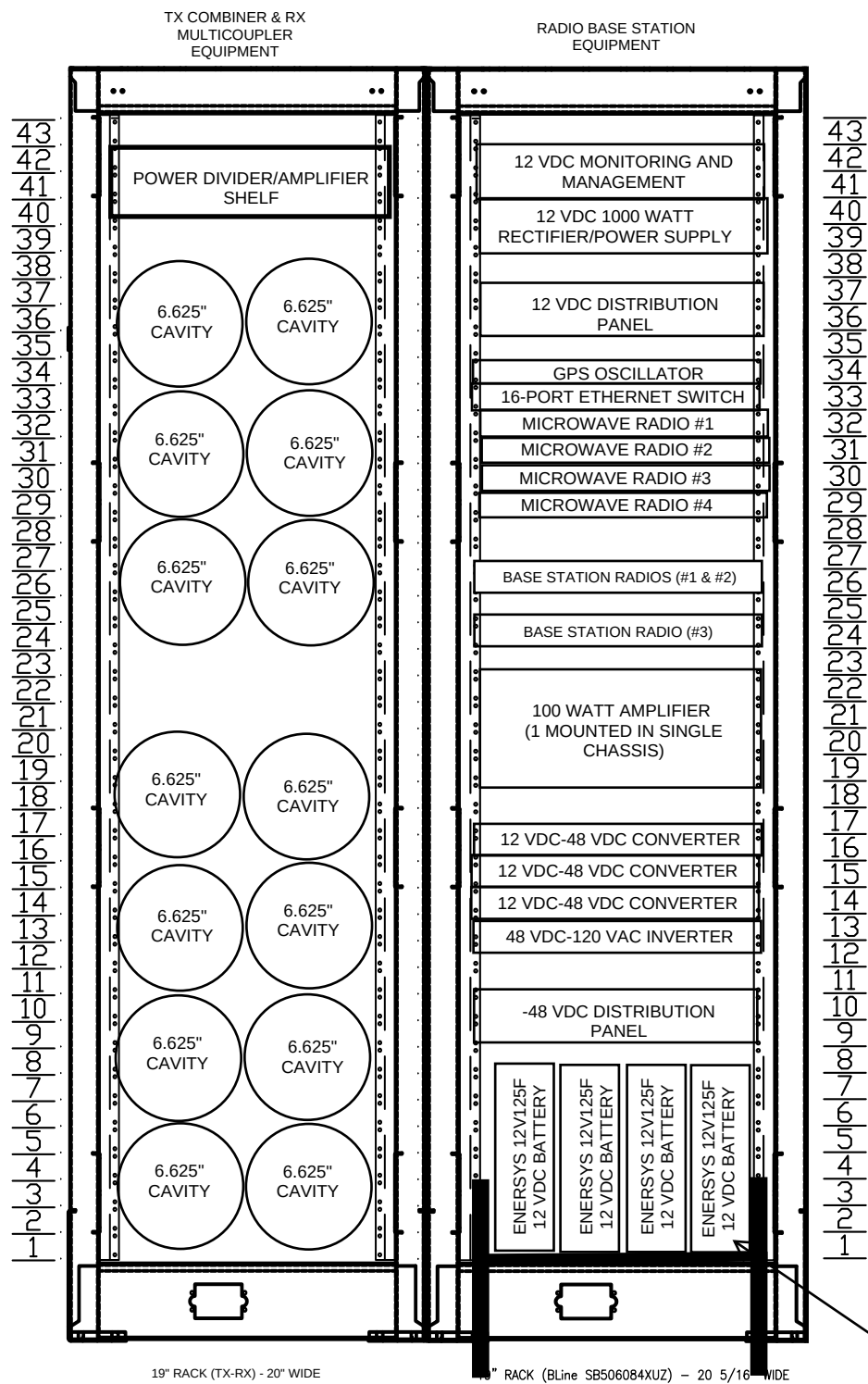
CITY OF MOSCOW, IDAHO
11/22

DRAWING R004

WELL 10 SITE GROUND LEVEL

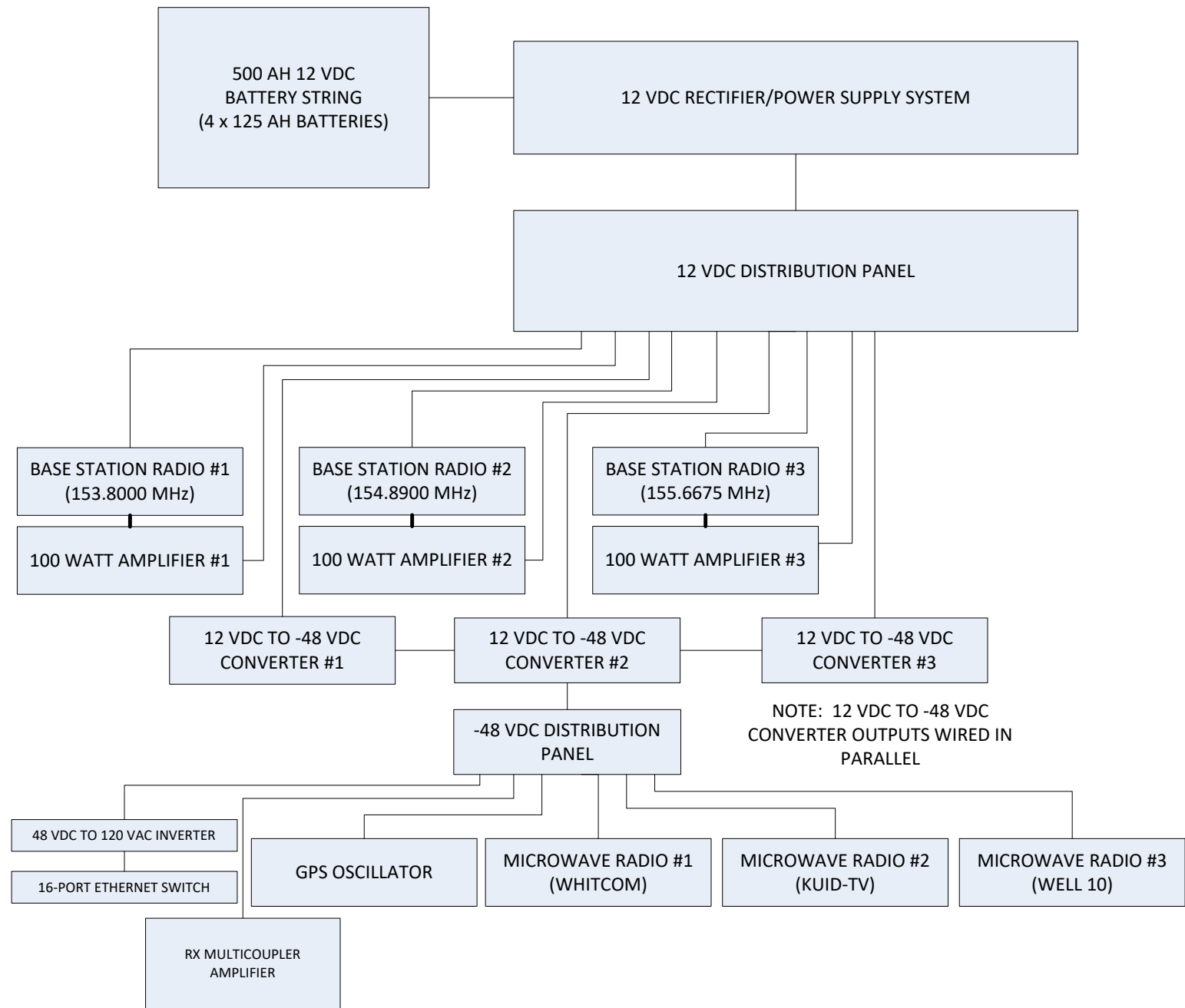


HATFIELD & DAWSON CONSULTING ENGINEERS	MOSCOW MOUNTAIN FLOOR PLAN AND RACK LAYOUT			
	RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO			
	SIZE	DATE	DWG NO	REV
		NOVEMBER 2022	R005	
	SCALE	1/2" = 1'-0"	SHEET	1 OF 1

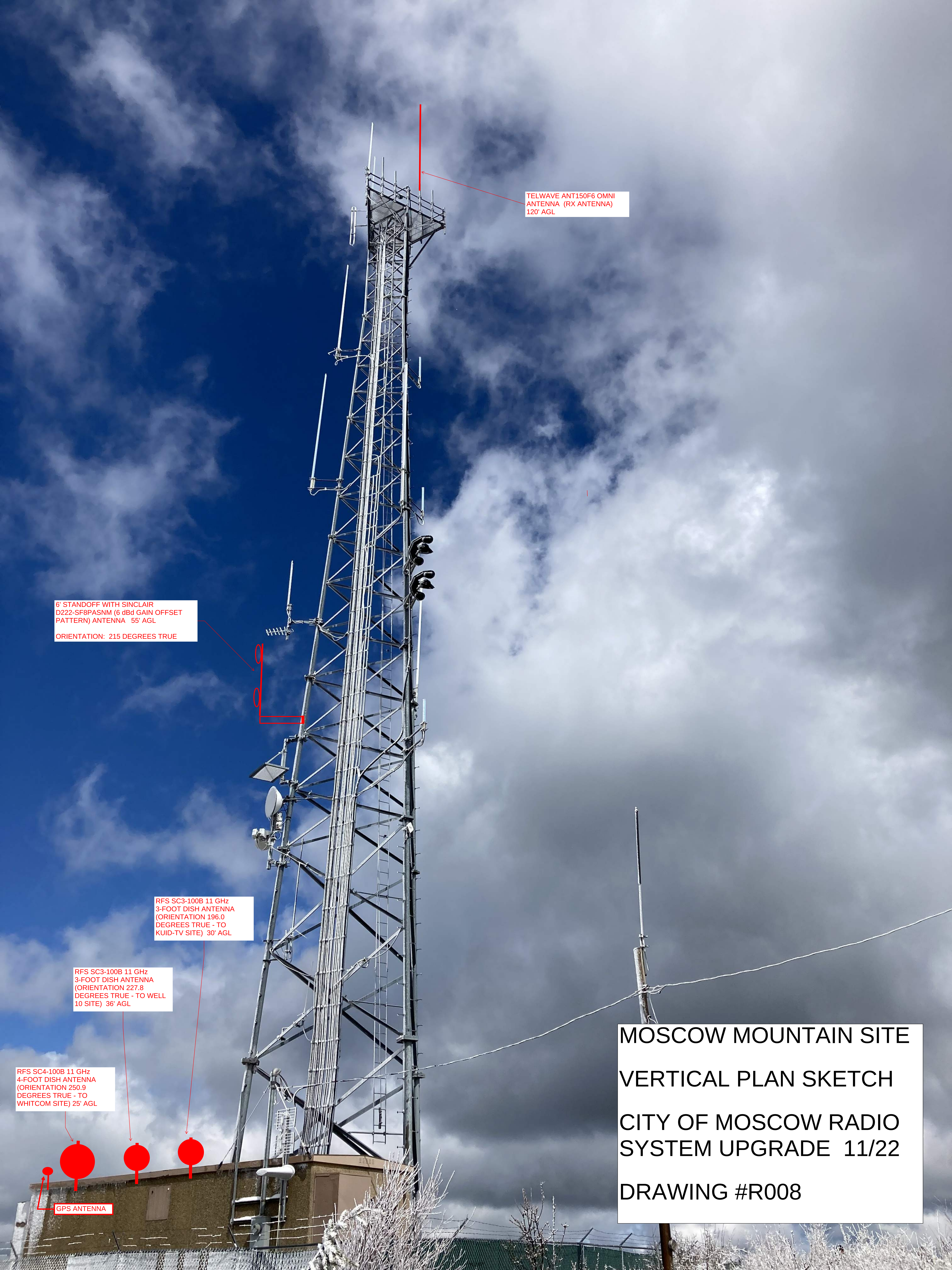


NOTE 1

NOTE 1 ENERSYS POWERSAFE 12V125F 12 VDC BATTERIES WIRED IN PARELLEL TO PROVIDE 12 VDC 500 AH BATTERY SYSTEM. BACKUP TIME TO 1.75 Vpc @ 77 DEGREES ~ 12 HOURS



HATFIELD & DAWSON CONSULTING ENGINEERS	TYPICAL RACK ELEVATION DRAWING & POWER SUPPLY SYSTEM CONFIGURATION (12 VDC POWER SUPPLY) MOSCOW MOUNTAIN SITE			
	RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO			
	SIZE	DATE	DWG NO	REV
		November 2022	R006	1
	SCALE	1 : 1	SHEET	1 OF 1



TELWAVE ANT150F6 OMNI
ANTENNA (RX ANTENNA)
120' AGL

6' STANDOFF WITH SINCLAIR
D222-SF8PASNM (6 dBd GAIN OFFSET
PATTERN) ANTENNA 55' AGL
ORIENTATION: 215 DEGREES TRUE

RFS SC3-100B 11 GHz
3-FOOT DISH ANTENNA
(ORIENTATION 196.0
DEGREES TRUE - TO
KUID-TV SITE) 30' AGL

RFS SC3-100B 11 GHz
3-FOOT DISH ANTENNA
(ORIENTATION 227.8
DEGREES TRUE - TO WELL
10 SITE) 36' AGL

RFS SC4-100B 11 GHz
4-FOOT DISH ANTENNA
(ORIENTATION 250.9
DEGREES TRUE - TO
WHITCOM SITE) 25' AGL

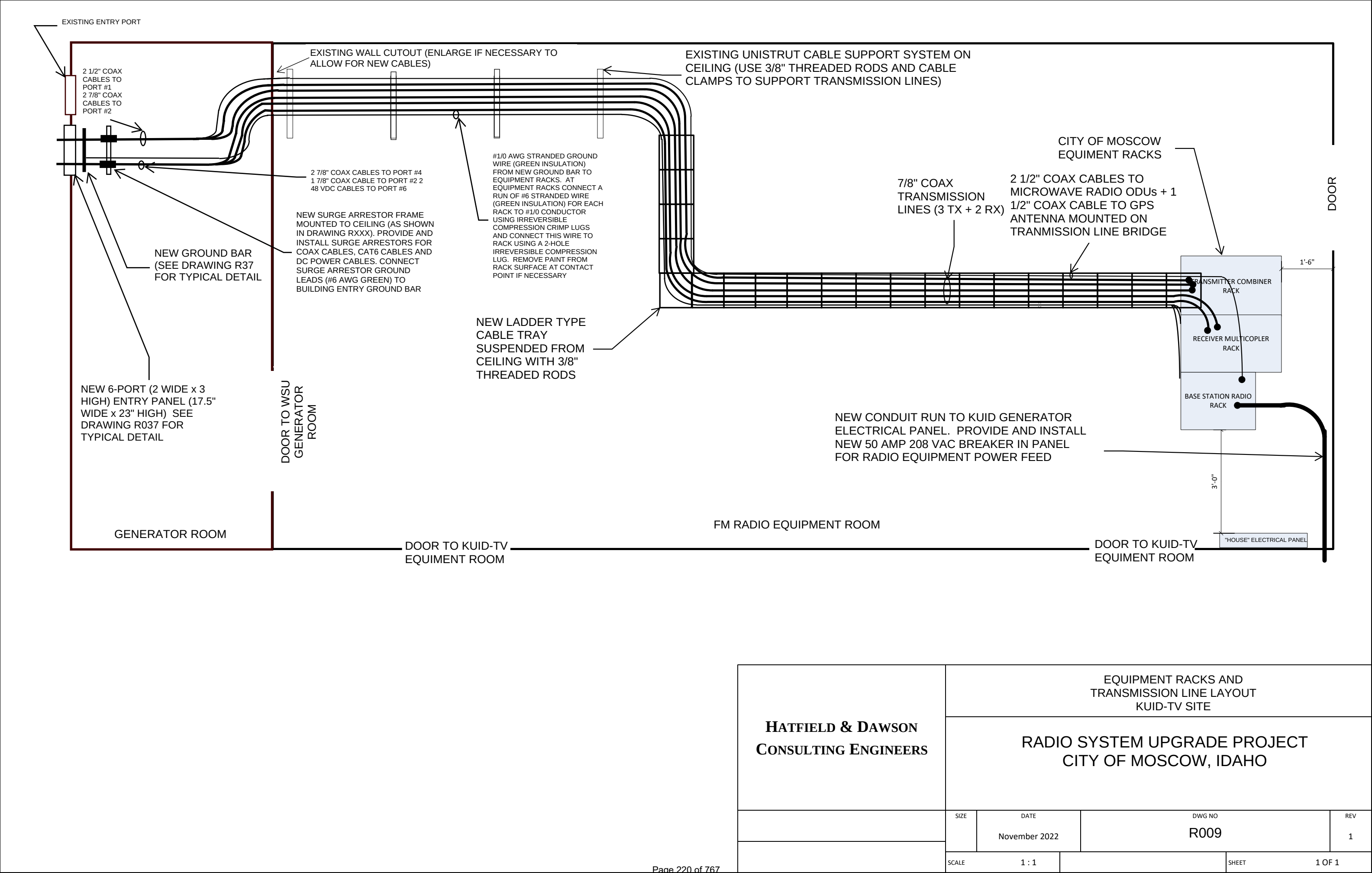
GPS ANTENNA

MOSCOW MOUNTAIN SITE

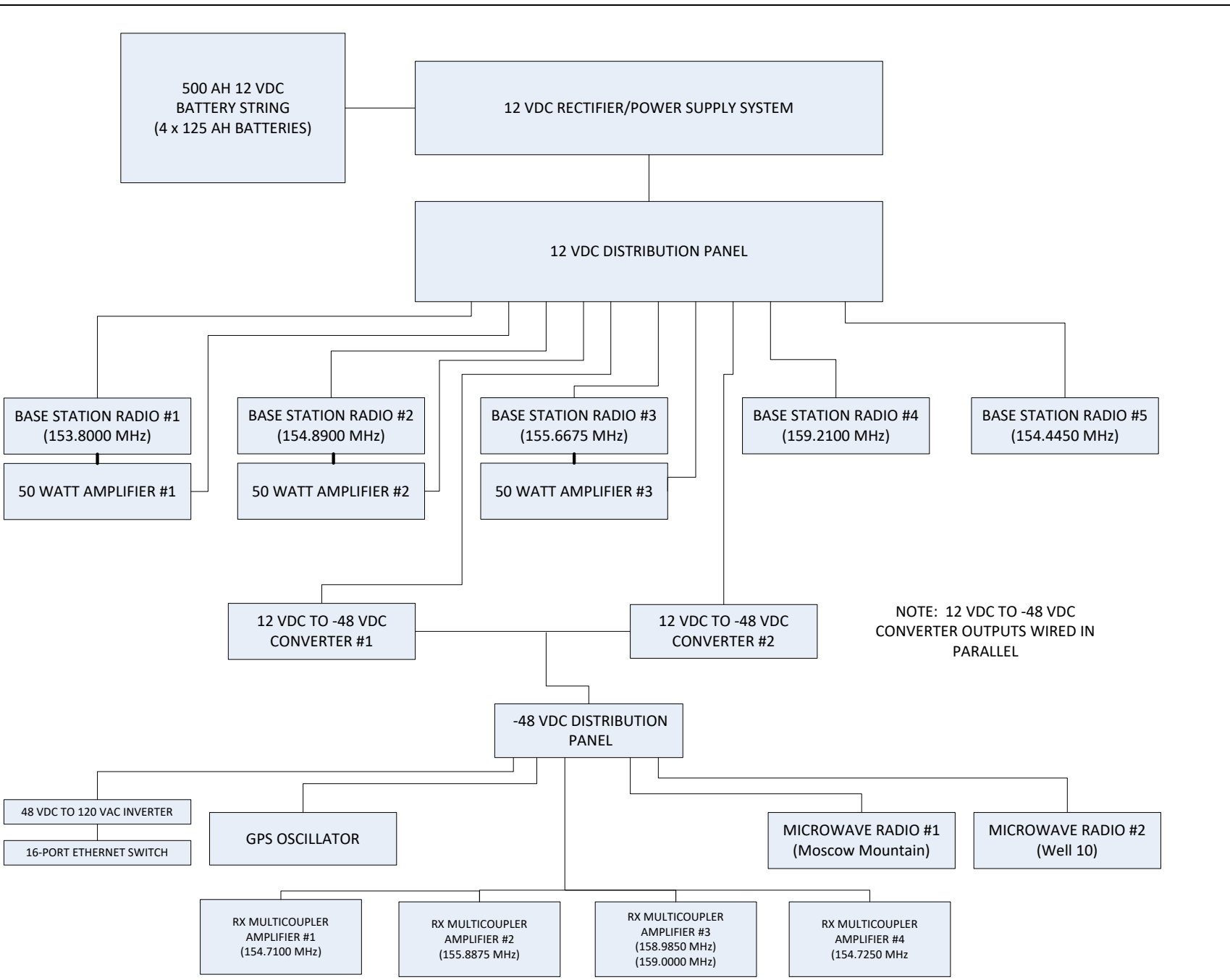
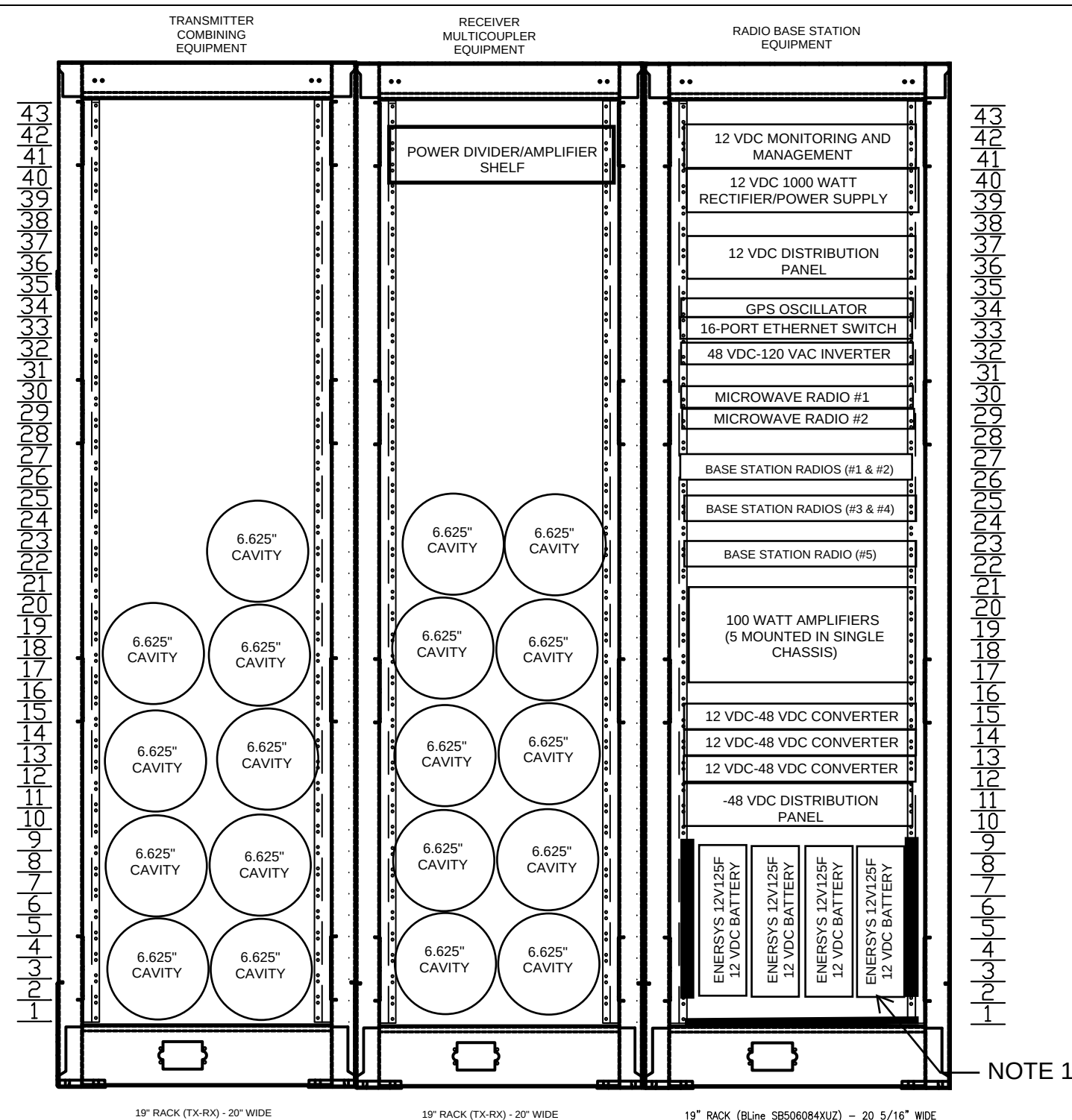
VERTICAL PLAN SKETCH

CITY OF MOSCOW RADIO
SYSTEM UPGRADE 11/22

DRAWING #R008

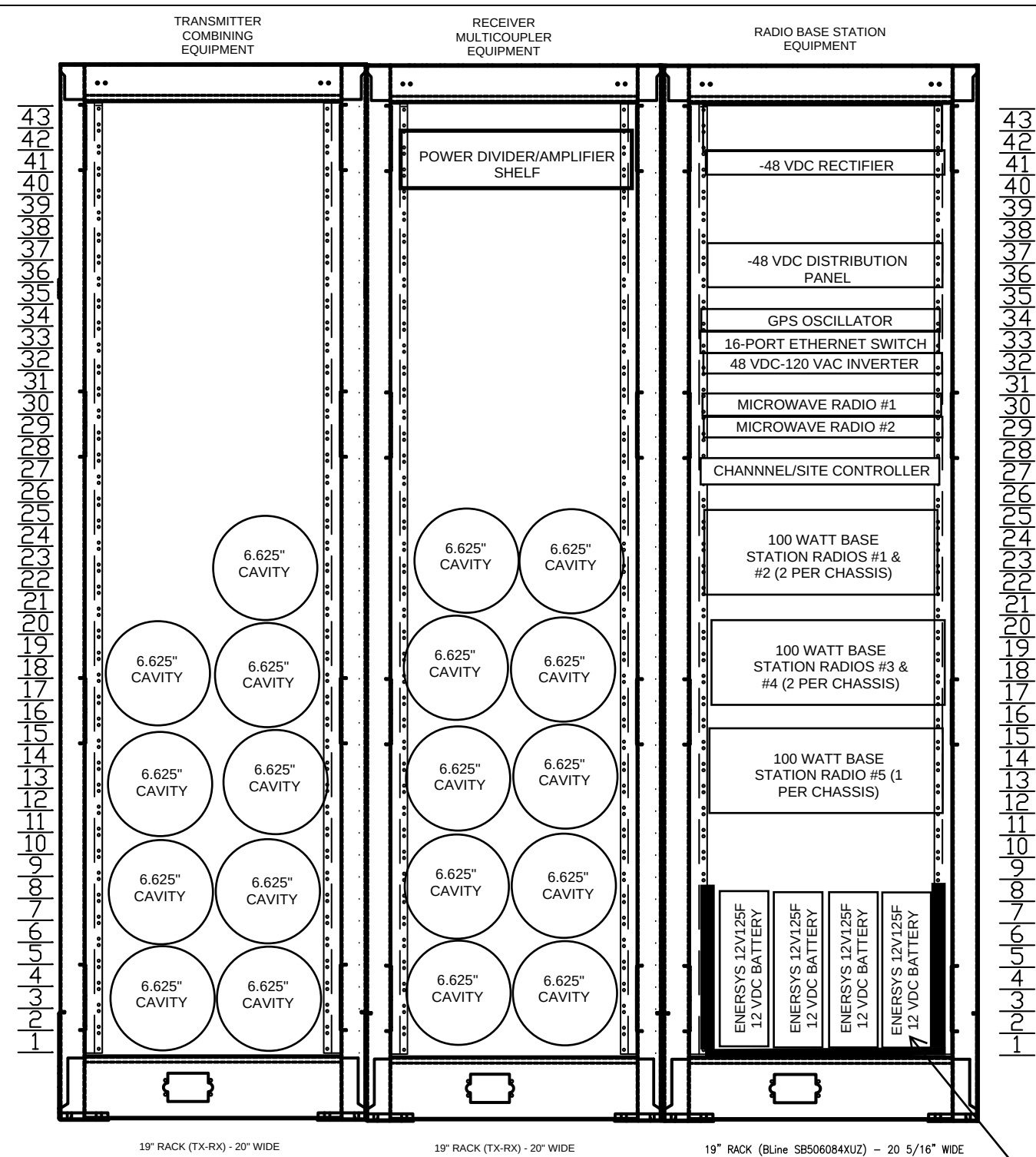


HATFIELD & DAWSON CONSULTING ENGINEERS	EQUIPMENT RACKS AND TRANSMISSION LINE LAYOUT KUID-TV SITE			
	RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO			
	SIZE	DATE	DWG NO	REV
		November 2022	R009	1
	SCALE	1 : 1	SHEET	1 OF 1



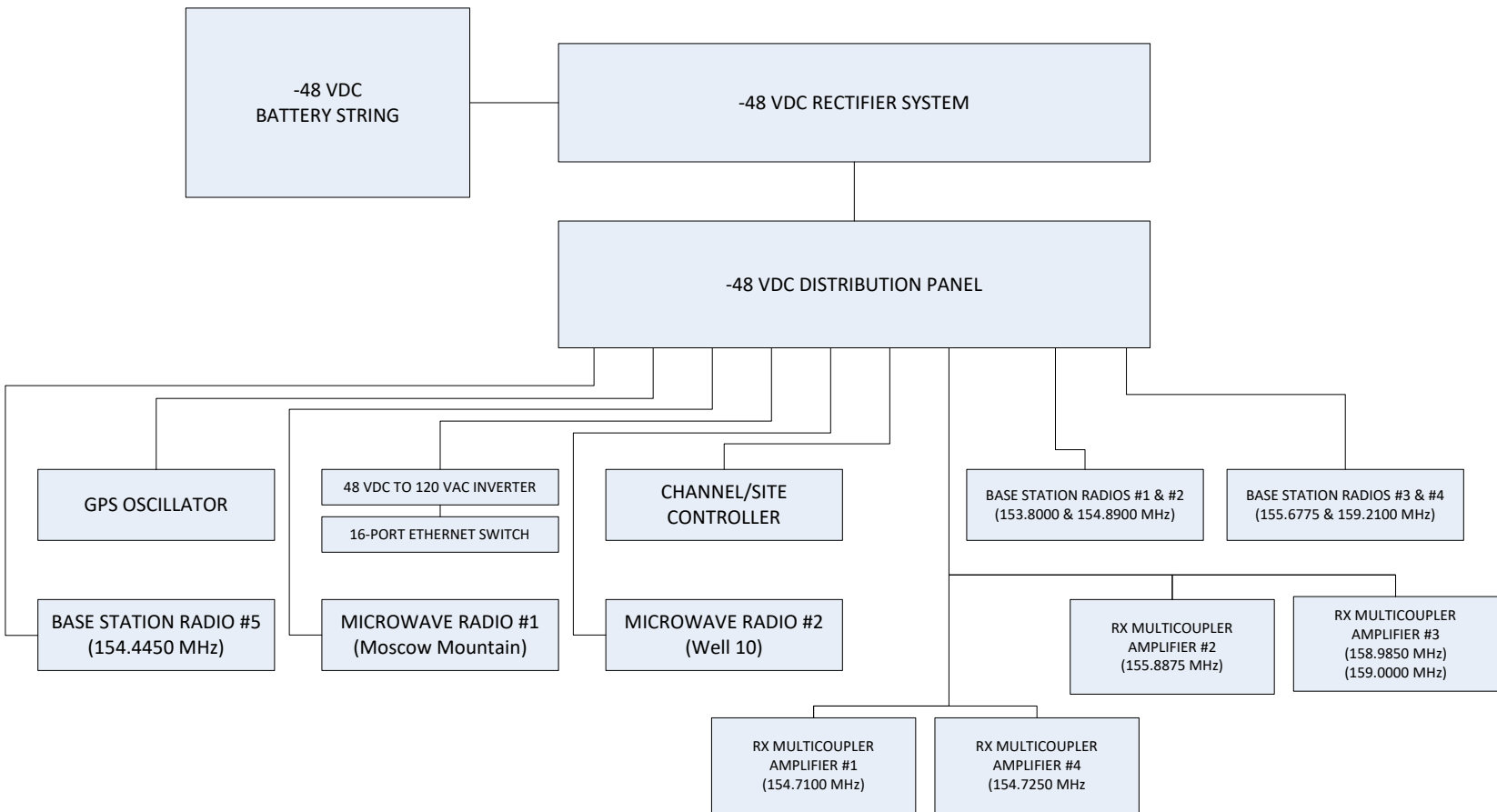
NOTE 1 ENERSYS POWERSAFE 12V125F 12 VDC BATTERIES WIRED IN PARALLEL TO PROVIDE 12 VDC 500 AH BATTERY SYSTEM. BACKUP TIME TO 1.75 Vpc @ 77 DEGREES ~ 8 HOURS

HATFIELD & DAWSON CONSULTING ENGINEERS	TYPICAL RACK ELEVATION DRAWING & POWER SUPPLY SYSTEM CONFIGURATION (12 VDC POWER SUPPLY) KUID-TV SITE			
	RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO			
	SIZE	DATE November 2022	DWG NO R010	REV 1
	SCALE 1 : 1	SHEET	1 OF 1	

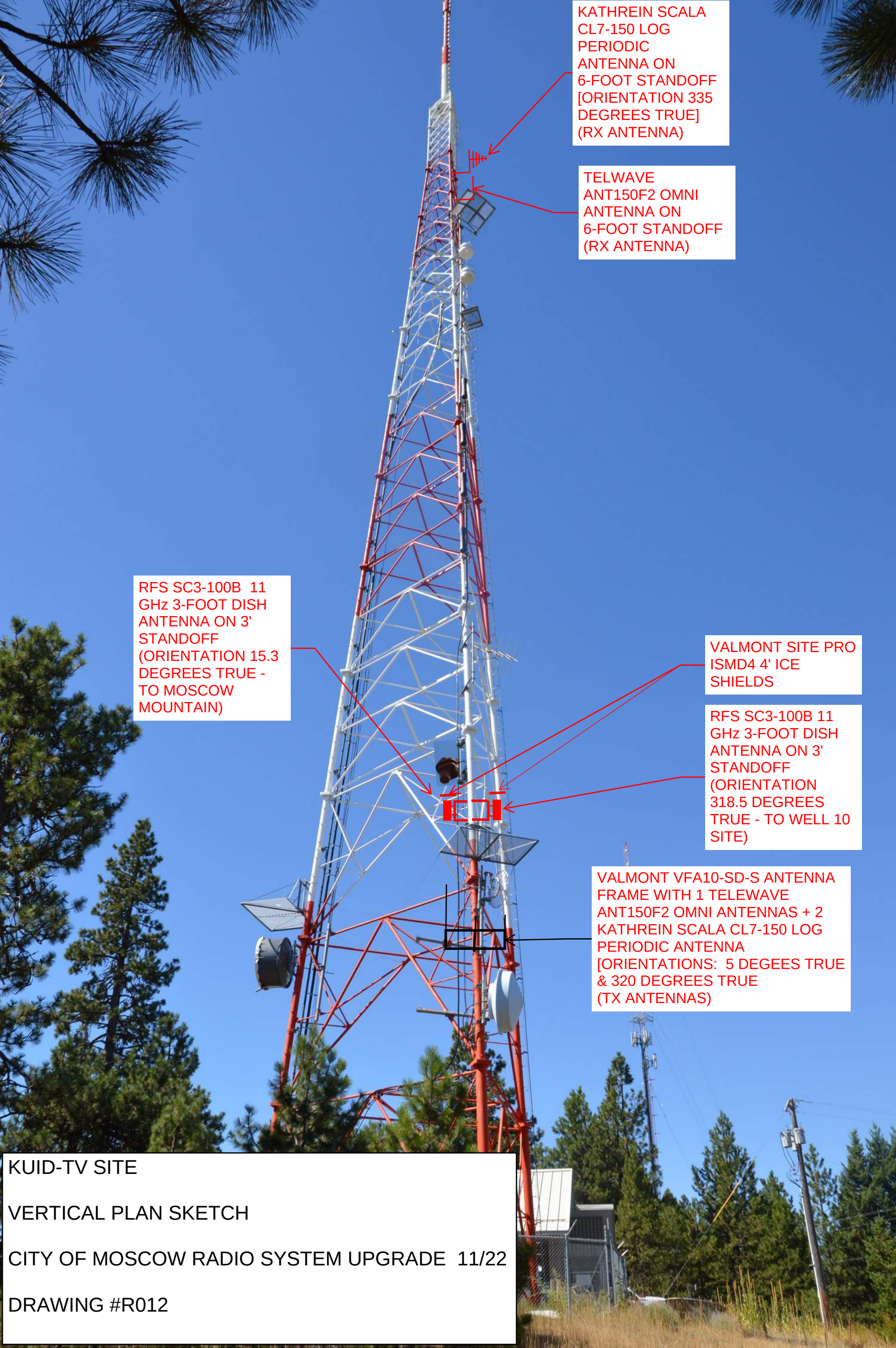


NOTE 1 ENERSYS POWERSAFE 12V125F 12 VDC BATTERIES WIRED IN SERIES TO PROVIDE -48 VDC. BACKUP TIME TO 1.75 Vpc @ 77 DEGREES ~ 3.5 HOURS

NOTE 1



HATFIELD & DAWSON CONSULTING ENGINEERS	TYPICAL RACK ELEVATION DRAWING & POWER SUPPLY SYSTEM CONFIGURATION (-48 VDC POWER SUPPLY) KUID-TV SITE			
	RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO			
	SIZE	DATE	DWG NO	REV
		November 2022	R011	1
	SCALE	1 : 1	SHEET	1 OF 1



KATHREIN SCALA
CL7-150 LOG
PERIODIC
ANTENNA ON
6-FOOT STANDOFF
[ORIENTATION 335
DEGREES TRUE]
(RX ANTENNA)

TELWAVE
ANT150F2 OMNI
ANTENNA ON
6-FOOT STANDOFF
(RX ANTENNA)

RFS SC3-100B 11
GHz 3-FOOT DISH
ANTENNA ON 3'
STANDOFF
(ORIENTATION 15.3
DEGREES TRUE -
TO MOSCOW
MOUNTAIN)

VALMONT SITE PRO
ISMD4 4' ICE
SHIELDS

RFS SC3-100B 11
GHz 3-FOOT DISH
ANTENNA ON 3'
STANDOFF
(ORIENTATION
318.5 DEGREES
TRUE - TO WELL 10
SITE)

VALMONT VFA10-SD-S ANTENNA
FRAME WITH 1 TELEWAVE
ANT150F2 OMNI ANTENNAS + 2
KATHREIN SCALA CL7-150 LOG
PERIODIC ANTENNA
[ORIENTATIONS: 5 DEGEES TRUE
& 320 DEGREES TRUE
(TX ANTENNAS)]

KUID-TV SITE

VERTICAL PLAN SKETCH

CITY OF MOSCOW RADIO SYSTEM UPGRADE 11/22

DRAWING #R012

NEW 1-1/2" RIGID STEEL
(RMC) CONDUIT RUN TO
CITY OF MOSCOW RADIO
EQUIPMENT RACK IN
RADIO EQUIPMENT ROOM

KUID GENERATOR PANEL
120/208 VAC 3-PHASE.
PROVIDE AND INSTALL
NEW 50 AMP BREAKER
FOR CITY OF MOSCOW
RADIO EQUIPMENT

KUID-TV SITE

ELECTRICAL PANEL
CONNECTION

CITY OF MOSCOW RADIO
SYSTEM UPGRADE 11/22

DRAWING #R013

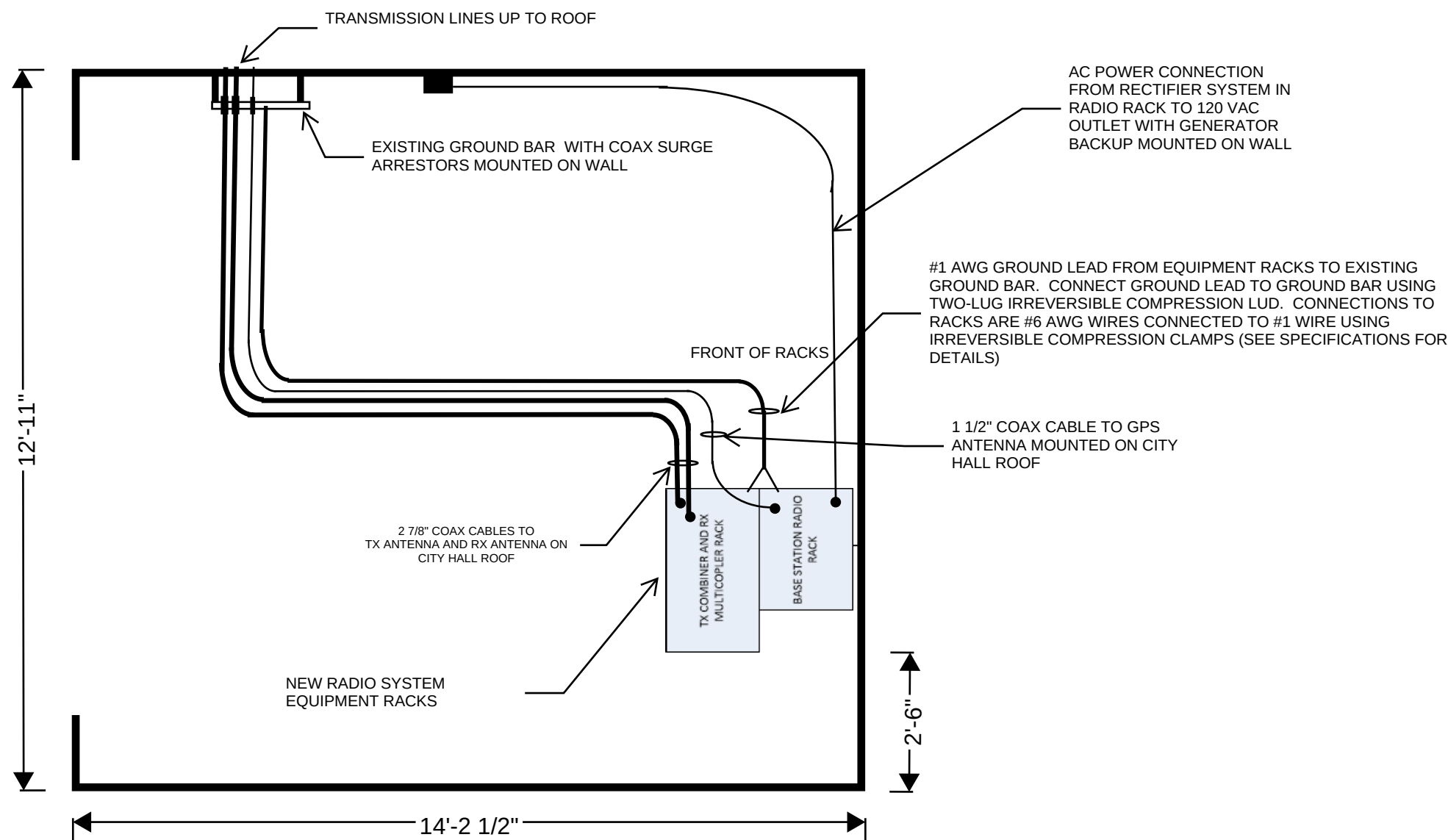
NEW 1-1/2" RIGID STEEL
(RMC) CONDUIT RUN TO
CITY OF MOSCOW RADIO
EQUIPMENT RACK IN
RADIO EQUIPMENT ROOM

KUID-TV SITE

ELECTRICAL PANEL
CONDUIT RUN

CITY OF MOSCOW RADIO
SYSTEM UPGRADE 11/22

DRAWING #R014



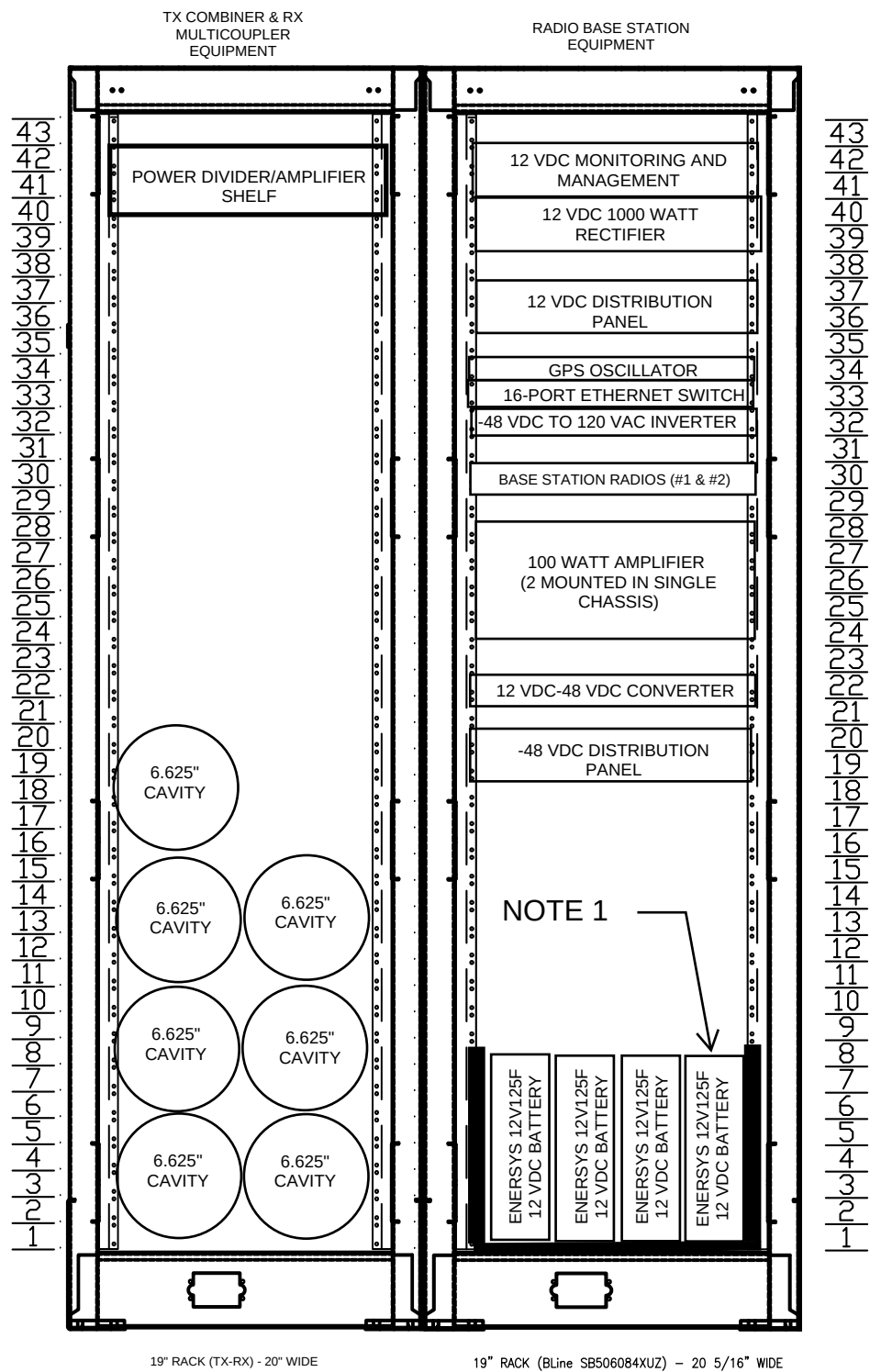
**HATFIELD & DAWSON
CONSULTING ENGINEERS**

**FLOOR PLAN AND RACK LAYOUT
CITY HALL SITE**

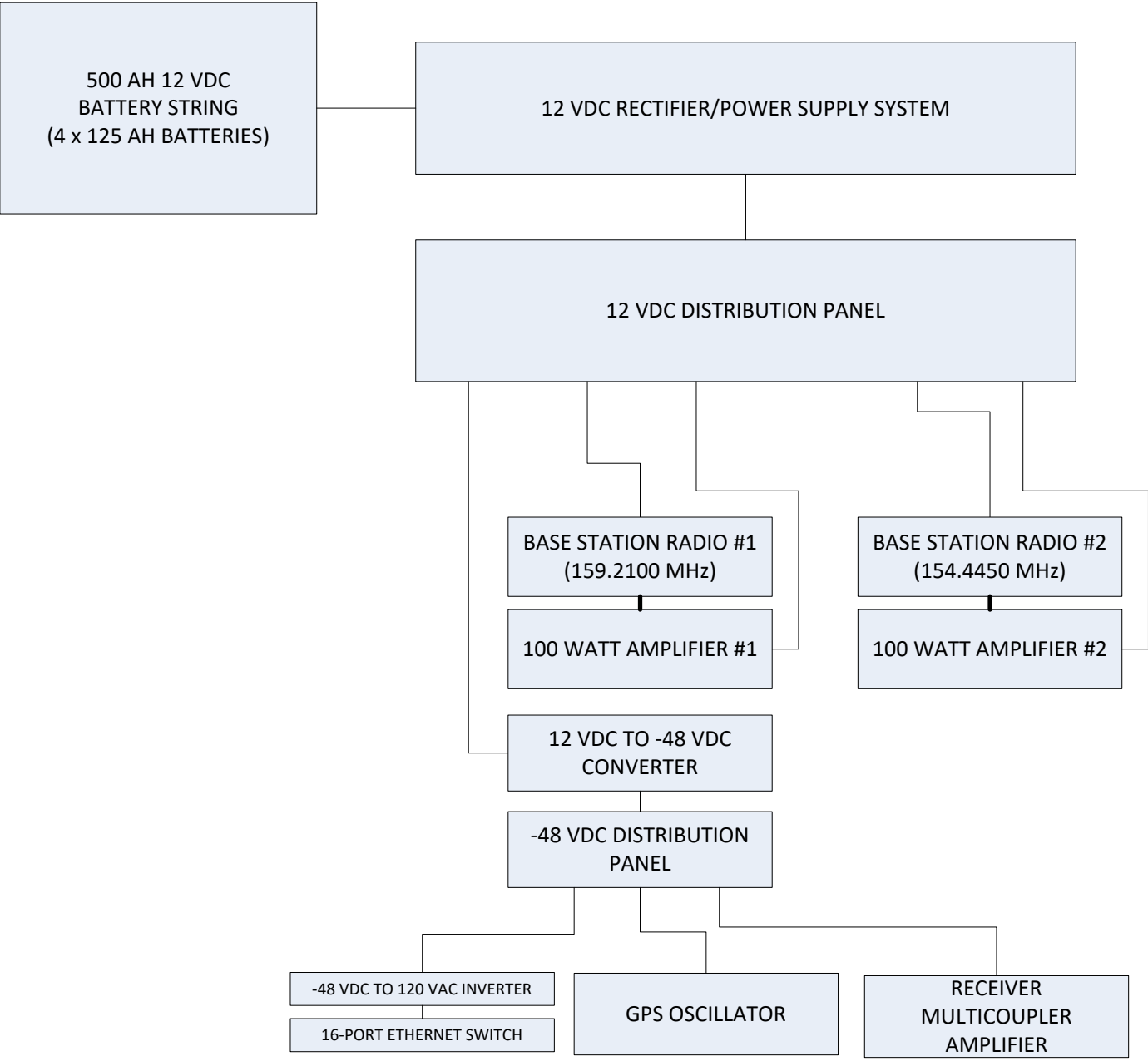
**RADIO SYSTEM UPGRADE PROJECT
CITY OF MOSCOW, IDAHO**

3'-0"
DRAWING SCALE

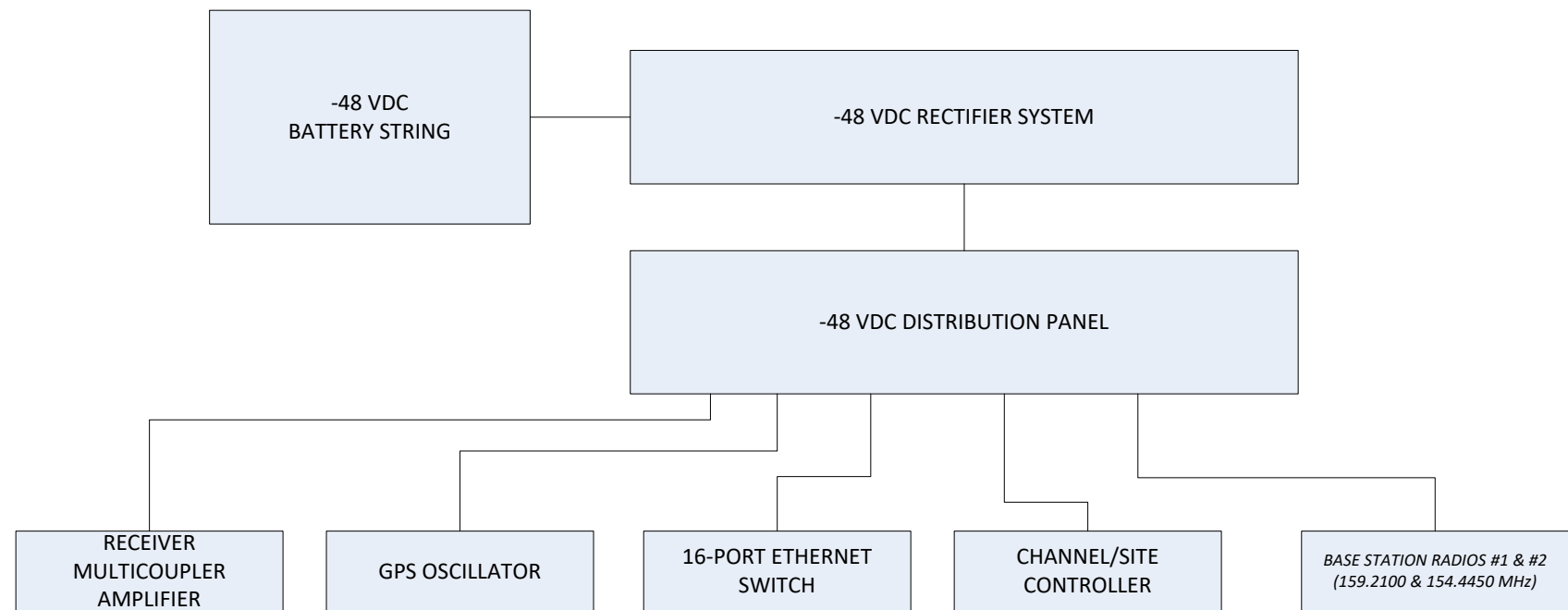
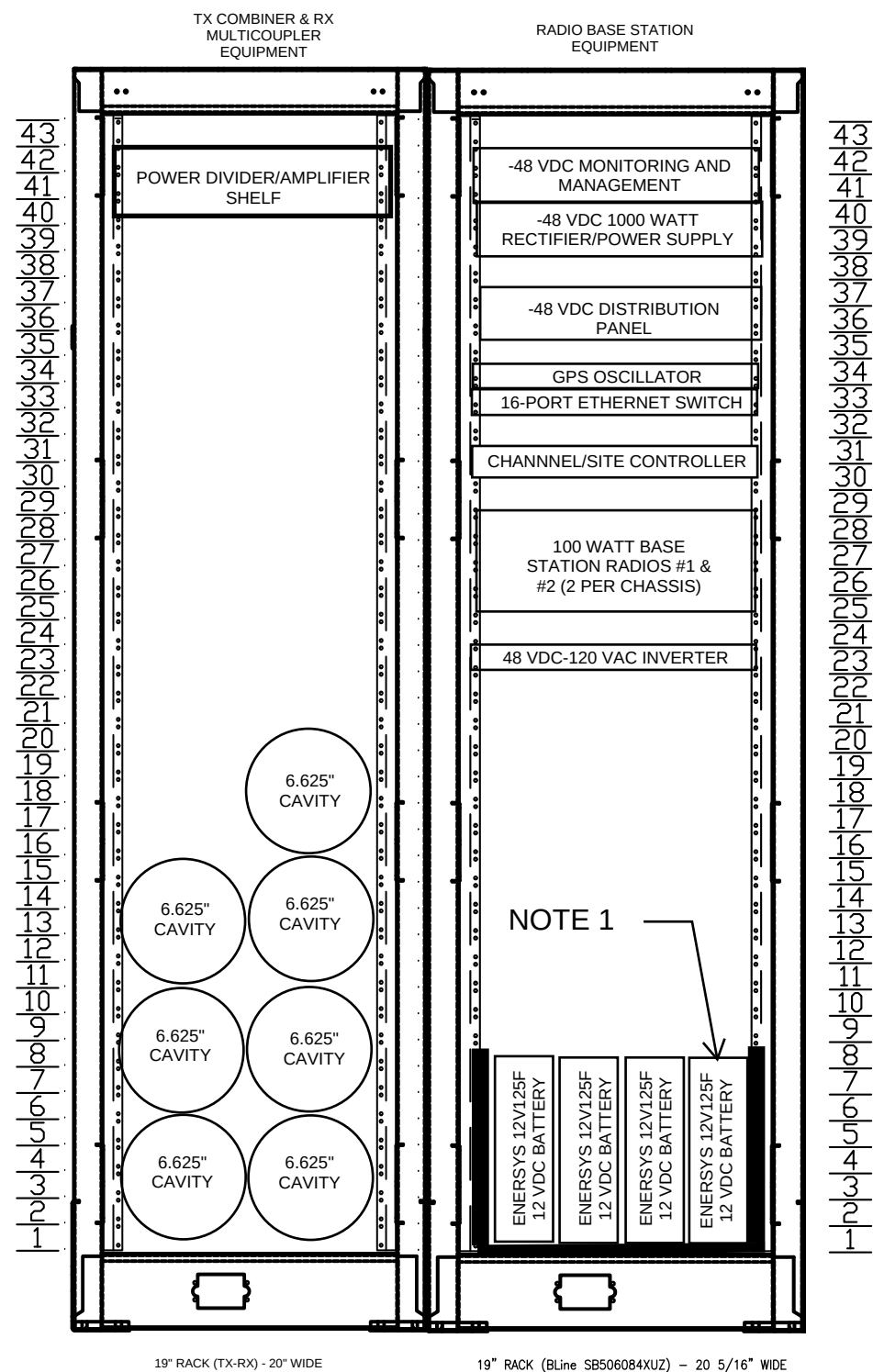
SIZE	DATE	DWG NO	REV
	November 2022	R015	1
SCALE	SHEET		1 OF 1



NOTE 1 ENERSYS POWERSAFE 12V125F 12 VDC BATTERIES WIRED IN PARALLEL TO PROVIDE 12 VDC 500 AH BATTERY SYSTEM. BACKUP TIME TO 1.75 Vpc @ 77 DEGREES ~ 22 HOURS



HATFIELD & DAWSON CONSULTING ENGINEERS	TYPICAL RACK ELEVATION DRAWING & POWER SUPPLY SYSTEM CONFIGURATION (12 VDC POWER SUPPLY) CITY HALL SITE			
	RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO			
	SIZE	DATE	DWG NO	REV
		November 2022	R016	1
	SCALE	1 : 1	SHEET	1 OF 1



NOTE 1 ENERSYS POWERSAFE 12V125F 12 VDC BATTERIES WIRED IN SERIES TO PROVIDE -48 VDC. BACKUP TIME TO 1.75 Vpc @ 77 DEGREES ~ 11.5 HOURS

HATFIELD & DAWSON CONSULTING ENGINEERS	TYPICAL RACK ELEVATION DRAWING & POWER SUPPLY SYSTEM CONFIGURATION (-48 VDC POWER SUPPLY) CITY HALL SITE			
	RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO			
	SIZE	DATE	DWG NO	REV
		November 2022	R017	1
	SCALE	1 : 1	SHEET	1 OF 1

REPLACE EXISTING ANTENNAS WITH TELEWAVE
ANT150F2 2.5 dBd GAIN OMNI WHIP ANTENNAS
AND REPLACE EXISTING TRANSMISSION LINE
RUNS WITH 7/8" COAXIAL CABLES. RUN CABLES
DOWN TO COMM ROOM VIA CHIMNEY
TRANSMISSION LINE CHASE

RELOCATE EXISTING ANTENNA MOUNTS TO
ENDS OF ROOF RIDGELINE TO PROVIDE ~40 FEET
HORIZONTAL SEPARATION

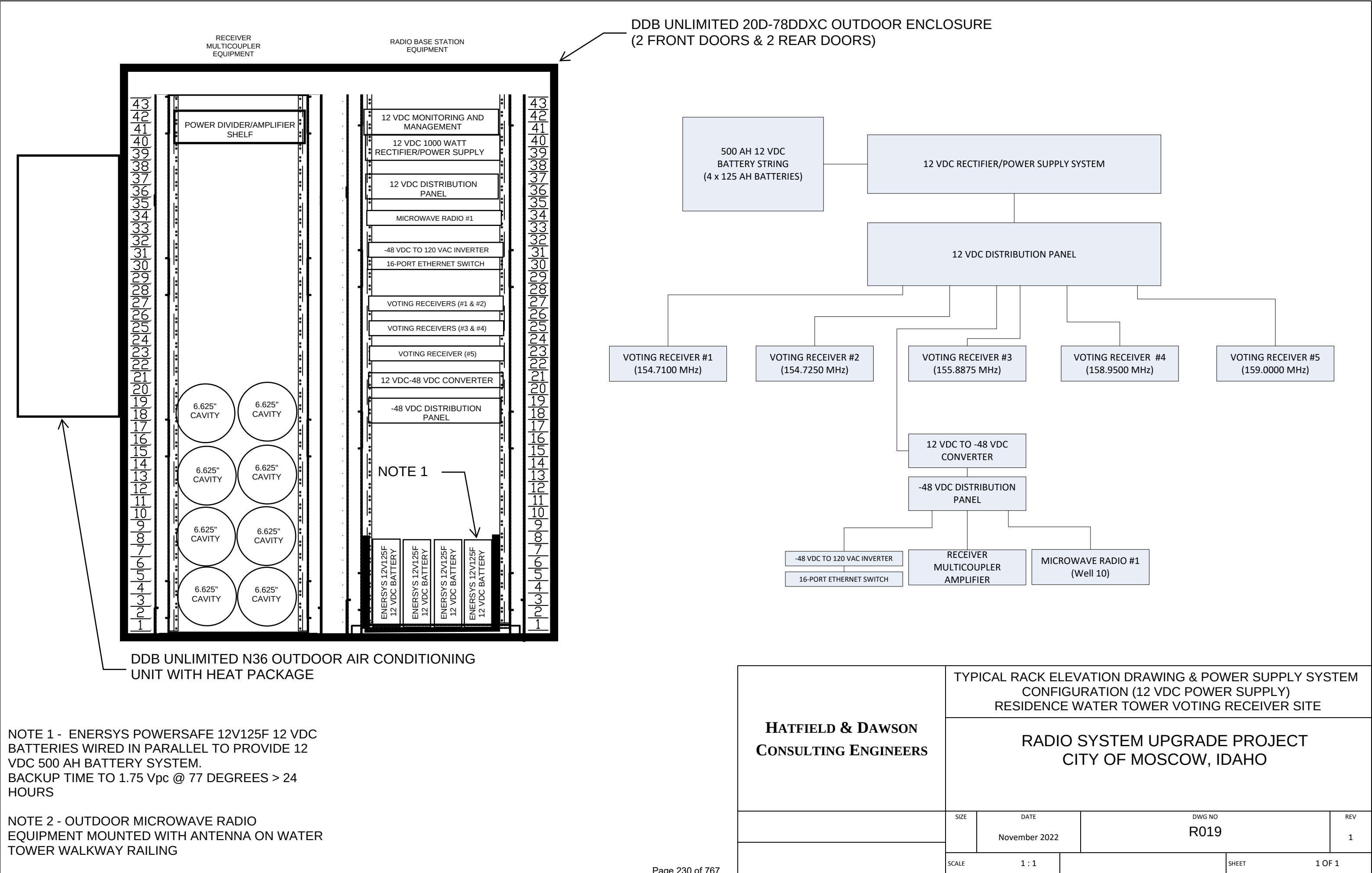
GPS ANTENNA WITH 1/2"
COAX TRANSMISSION
LINE DOWN TO SURGE
ARRESTOR IN
EQUIPMENT ROOM VIA
CHIMNEY TRANSMISSION
LINE CHASE

CITY HALL SITE

ANTENNA MOUNTING DETAILS

CITY OF MOSCOW RADIO SYSTEM
UPGRADE 11/22

DRAWING #R018



RESIDENCE WATER TOWER

EQUIPMENT ENCLOSURE AND
ANTENNA MOUNTING DETAILS

RADIO SYSTEM UPGRADE
PROJECT 11/22

DRAWING R021

MICROWAVE RADIO ODUS
CONFIGURED FOR HOT
STANDBY OPERATION
ATTACHED TO RFS SC1-220A
1-FOOT 23 GHz DISH ANTENNA
ORIENTATION - 193.5 DEGREES
TRUE

ODU/ANTENNA ASSEMBLY
MOUNTED ON WATER TOWER
WALKWAY RAILING

TELEWAVE ANT150F6 RX
ANTENNA MOUNTED ON
6-FOOT STANDOFF ON WATER
TOWER WALKWAY RAILING

7/8" COAX TRANSMISSION LINE
RUN FROM RX MULTICOUPLER
IN CABINET TO RX ANTENNA
ON WATER TOWER

1/2" COAX TRANSMISSION LINE
RUN FROM MICROWAVE RADIO
INDOOR UNIT TO MICROWAVE
RADIO OUTDOOR UNIT ON
WATER TOWER

EXISTING ELECTRICAL PANEL
PROVIDE AND INSTALL 1 NEW
20 AMP 120 VAC BREAKER
FOR RADIO EQUIPMENT AND 1
NEW 30 AMP 240 VAC
BREAKER FOR AIR
CONDITIONING UNIT

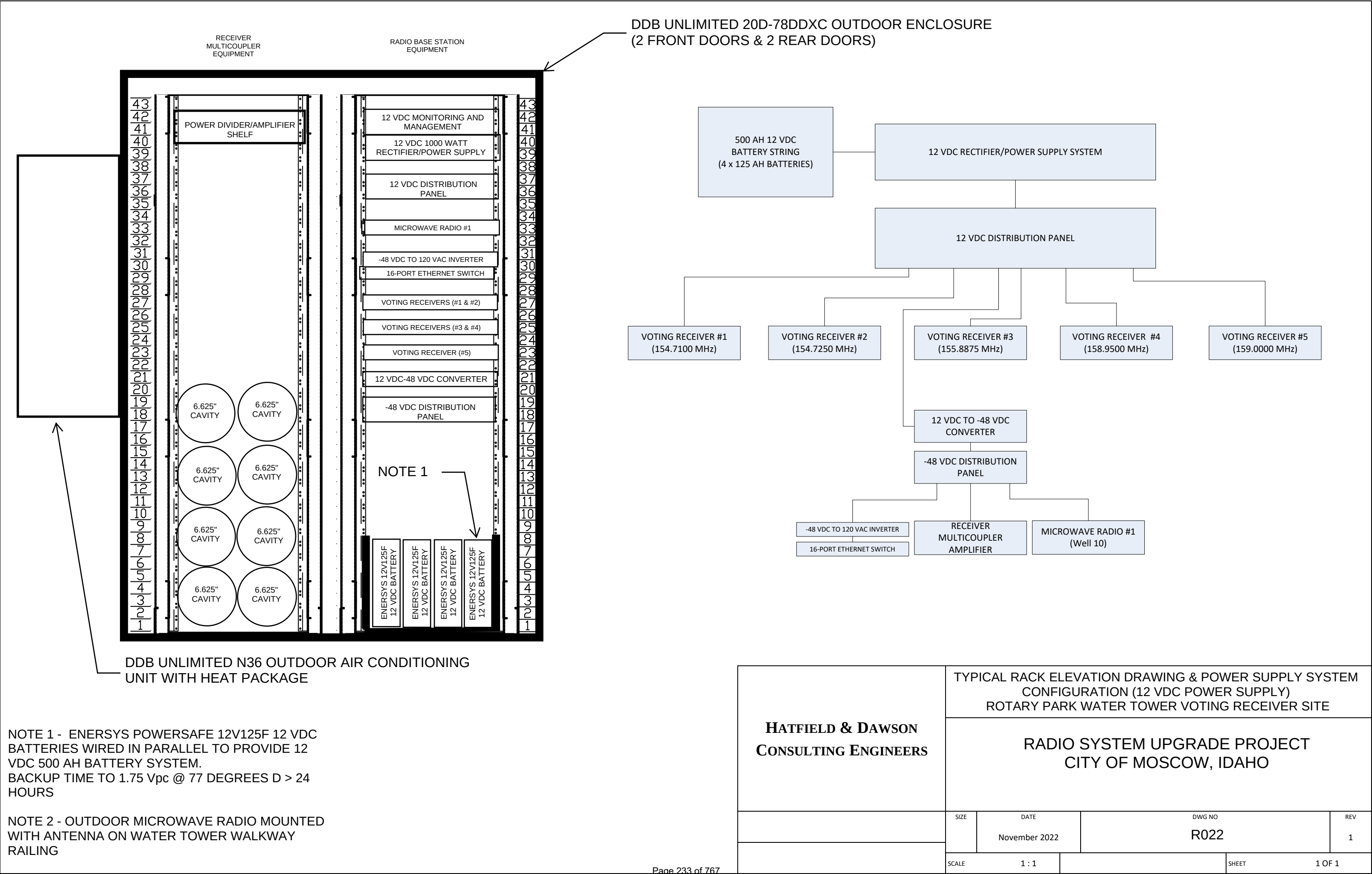
EXISTING ELECTRICAL PANEL
PROVIDE AND INSTALL 1 NEW
20 AMP 120 VAC BREAKER FOR
RADIO EQUIPMENT AND 1 NEW
30 AMP 240 VAC BREAKER FOR
AIR CONDITIONING UNIT

1-1/2" SCHEDULE 80 PVC OR
DIRECT BURIAL FLEX CONDUIT
RUN FROM BOTTOM OF
CABINET TO ELECTRICAL
PANEL

3" SCHEDULE 80 PVC OR
DIRECT BURIAL FLEX CONDUIT
RUN FROM BOTTOM OF
CABINET TO WATER TOWER
LEG FOR TRANSMISSION LINE
RUNS TO ANTENNAS

#2 TINNED SOLID COPPER
WIRE FROM GROUND BAR
INSIDE EQUIPMENT CABINET
VIA SCHEDULE 80 PVC
CONDUIT RUN

EXOTHERMICALLY WELD WIRE
TO TOWER LEG



DDB UNLIMITED 20D-78DDXC
(168 RU) OUTDOOR ENCLOSURE
MOUNTED ON 86" x 66" CONCRETE PAD
(LOCATION OF ENCLOSURE IS
REPRESENTATIVE; CONTRACTOR TO
FINALIZE ENCLOSURE LOCATION
AFTER PHYSICAL SITE SURVEY)

1-1/2" SCHEDULE 80 PVC OR DIRECT
BURIAL FLEX CONDUIT RUN FROM
BOTTOM OF CABINET TO ELECTRICAL
PANEL

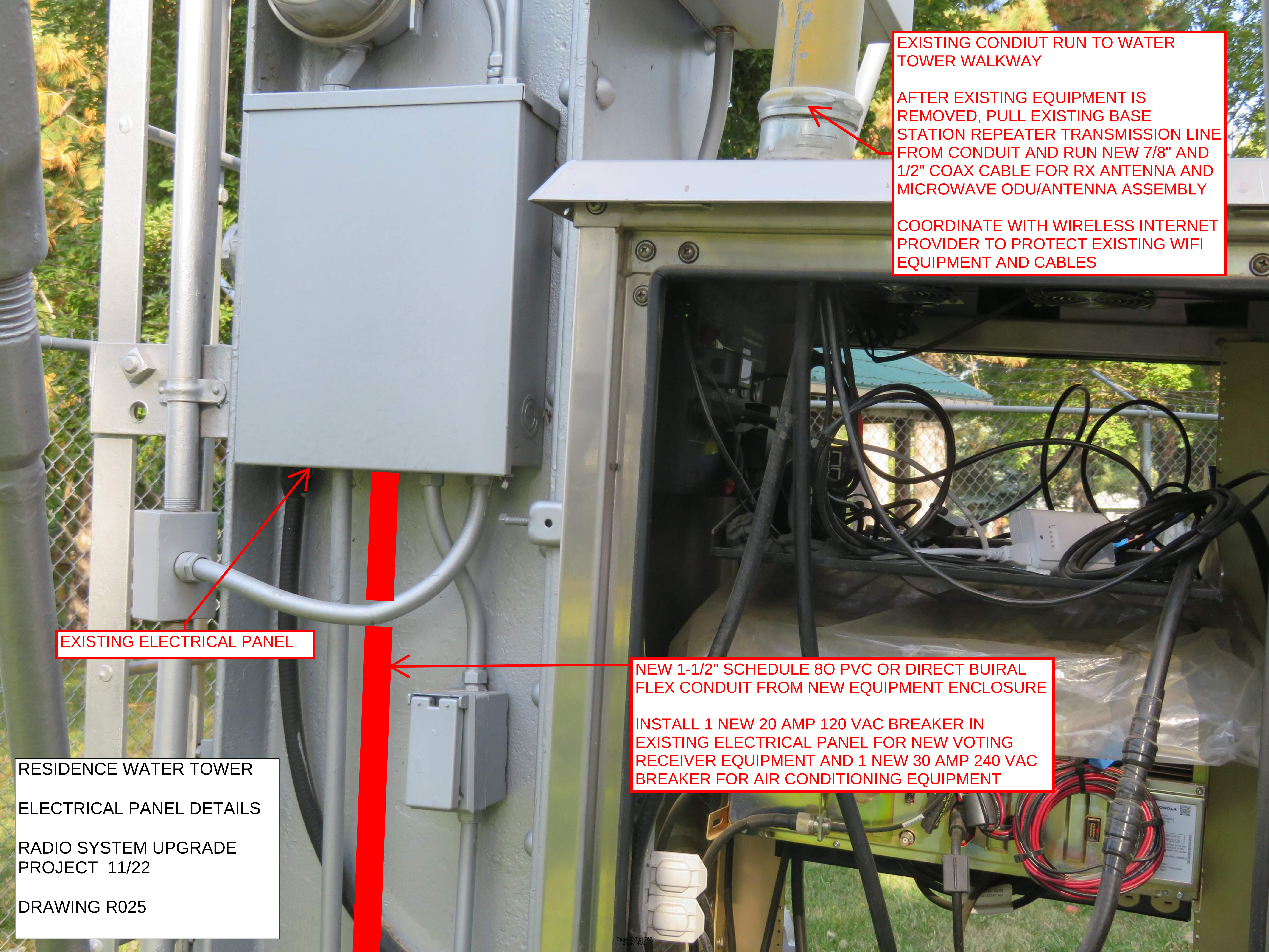
3" SCHEDULE 80 PVC OR DIRECT
BURIAL FLEX CONDUIT RUN FROM
BOTTOM OF CABINET TO BOTTOM OF
EXISTING CABINET FOR TRANSMISSION
LINE RUNS TO ANTENNAS

#2 TINNED SOLID
COPPER WIRE FROM
GROUND BAR INSIDE
EQUIPMENT CABINET
VIA 1-1/2" SCHEDULE
80 PVC CONDUIT RUN

EXOTHERMICALLY
WELD WIRE TO
TOWER LEG

3" SCHEDULE 80 PVC OR DIRECT
BURIAL FLEX CONDUIT RUN FROM
BOTTOM OF CABINET TO BOTTOM OF
EXISTING CABINET FOR TRANSMISSION
LINE RUNS TO ANTENNAS

RESIDENCE WATER TOWER
EQUIPMENT ENCLOSURE AND
ANTENNA MOUNTING DETAILS
RADIO SYSTEM UPGRADE
PROJECT 11/22
DRAWING R024



EXISTING CONDUIT RUN TO WATER TOWER WALKWAY

AFTER EXISTING EQUIPMENT IS REMOVED, PULL EXISTING BASE STATION REPEATER TRANSMISSION LINE FROM CONDUIT AND RUN NEW 7/8" AND 1/2" COAX CABLE FOR RX ANTENNA AND MICROWAVE ODU/ANTENNA ASSEMBLY

COORDINATE WITH WIRELESS INTERNET PROVIDER TO PROTECT EXISTING WIFI EQUIPMENT AND CABLES

EXISTING ELECTRICAL PANEL

NEW 1-1/2" SCHEDULE 80 PVC OR DIRECT BURIAL FLEX CONDUIT FROM NEW EQUIPMENT ENCLOSURE

INSTALL 1 NEW 20 AMP 120 VAC BREAKER IN EXISTING ELECTRICAL PANEL FOR NEW VOTING RECEIVER EQUIPMENT AND 1 NEW 30 AMP 240 VAC BREAKER FOR AIR CONDITIONING EQUIPMENT

RESIDENCE WATER TOWER
ELECTRICAL PANEL DETAILS
RADIO SYSTEM UPGRADE
PROJECT 11/22
DRAWING R025

MICROWAVE RADIO ODUs CONFIGURED FOR
HOT STANDBY OPERATION ATTACHED TO RFS
SC2-220C 2-FOOT 23 GHz DISH ANTENNA
ORIENTATION - 260.9 DEGREES TRUE

ODU/ANTENNA ASSEMBLY MOUNTED ON WATER
TOWER WALKWAY RAILING

TELEWAVE ANT150F6
6 dBd GAIN RX ANTENNA
MOUNTED ON 6-FOOT
STANDOFF

1/2" COAX CABLE TO MICROWAVE RADIO
ODUs

7/8" COAX CABLE TO RX ANTENNA

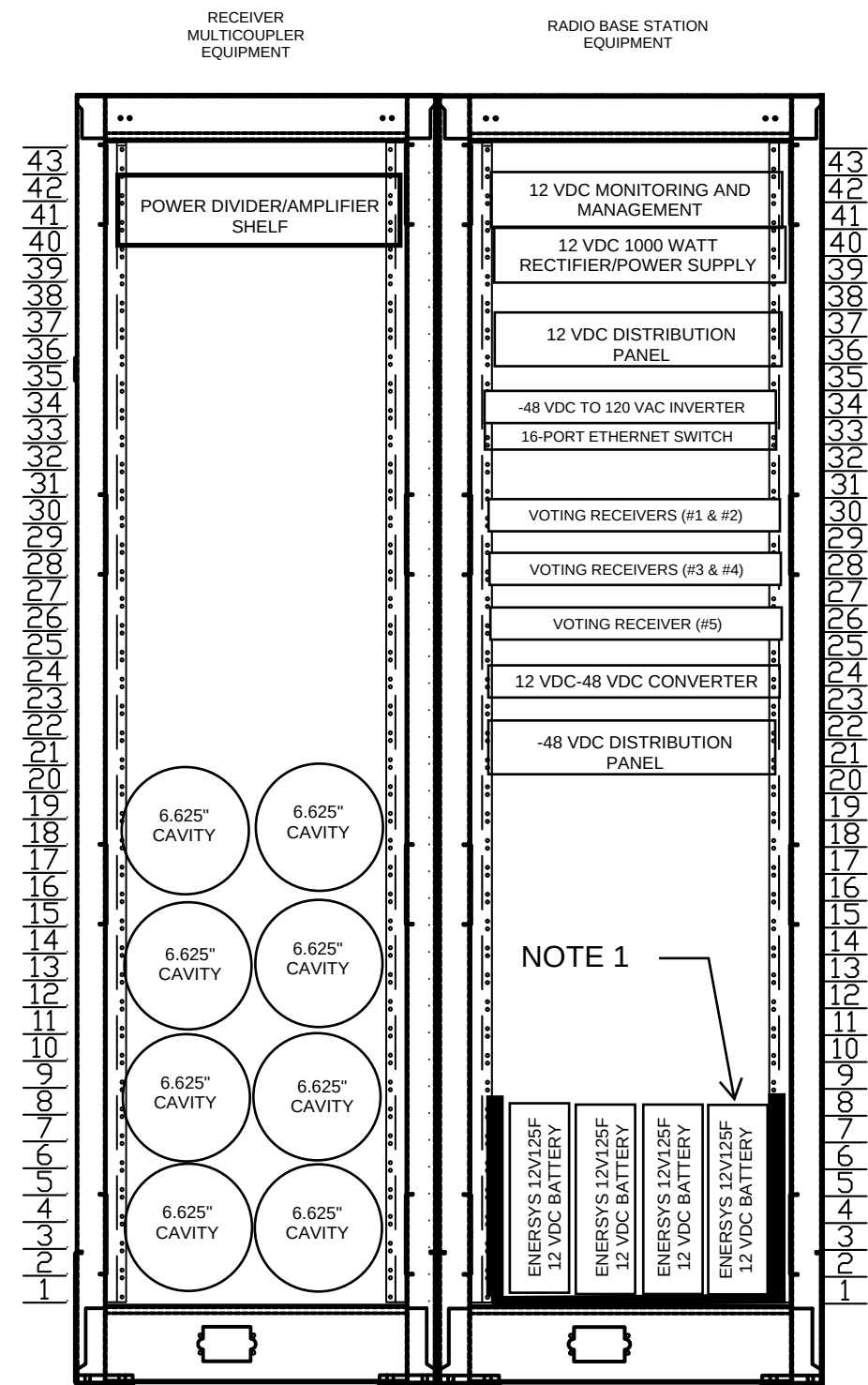
CABLES CONTINUE DOWN VIA EXISTING
CONDUIT RUN FROM EXISTING EQUIPMENT
CABINET AT BASE OF CLIMBING LADDER

RESIDENCE WATER TOWER

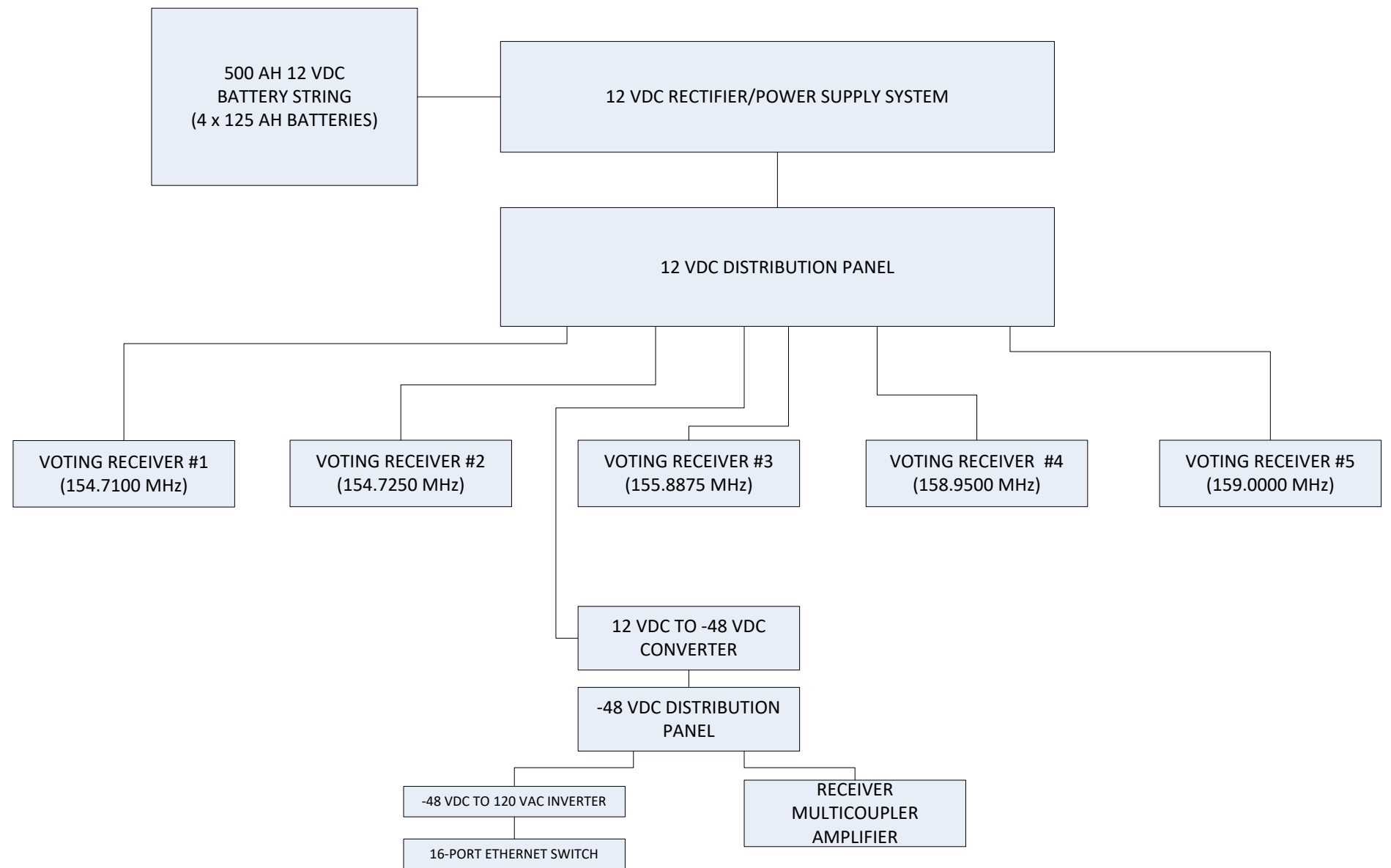
ANTENNA MOUNTING
DETAILS

RADIO SYSTEM UPGRADE
PROJECT 11/22

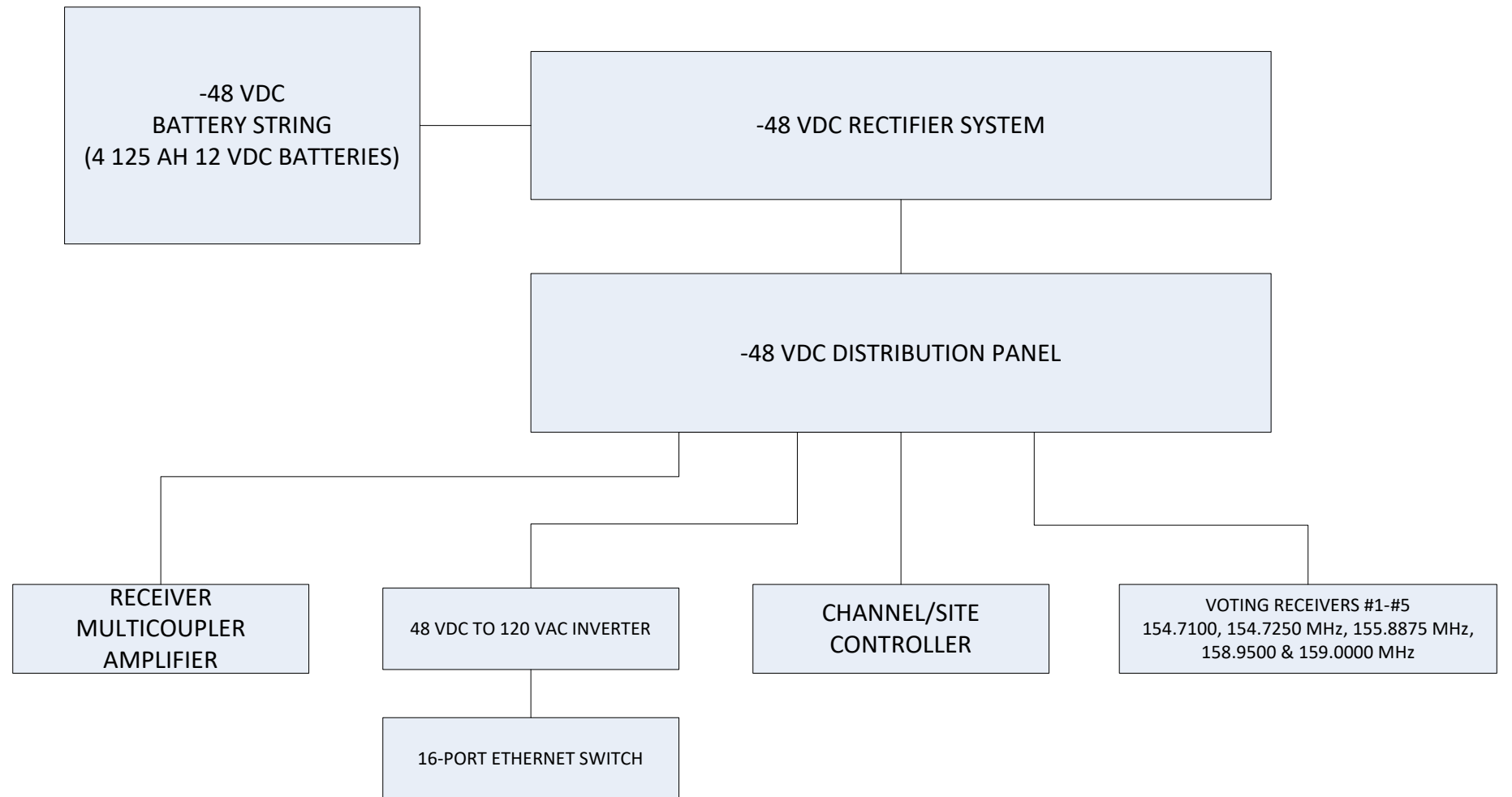
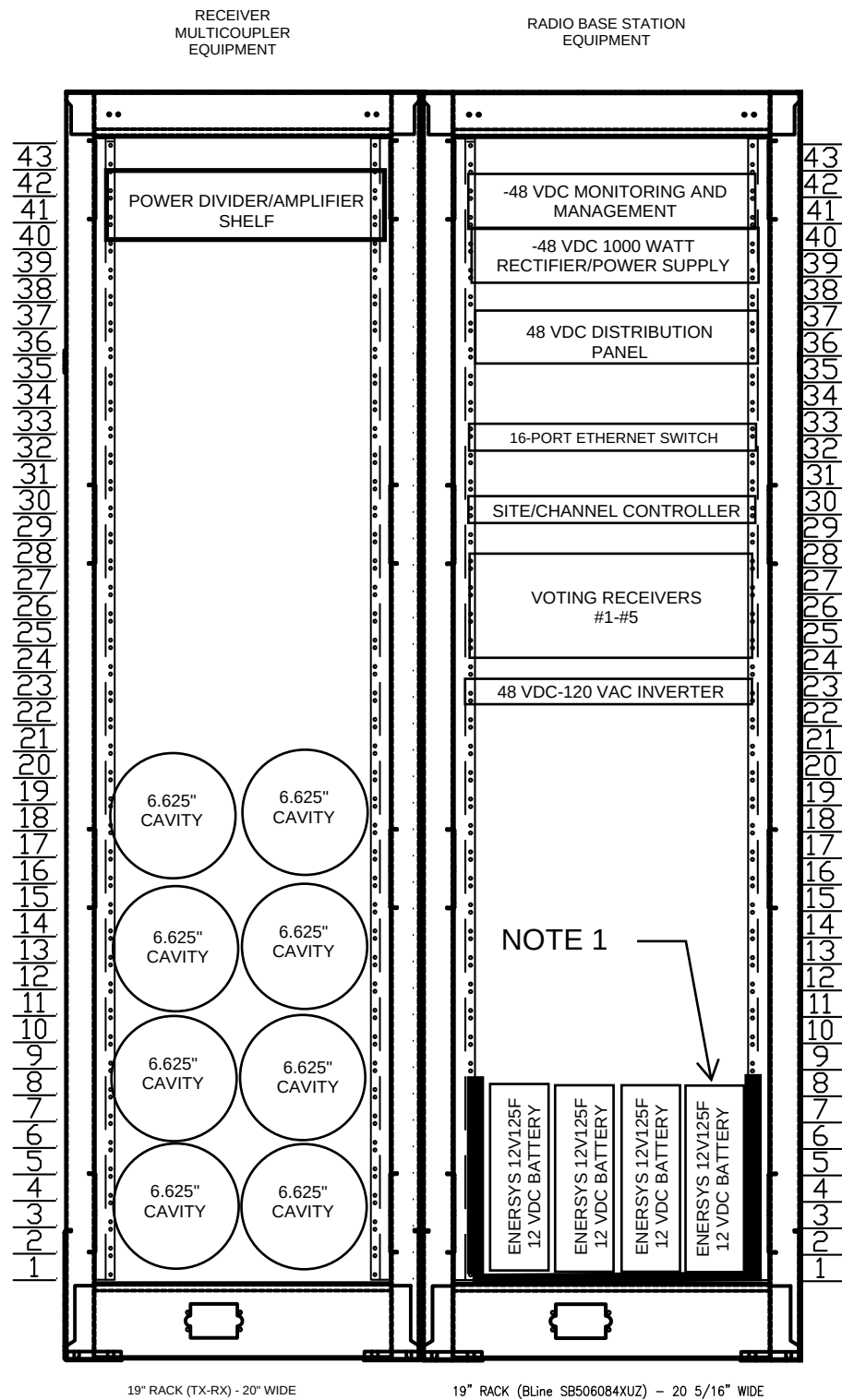
DRAWING R026



NOTE 1 - ENERSYS POWERSAFE 12V125F 12 VDC BATTERIES WIRED IN PARALLEL TO PROVIDE 12 VDC 500 AH BATTERY SYSTEM.
 BACKUP TIME TO 1.75 Vpc @ 77 DEGREES D > 24 HOURS



HATFIELD & DAWSON CONSULTING ENGINEERS	TYPICAL RACK ELEVATION DRAWING & POWER SUPPLY SYSTEM CONFIGURATION (12 VDC POWER SUPPLY) VISTA WATER TANK VOTING RECEIVER SITE			
	RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO			
	SIZE	DATE	DWG NO	REV
		November 2022	R027	1
	SCALE	1 : 1	SHEET	1 OF 1



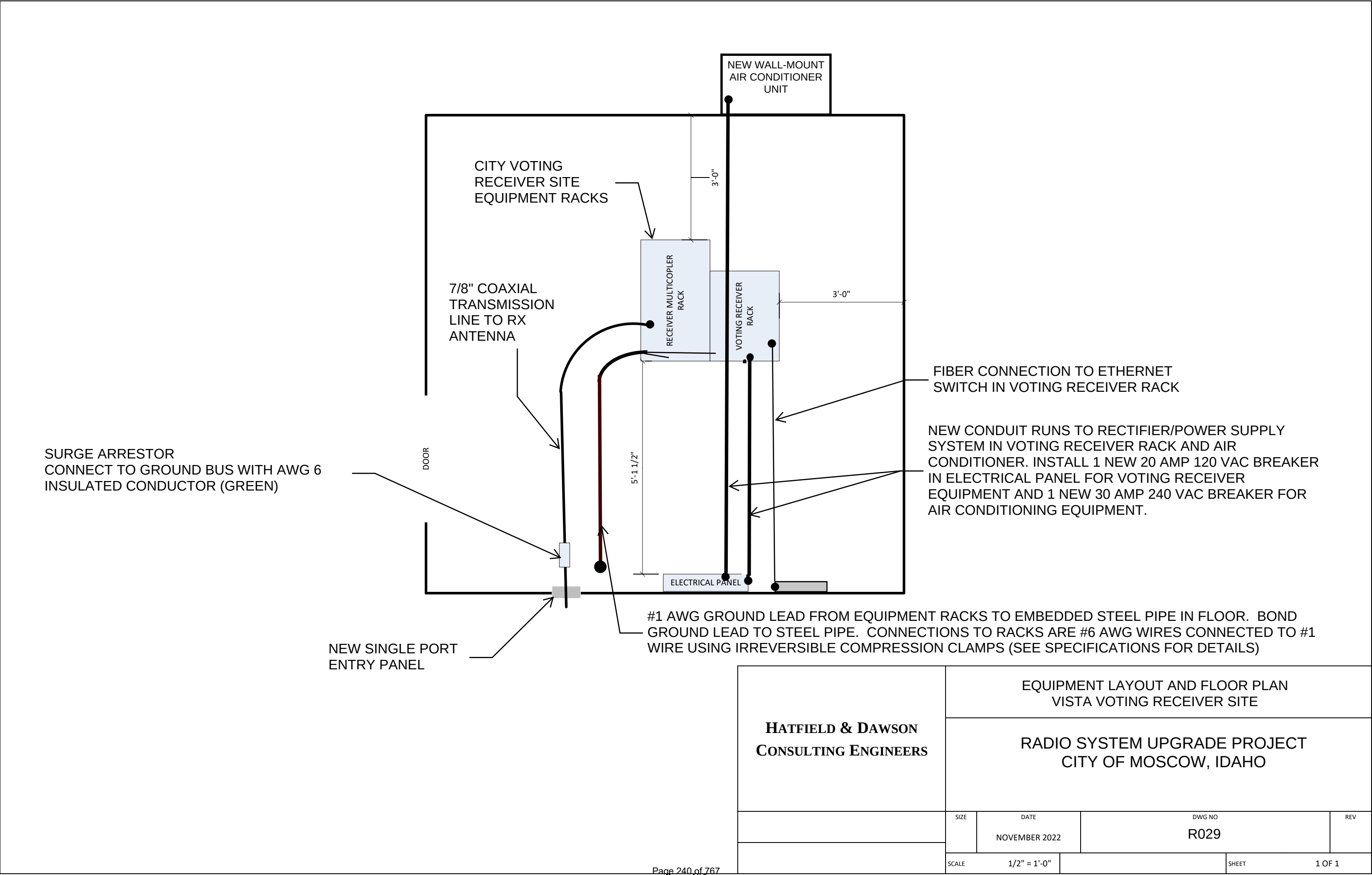
NOTE 1 - ENERSYS POWERSAFE 12V125F 12 VDC BATTERIES WIRED IN SERIES TO PROVIDE 48 VDC. BACKUP TIME TO 1.75 Vpc @ 77 DEGREES D > 24 HOURS

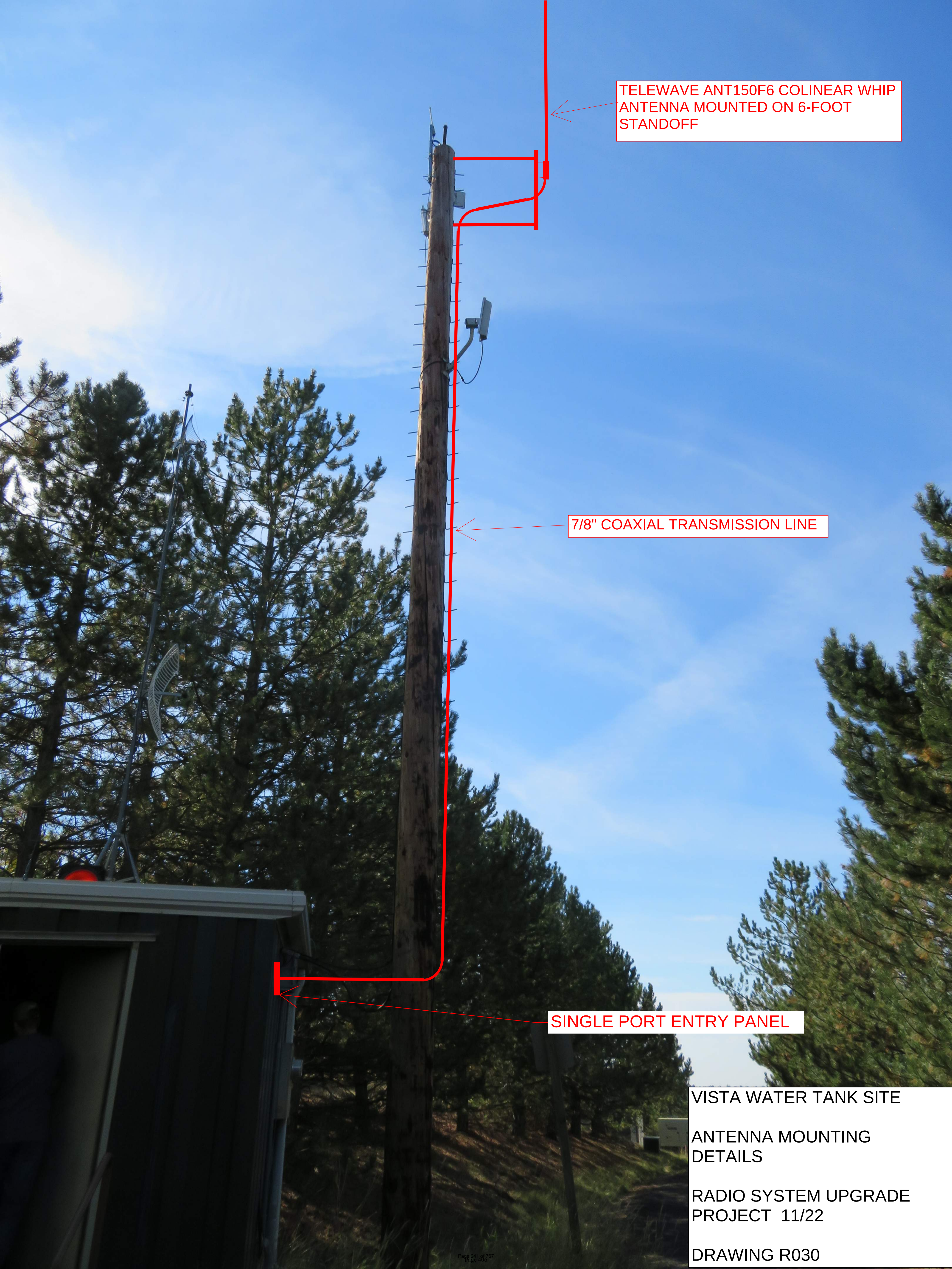
HATFIELD & DAWSON
CONSULTING ENGINEERS

TYPICAL RACK ELEVATION DRAWING & POWER SUPPLY SYSTEM CONFIGURATION (48 VDC POWER SUPPLY)
VISTA WATER TANK VOTING RECEIVER SITE

RADIO SYSTEM UPGRADE PROJECT
CITY OF MOSCOW, IDAHO

SIZE	DATE	DWG NO	REV
	November 2022	R028	1
SCALE	1 : 1	SHEET	1 OF 1





TELEWAVE ANT150F6 COLINEAR WHIP
ANTENNA MOUNTED ON 6-FOOT
STANDOFF

7/8" COAXIAL TRANSMISSION LINE

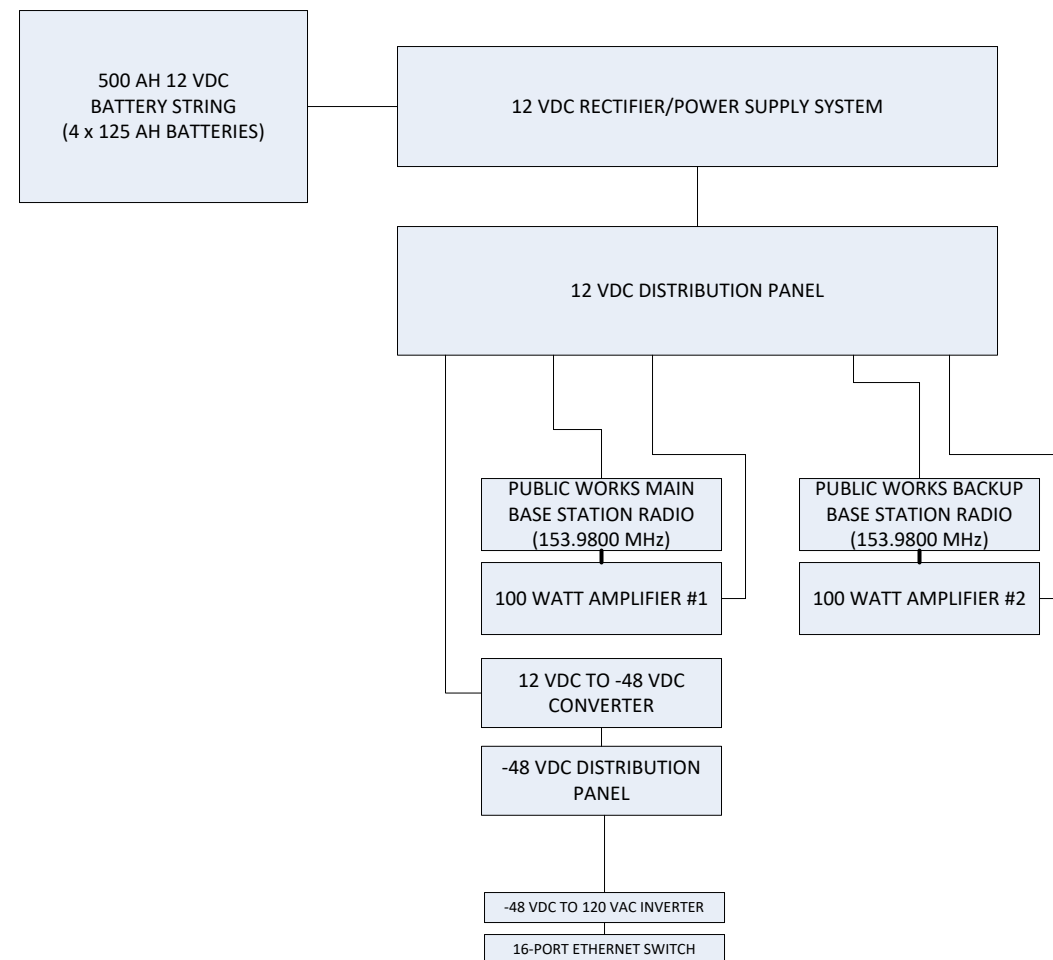
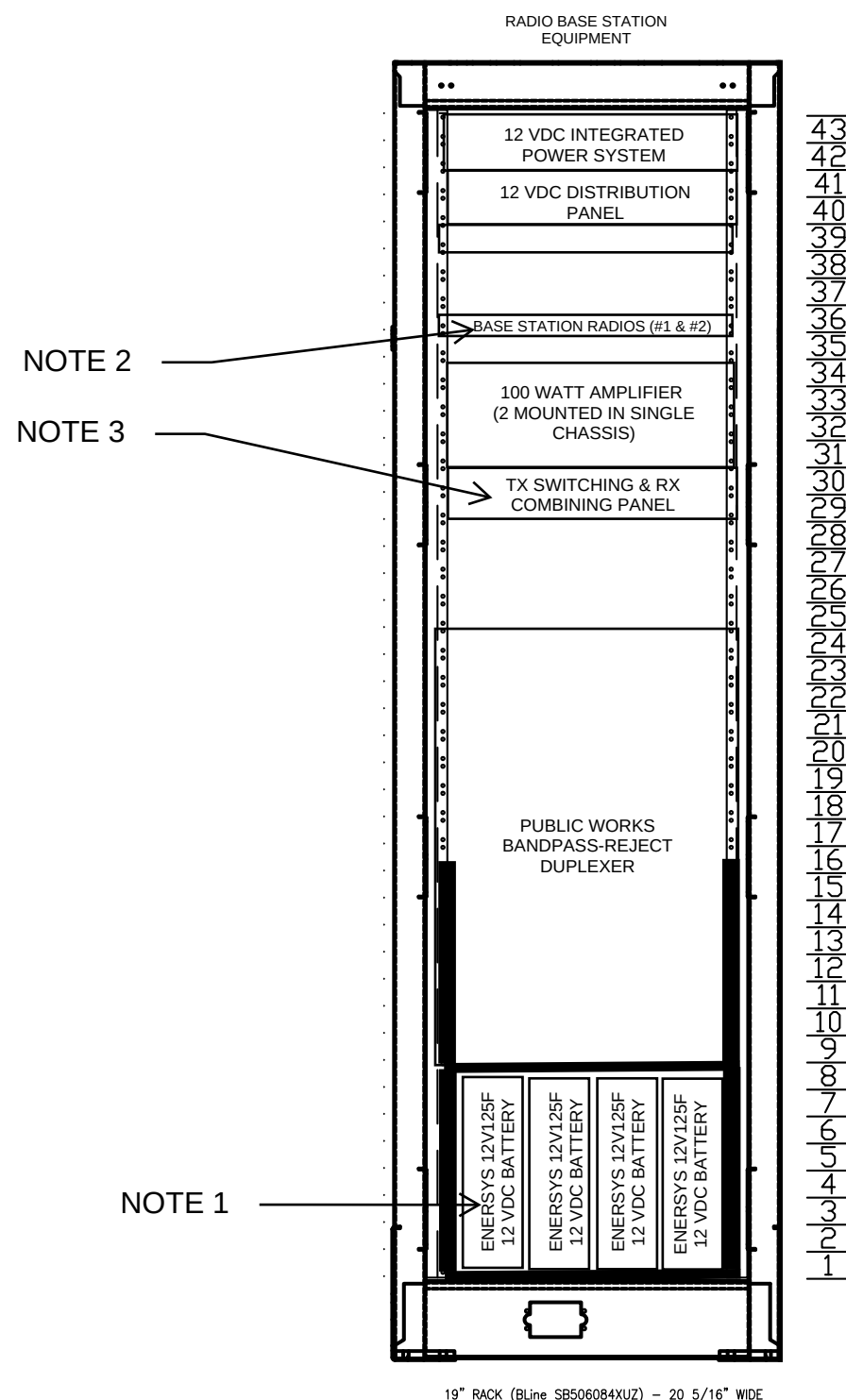
SINGLE PORT ENTRY PANEL

VISTA WATER TANK SITE

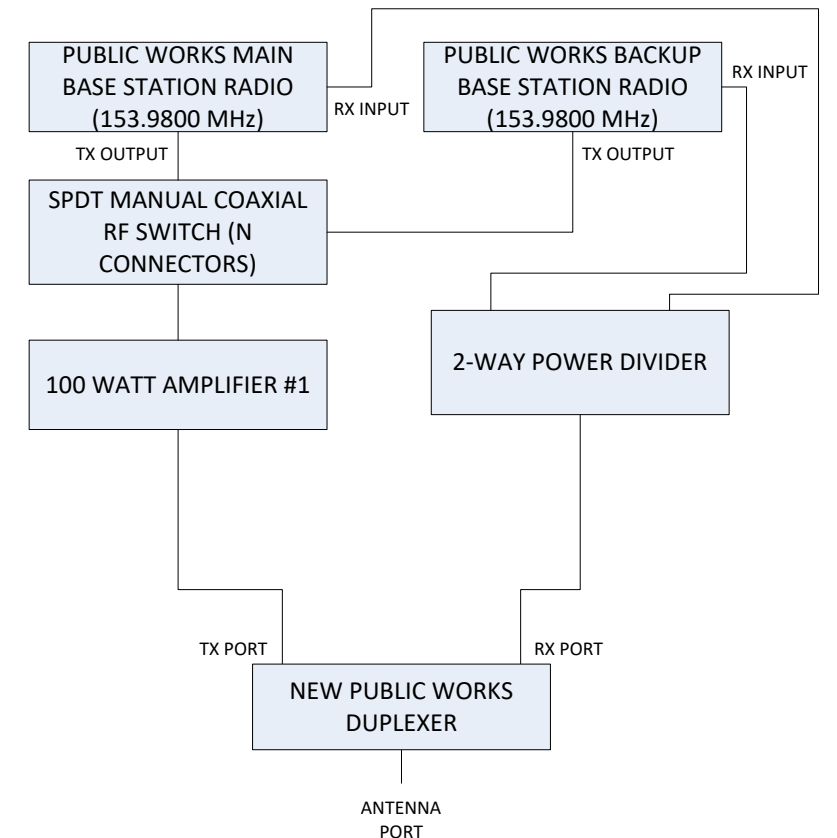
ANTENNA MOUNTING
DETAILS

RADIO SYSTEM UPGRADE
PROJECT 11/22

DRAWING R030



DC POWER DISTRIBUTION BLOCK DIAGRAM



MAIN/BACK RF SWITCHING PANEL BLOCK DIAGRAM

NOTE 1 - ENERSYS POWERSAFE 12V125F 12 VDC
BATTERIES WIRED IN PARALLEL TO PROVIDE 12
VDC 500 AH BATTERY SYSTEM.
BACKUP TIME TO 1.75 Vpc @ 77 DEGREES ~ 22
HOURS

NOTE 2 - PUBLIC WORKS MAIN AND BACKUP STAND-ALONE REPEATERS

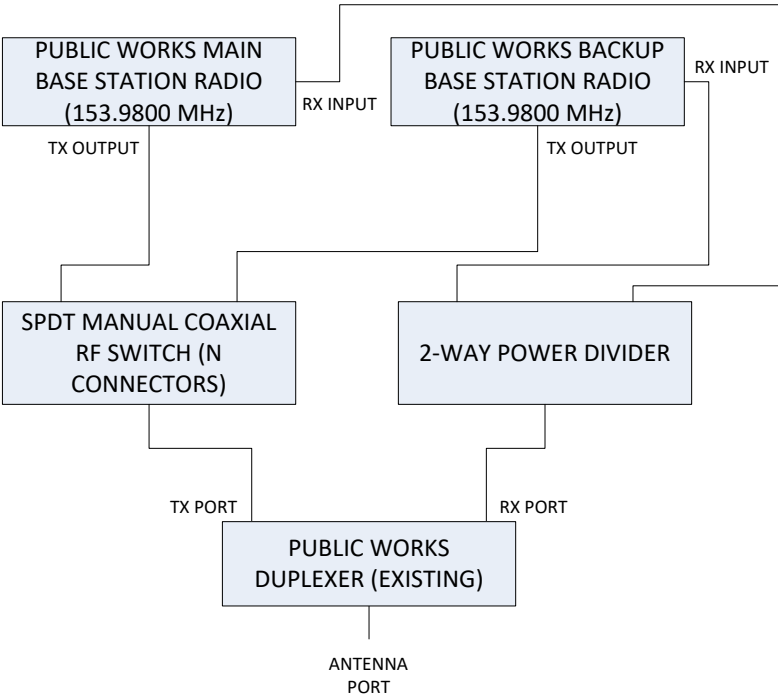
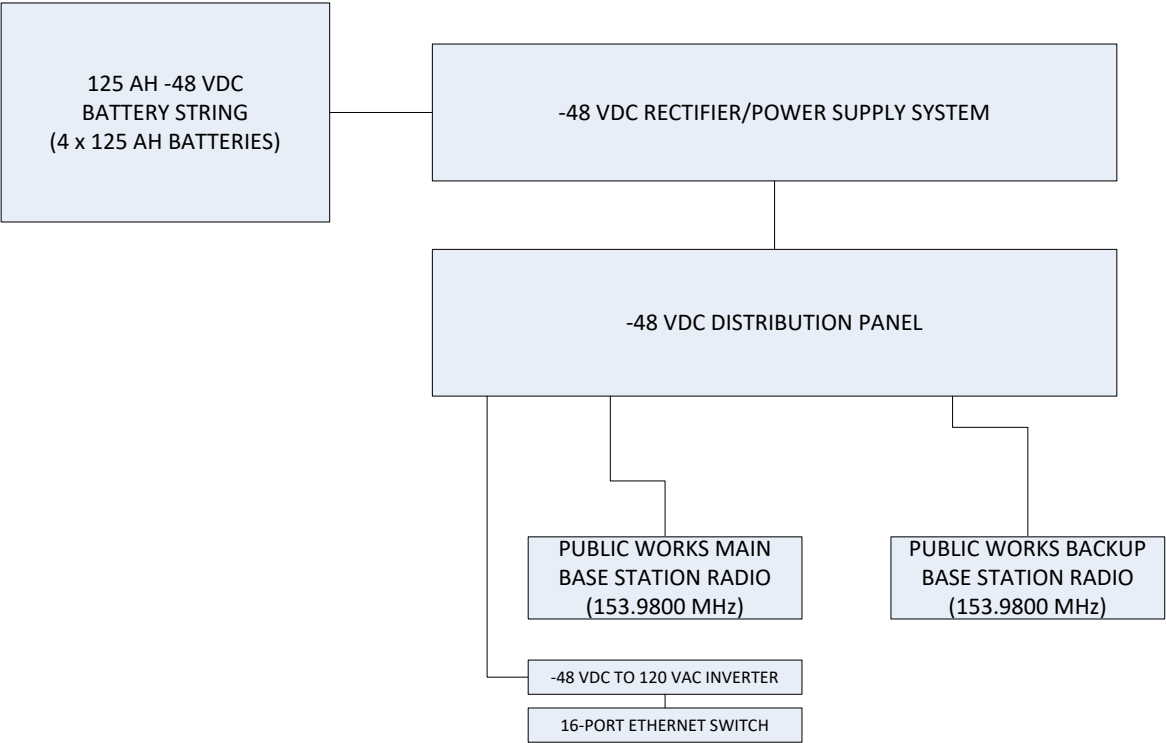
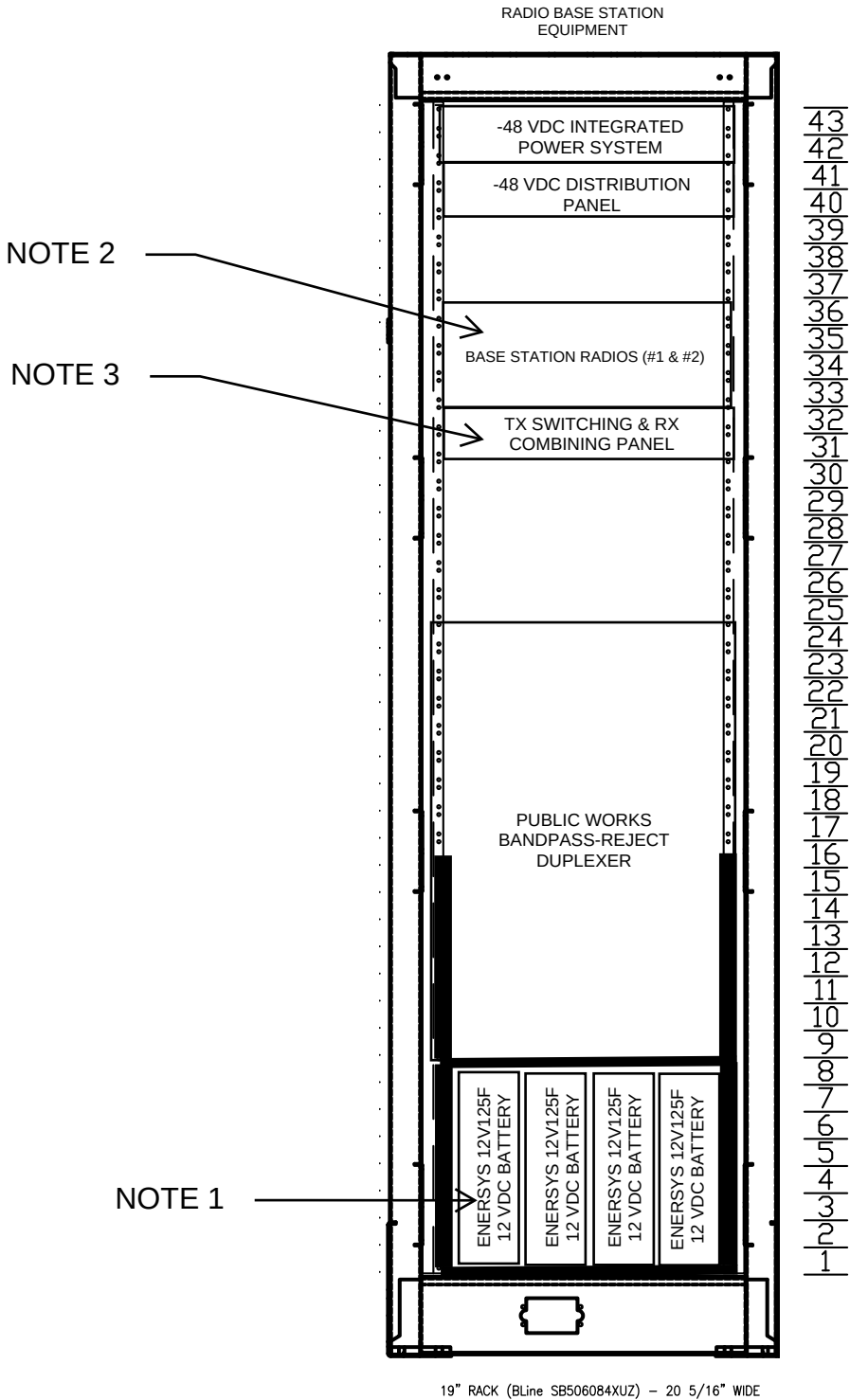
NOTE 3 - BASE STATION MAIN/BACKUP SWITCHING
PANEL. SPDT COAXIAL RF SWITCH ON TX
OUTPUTS FEEDING DUPLEXER TX PORT & 2-WAY
POWER COMBINER ON RX INPUTS CONNECTED TO
DUPLEXER RX PORT

HATFIELD & DAWSON
CONSULTING ENGINEERS

TYPICAL RACK ELEVATION DRAWING & POWER SUPPLY SYSTEM
CONFIGURATION (12 VDC POWER SUPPLY)
COURTHOUSE SITE

RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO

	SIZE	DATE	DWG NO	REV
		November 2022	R031	1
	SCALE	1 : 1	SHEET	1 OF 1



NOTE 1 - ENERSYS POWERSAFE 12V125F 12 VDC BATTERIES WIRED IN SERIES TO PROVIDE -48 VDC 125 AH BATTERY SYSTEM. BACKUP TIME TO 1.75 Vpc @ 77 DEGREES ~ 22 HOURS

NOTE 2 - PUBLIC WORKS MAIN AND BACKUP STAND-ALONE REPEATERS

NOTE 3 - BASE STATION MAIN/BACKUP SWITCHING PANEL. SPDT COAXIAL RF SWITCH ON TX OUTPUTS FEEDING DUPLEXER TX PORT & 2-WAY POWER COMBINER ON RX INPUTS CONNECTED TO DUPLEXER RX PORT

DC POWER DISTRIBUTION BLOCK DIAGRAM

MAIN/BACKUP RF SWITCHING PANEL BLOCK DIAGRAM

HATFIELD & DAWSON CONSULTING ENGINEERS	TYPICAL RACK ELEVATION DRAWING & POWER SUPPLY SYSTEM CONFIGURATION (-48 VDC POWER SUPPLY) COURTHOUSE SITE			
	RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO			
	SIZE	DATE	DWG NO	REV
		November 2022	R032	1
	SCALE	1 : 1	SHEET	1 OF 1

NEW EQUIPMENT RACK
WITH PUBLIC WORKS
RADIOS OCCUPIES THIS
SPACE

EXISTING PUBLIC WORKS
DUPLEXER TO BE
REPAVED WITH NEW
DUPLEXER MOUNTED IN
NEW EQUIPMENT RACK

RELOCATE EXISTING
QUANTAR REPEATER TO
SPACE NOW OCCUPIED
BY PUBLIC WORKS
REPEATER

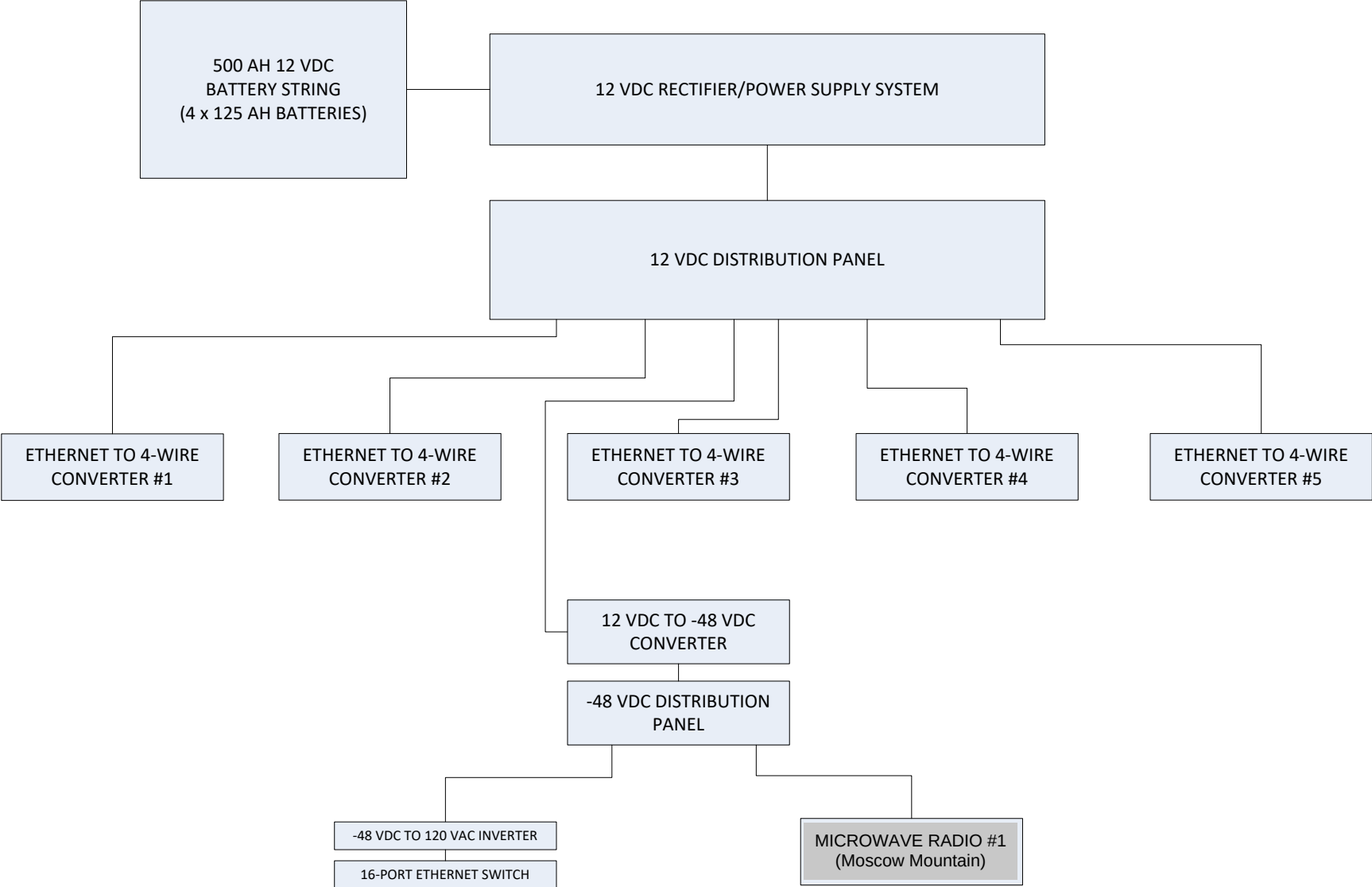
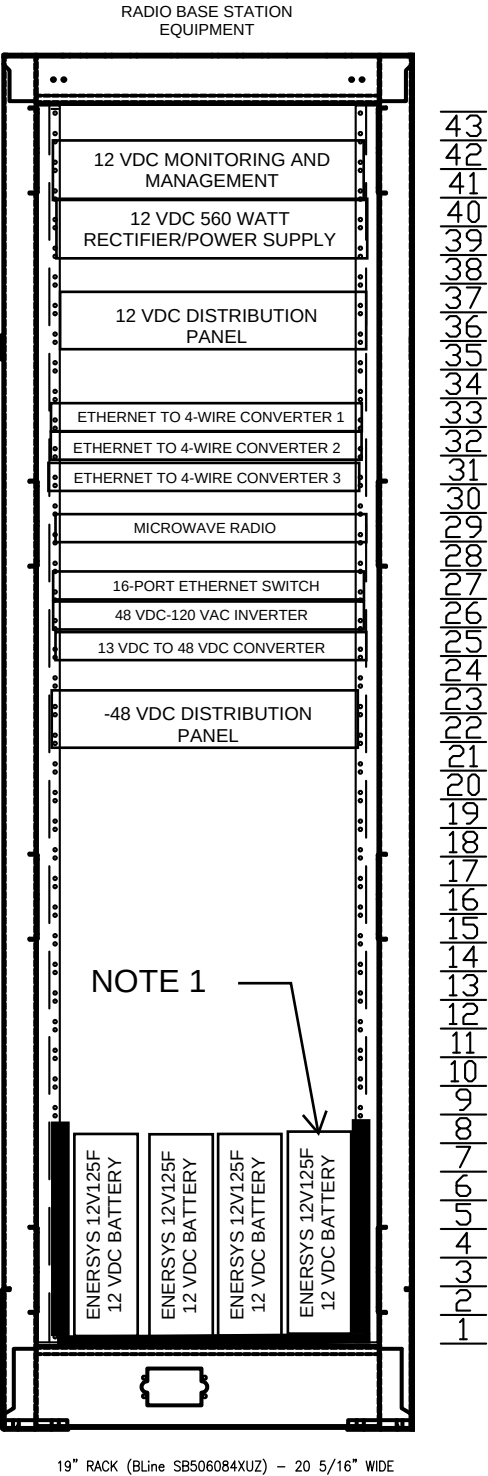
RELOCATE EXISTING
AVTECH PANELS
MOUNTED BELOW
QUANTAR REPEATER

COURTHOUSE SITE

EQUIPMENT RACK LOCATION
IN IT EQUIPMENT ROOM

RADIO SYSTEM UPGRADE
PROJECT 11/22

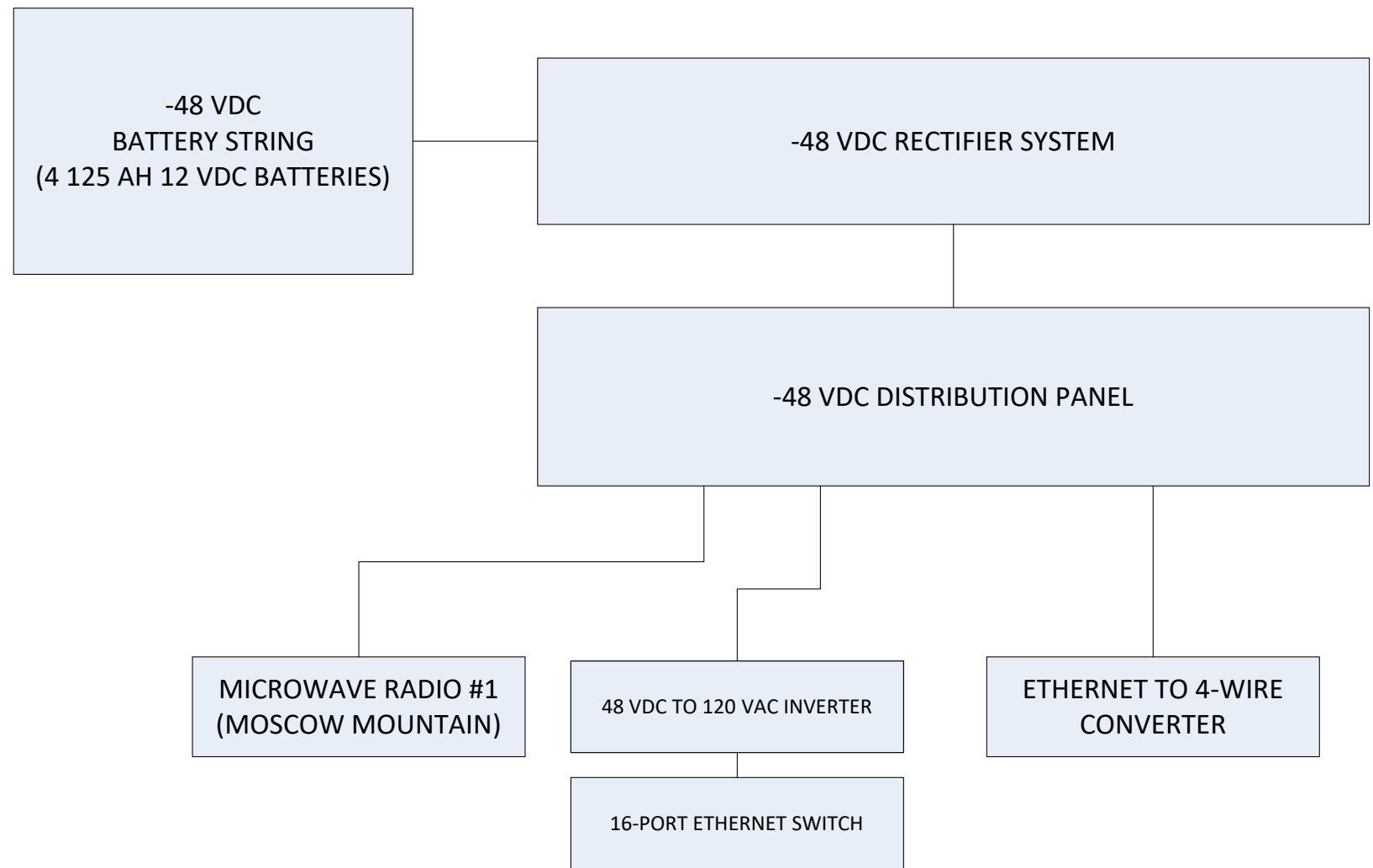
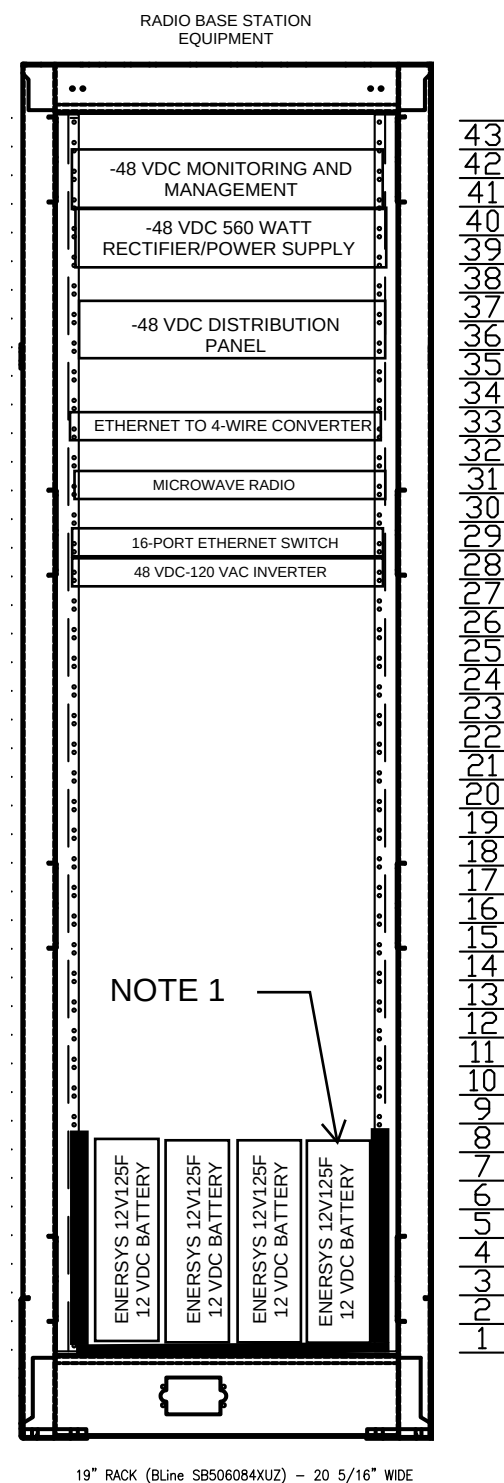
DRAWING R033



NOTE 1 - ENERSYS POWERSAFE 12V125F 12 VDC BATTERIES WIRED IN SERIES - BACKUP TIME TO 1.75 Vpc @ 77 DEGREES > 24 HOURS

NOTE 2 - ETHERNET TO 4-WIRE CONVERTERS 1& 2 CONFIGURED FOR 2 CHANNELS EACH; ETHERNET TO 4-WIRE CONVERTER 3 CONFIGURED FOR 1 CHANNEL

HATFIELD & DAWSON CONSULTING ENGINEERS	TYPICAL RACK ELEVATION DRAWING & POWER SUPPLY SYSTEM CONFIGURATION (12 VDC POWER SUPPLY) WHITCOM SITE			
	RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO			
	SIZE	DATE	DWG NO	REV
		November 2022	R034	1
	SCALE	1 : 1	SHEET	1 OF 1



NOTE 1 ENERSYS POWERSAFE 12V125F 12 VDC BATTERIES WIRED IN SERIES TO PROVIDE -48 VDC. BACKUP TIME TO 1.75 Vpc @ 77 DEGREES > 24 HOURS

NOTE 2 - ETHERNET TO 4-WIRE CONVERTER CONFIGURED FOR 5 CHANNELS

HATFIELD & DAWSON CONSULTING ENGINEERS	TYPICAL RACK ELEVATION DRAWING & POWER SUPPLY SYSTEM CONFIGURATION (-48 VDC POWER SUPPLY) WHITCOM SITE			
	RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO			
	SIZE	DATE	DWG NO	REV
		November 2022	R035	1
	SCALE	1 : 1	SHEET	1 OF 1



1/2" COAX CABLE TO ODUs FROM
INDOOR UNIT IN RACK INSIDE
WHITCOM EQUIPMENT SHELTER

MICROWAVE RADIO ODUs
CONFIGURED FOR HOT STANDBY
OPERATION ATTACHED TO RFS
SC4-100B 4-FOOT 11 GHz DISH
ANTENNA - 110 FEET AGL
ORIENTATION - 70.9 DEGREES TRUE

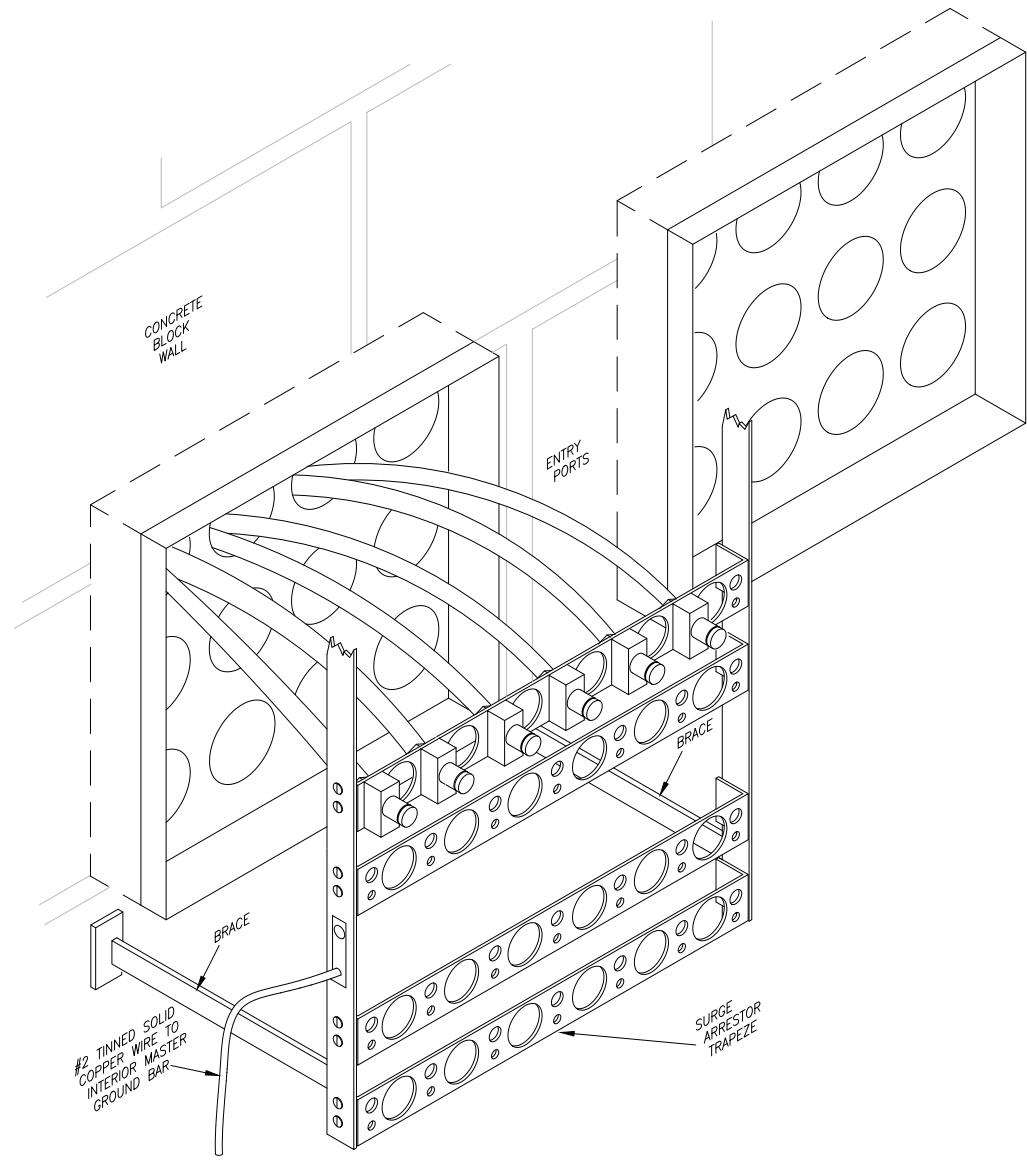
WHITCOM SITE

ANTENNA MOUNTING
DETAILS

RADIO SYSTEM UPGRADE
PROJECT 11/22

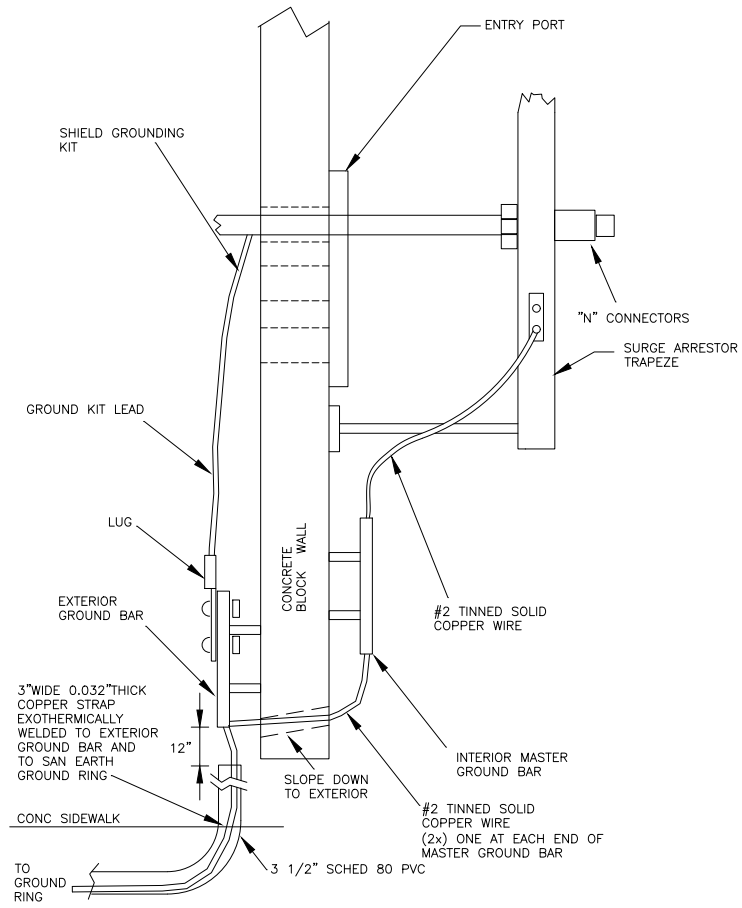
DRAWING R036

WHITCOM EQUIPMENT SHELTER



SURGE ARRESTOR TRAPEZE DETAIL - ISOMETRIC VIEW

SCALE: NONE 2



SURGE ARRESTOR TRAPEZE DETAIL - PROFILE VIEW

SCALE: NONE 1

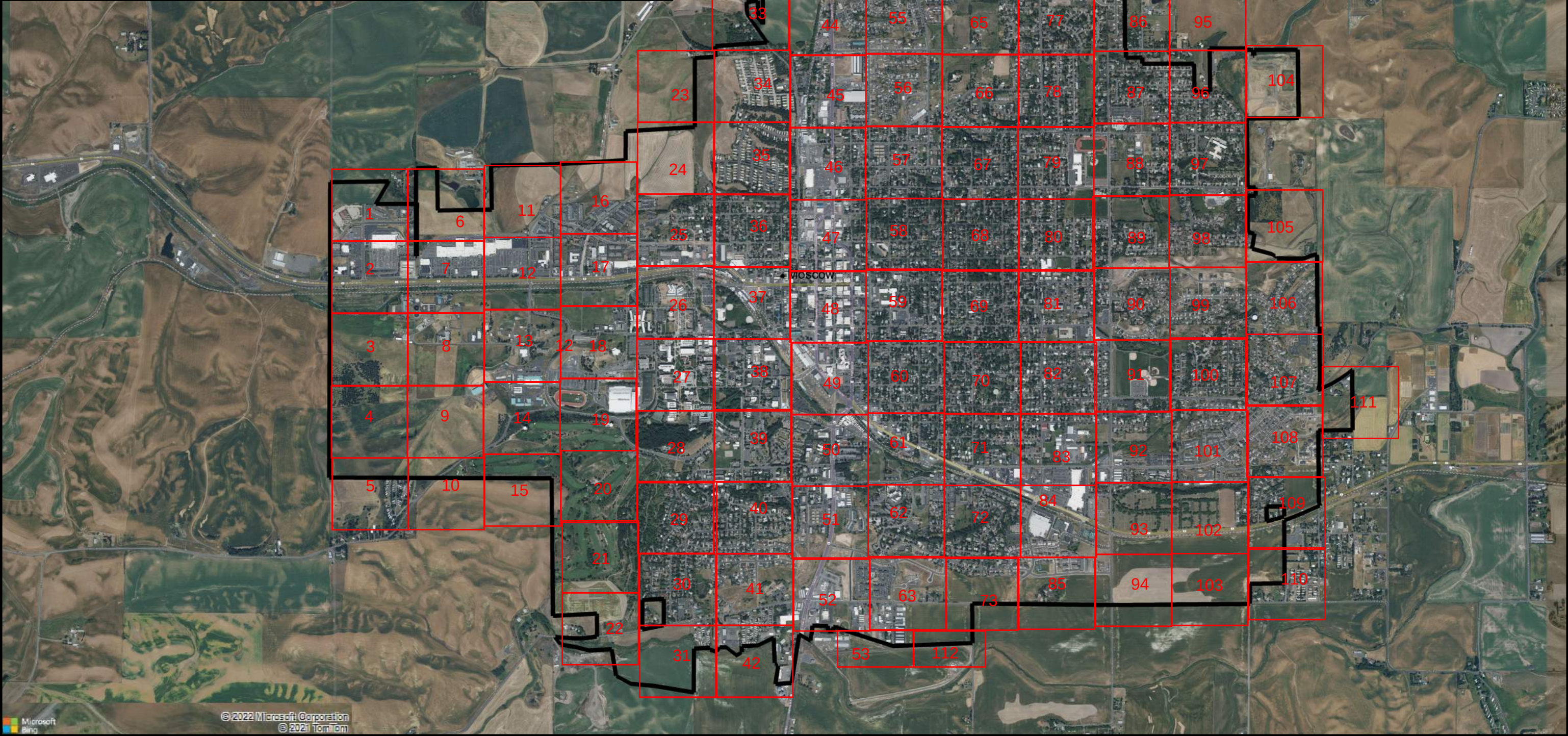
HATFIELD & DAWSON
CONSULTING ENGINEERS

TYPICAL TRANSMISSIONLINE ENTRY PORT
AND SURGE ARRESTOR TRAPEZE
CONFIGURATION

RADIO SYSTEM UPGRADE PROJECT
CITY OF MOSCOW, IDAHO

SIZE	DATE	DWG NO	REV
	November 2022	R037	1
SCALE	1 : 1	SHEET	1 OF 1

HATFIELD & DAWSON CONSULTING ENGINEERS	MAP SHOWING TESTING GRID FOR DAQ TESTING			
	RADIO SYSTEM UPGRADE PROJECT CITY OF MOSCOW, IDAHO			
	SIZE	DATE	DWG NO	REV
		November 2022	R038	1
	SCALE	1:25,000	SHEET	1 OF 1

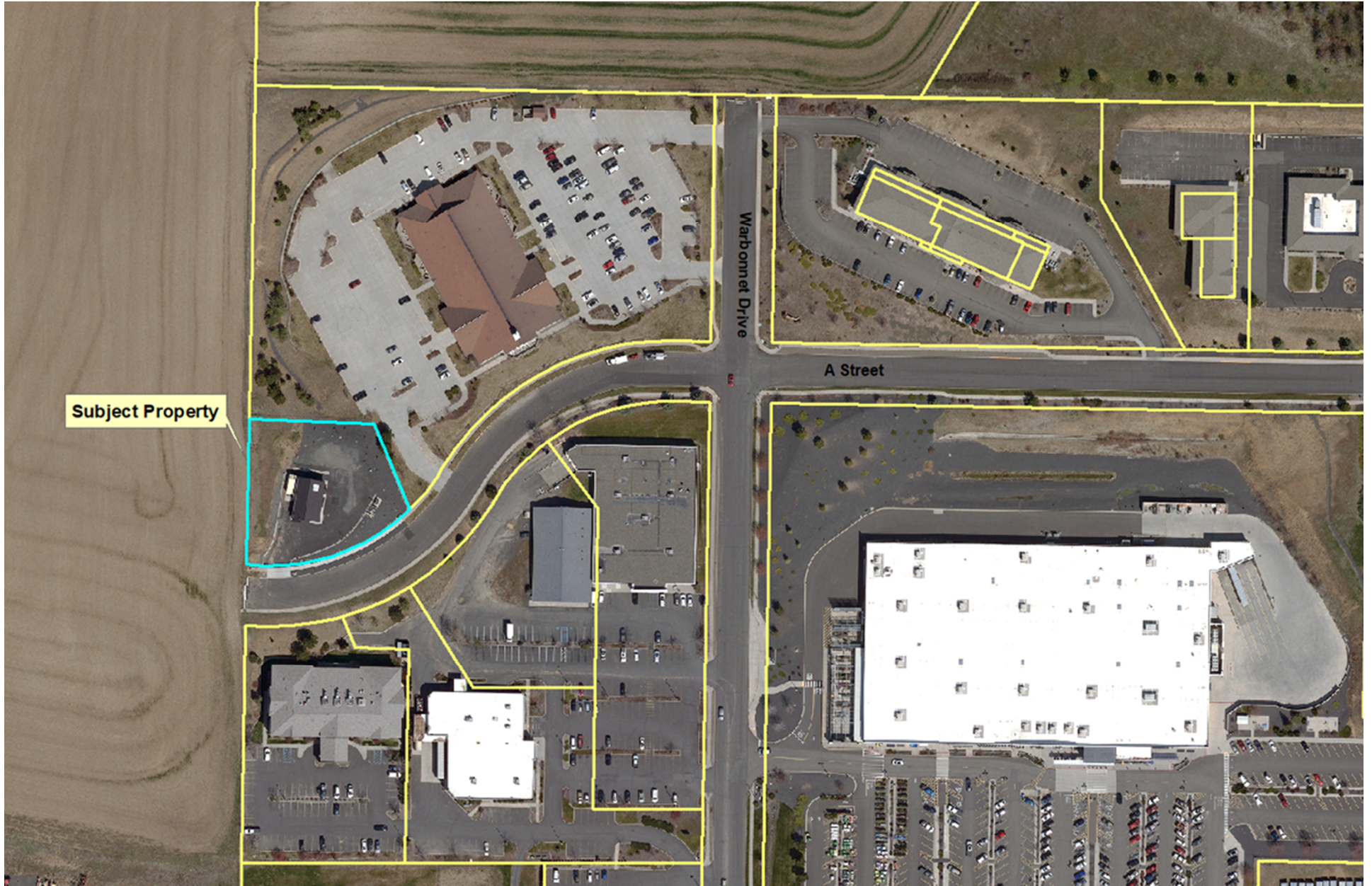




APPENDIX B

GEOTECHNICAL REPORT

RADIO SYSTEM UPGRADE PROJECT

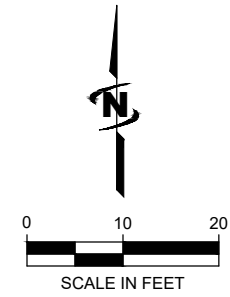


Subject Property

Warbonnet Drive

A Street

PROPOSED 85'-0"
MONOPOLE
TOWER



B1
S-403

CG13

CG2

3
CG-501

CG5

CG3
N:1850214.39
E:2301303.64

CG3
N:1850212.75
E:2301315.15

CG11
2
CG-501

CG9

S

CG2

CG10
1
CG-501

CG8

CG7

CG4

UTILITY NEW BOX

EXISTING
SEWER SERVICE

WELL HOUSE

D

S

D

D

TABLE 1 - Well 10 Microwave Dish Antennas					
Path	Azimuth (Degrees True)	Antenna Model #	Frequency Band (GHz)	Dish Size (feet)	Elevation On Tower (feet)
Moscow Mountain	47.7	RFS SC3-W100B	11	3.0	70
Residence Water Tower	85.5	RFS SC1-220A	23	1.0	83.5
Rotary Park Water Tank	80.9	RFS SC2-220C	23	2.0	83.5
KUID-TV Site (Paradise Ridge)	138.8	RFS SC3-W100B	11	3.0	70

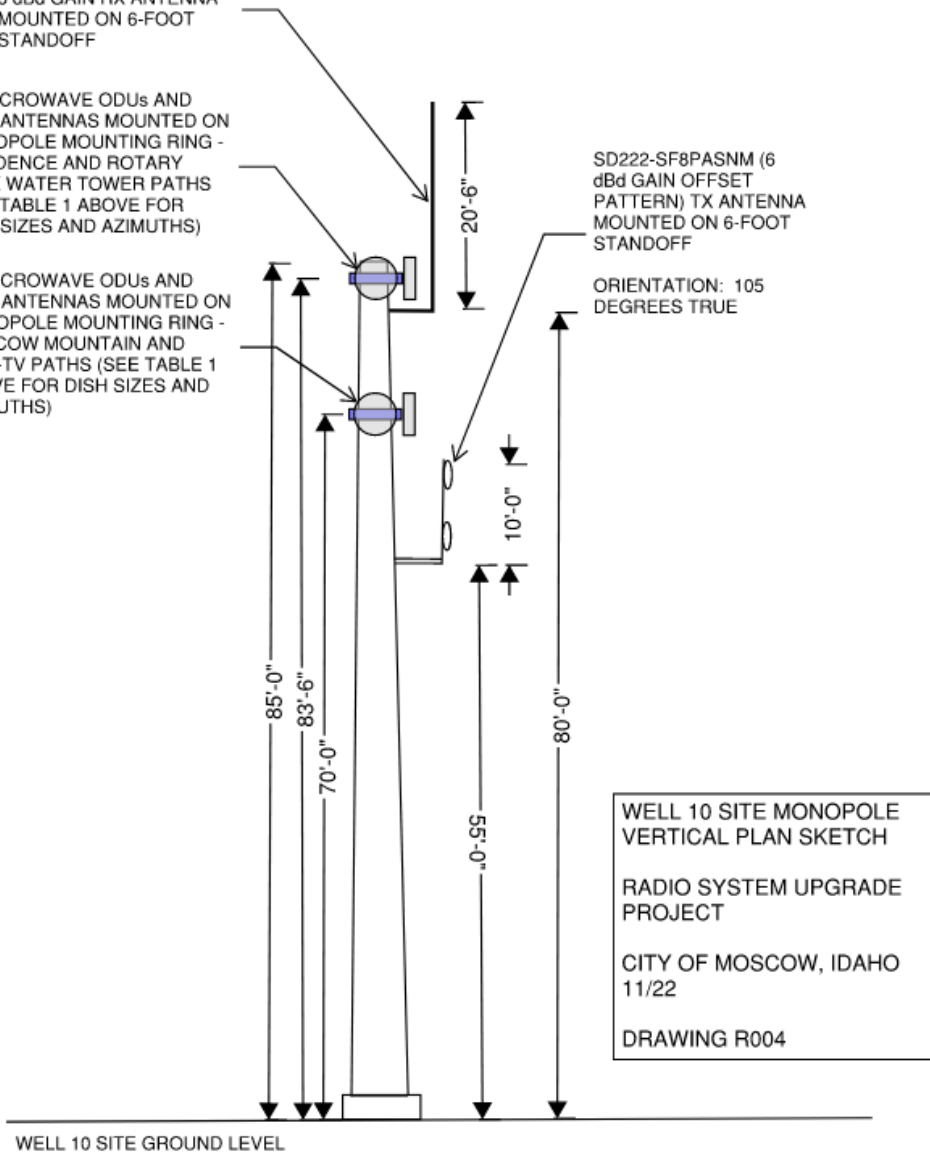
TELEWAVE ANT150F6
6 dBd GAIN RX ANTENNA
MOUNTED ON 6-FOOT
STANDOFF

(2) MICROWAVE ODUs AND
DISH ANTENNAS MOUNTED ON
MONOPOLE MOUNTING RING -
RESIDENCE AND ROTARY
PARK WATER TOWER PATHS
(SEE TABLE 1 ABOVE FOR
DISH SIZES AND AZIMUTHS)

(2) MICROWAVE ODUs AND
DISH ANTENNAS MOUNTED ON
MONOPOLE MOUNTING RING -
MOSCOW MOUNTAIN AND
KUID-TV PATHS (SEE TABLE 1
ABOVE FOR DISH SIZES AND
AZIMUTHS)

SD222-SF8PASNM (6
dBd GAIN OFFSET
PATTERN) TX ANTENNA
MOUNTED ON 6-FOOT
STANDOFF

ORIENTATION: 105
DEGREES TRUE



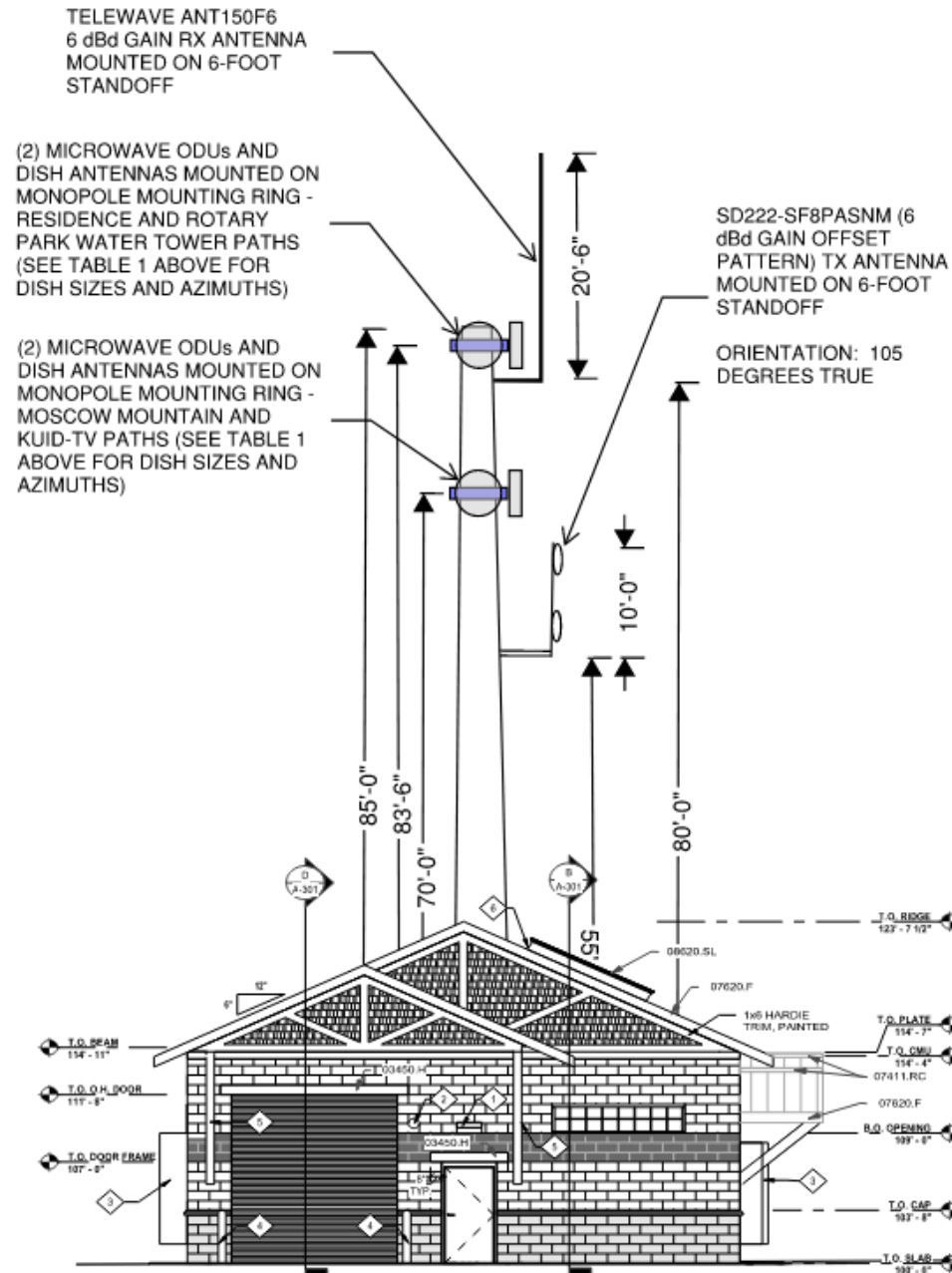
WELL 10 SITE MONOPOLE
VERTICAL PLAN SKETCH

RADIO SYSTEM UPGRADE
PROJECT

CITY OF MOSCOW, IDAHO
11/22

DRAWING R004

Path	Azimuth (Degrees True)	Antenna Model #	Frequency Band (GHz)	Dish Size (feet)	Elevation On Tower (feet)
Moscow Mountain	47.7	RFS SC3-W100B	11	3.0	70
Residence Water Tower	85.5	RFS SC1-220A	23	1.0	83.5
Rotary Park Water Tank	80.9	RFS SC2-220C	23	2.0	83.5
KUID-TV Site (Paradise Ridge)	138.8	RFS SC3-W100B	11	3.0	70



April 27, 2023
File: PU23066A

Mr. Scott Bontrager, P.E.
City of Moscow Engineering Manager
206 E. Third St.
Moscow, ID 83843
sbontrager@ci.moscow.id.us

RE: **Geotechnical Deliverable Transmittal**
Geotechnical Engineering Evaluation
Well 10 Communication Tower
West A Street
Moscow, Idaho

Good Day, Josh.

GeoProfessional Innovation Corporation (GPI) appreciates the opportunity to work with the City of Moscow on the proposed Well 10 communication tower project located at the western terminus of West A Street in Moscow, Idaho. The tower project involved geotechnical investigation to help visually observe and classify the soil profile and establish foundation and earthwork requirements.

It is important to provide this information to the tower foundation structural designers and to make sure they are aware that GPI stands ready to respond to requests for additional information, evaluating different foundation systems, or clarifying our information as necessary. Our work is based on the tower loading as outlined the attached deliverable. The structural designer shall verify these loads and where different, especially where higher loads exist, GPI should be notified. Further, we assumed some of the foundation characteristics such as foundation types, sizes, bury depth(s), and a variety of other factors; GPI will respond to any questions, comments, or necessary verifications for different foundation configurations. Individual sections of our geotechnical deliverable cannot be relied upon outside the entire deliverable context.

The remainder of this transmittal letter provides you, the design and construction management team, information on how to correctly interpret and apply our information. It further outlines the variability of subsurface conditions and other pitfalls of changing geology, which can commonly occur through incorrect applications or expectations of our work. This information is partially adapted from GBA, the *Geoprofessional Business Association*, of which GPI is a member.

INFORMATION ABOUT YOUR GEOTECHNICAL DELIVERABLE

Geotechnical Deliverable Use

This document for the tower site includes GPI's geotechnical design, soil engineering characteristics, and earthwork criteria. Please read, understand, and implement the geotechnical recommendations in their entirety and in conjunction with the structural design. Serious problems have occurred because those relying on geotechnical engineering deliverables did not read and apply it all. Should design modifications, project concepts, or project locations change, notify us so that our recommendations can be reevaluated and modified accordingly.

Our geotechnical engineering evaluation is unique, prepared solely for you and your project team, and no one except you and your designated team should rely on GPI's geotechnical engineering deliverable without first conferring with the geotechnical engineer who prepared it. The appended geotechnical deliverable is only intended for use by the City of Moscow, its retained design consultants, and the owners/operators of the tower. The information is valid only for the project, description, and location. If the project concept changes from our understanding, please notify us.

Other team members' misinterpretation of GPI's deliverables may result in costly problems. You can lower that risk by having GPI confer with appropriate members of the project team during the entire design and construction process. We look forward to providing our review of pertinent final aspects of the plans and specifications.

As a general rule, *always* inform GPI of project changes – even minor ones – and request an assessment of their impact. GPI cannot accept responsibility or liability for problems that occur because our document does not consider developments of which we were not informed.

Geologic Impacts

Unknown or unanticipated subsurface conditions are a principal cause of construction delays, cost overruns, and disputes. The information contained herein is provided to help you manage your risk associated with subsurface conditions. This site is located in sloping terrain and the underlying geology, especially soil and underlying bedrock conditions, can change in short lateral or vertical distances.

Site exploration identifies only a small portion of the site's subsurface conditions, which can change significantly between exploration locations. GPI observed 1 soil boring at the tower site. The boring extended 26.5 feet deep and encountered silt loess. Neither groundwater nor bedrock was encountered but is anticipated within 50 feet of the ground surface at the site. Actual subsurface conditions may differ – sometimes significantly – from those witnessed in the field and identified in our document. Therefore, retaining GPI to provide construction observation is the most effective method of managing the risks associated with unanticipated or changed site conditions.

Geotechnical Recommendations Are Not Final

The design and resulting construction requirements are not final, because GPI engineers develop them principally from judgment and opinion. Construction continuity is a requirement and a critical element of the geotechnical design process. GPI can confirm our recommendations only by observing actual subsurface conditions revealed during construction. If for some reason a firm or individual other than GPI is retained to observe, test, or interpret actual field conditions, they are in essence assuming the role of geotechnical engineer-of-record and responsible for implementing design. It is important to notify this entity of their role and responsibility.

Read Responsibility Provisions Closely

Geotechnical engineering is a far less exact science than other engineering disciplines. Geology does not behave uniformly or linearly and is subject to change based on various factors beyond anyone's control. This lack of understanding and the presumption that geotechnical design can be administered similar to structural and civil design has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, GPI includes an *Evaluation Limitations* section

herein to indicate where GPI's responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions.* Ask questions; GPI will respond fully and frankly.

Design and Analyses

The planned cellular tower consists of a monopole structure. The tower is expected to bear on either a drilled shaft or structural mat foundation. Preliminary design and construction considerations are based on results from field exploration and laboratory testing provided in the appended geotechnical deliverable. Our design recommendations plan for the 2 types of foundations and provide estimated design criteria. Once structural loading and foundation configurations are finalized by your structural design team, it may be desirable to have GPI review these criteria and refine them as necessary.

The site is suitable for the proposed cellular tower, provided our recommendations are properly executed. We provide subgrade preparation requirements to expose native soil to achieve design bearing pressures and settlement characteristics outlined for the tower site. Other construction guidance and requirements are provided to help reduce the risks associated with settlement, stormwater impacts, and challenges coincident to soft soil conditions.

GEOTECHNICAL DESIGN CONTINUITY

We base the information contained in this deliverable on existing site conditions and project data supplied by project team members for the currently planned cellular tower project. Changes to the project configuration, including loading, height, or foundation type, may require additional analyses specific to the actual anticipated construction conditions and final grading configuration. We recommend retaining GPI to provide geotechnical continuity through the final planning, design, and construction for the project. This includes GPI's involvement in plan and specification review of appropriate portions of structural, civil, and grading for the project. It also includes verifying the foundation bearing units exposed at the time of construction, reinforcing steel inspection, and concrete sampling to verify structural requirements. GPI can perform required structural steel or concrete inspection as well.

EVALUATION LIMITATIONS

The attached deliverable is prepared to assist the planning, design, and construction for the tower site outlined herein. Our services comprise professional opinions and recommendations made in accordance with generally accepted geotechnical engineering principles and practices, as they exist at the time and in the area of the tower site. Our geotechnical analyses and deliverable does not provide, nor constitute an evaluation of structural design or structural verification as it relates to the cell tower's design of structural foundations and steel members. Tower loading was based on our experience with other similar tower projects. Our evaluation does not provide geotechnical design recommendations for specific access alignment or permitting construction.

The geotechnical recommendations provided herein are based on the premise that GPI or the geotechnical engineer of record retained for construction will conduct an adequate program of tests and observations during construction in order to verify compliance with our recommendations and to confirm conditions between exploration locations. This acknowledgment is in lieu of all express or implied warranties.

This deliverable only incorporates the design and project information specific to this tower and that was available at the time of its preparation. The final site design, configurations, loading, and geometry can

significantly alter our opinion and design recommendations. Specifically, changes in site geometry may require additional analysis specific to the actual anticipated construction conditions. Therefore, it is critical GPI continue to provide geotechnical continuity through the final planning and design as the tower aspects become available during final design and bidding phases.

CLOSING

We appreciate the opportunity to continuing our professional relationship with The City of Moscow and the entire design/construction team. If you have any questions regarding this deliverable or need more information, please contact us.

Sincerely,
GPI



Max B. Barnett, L.G.
Project Geologist

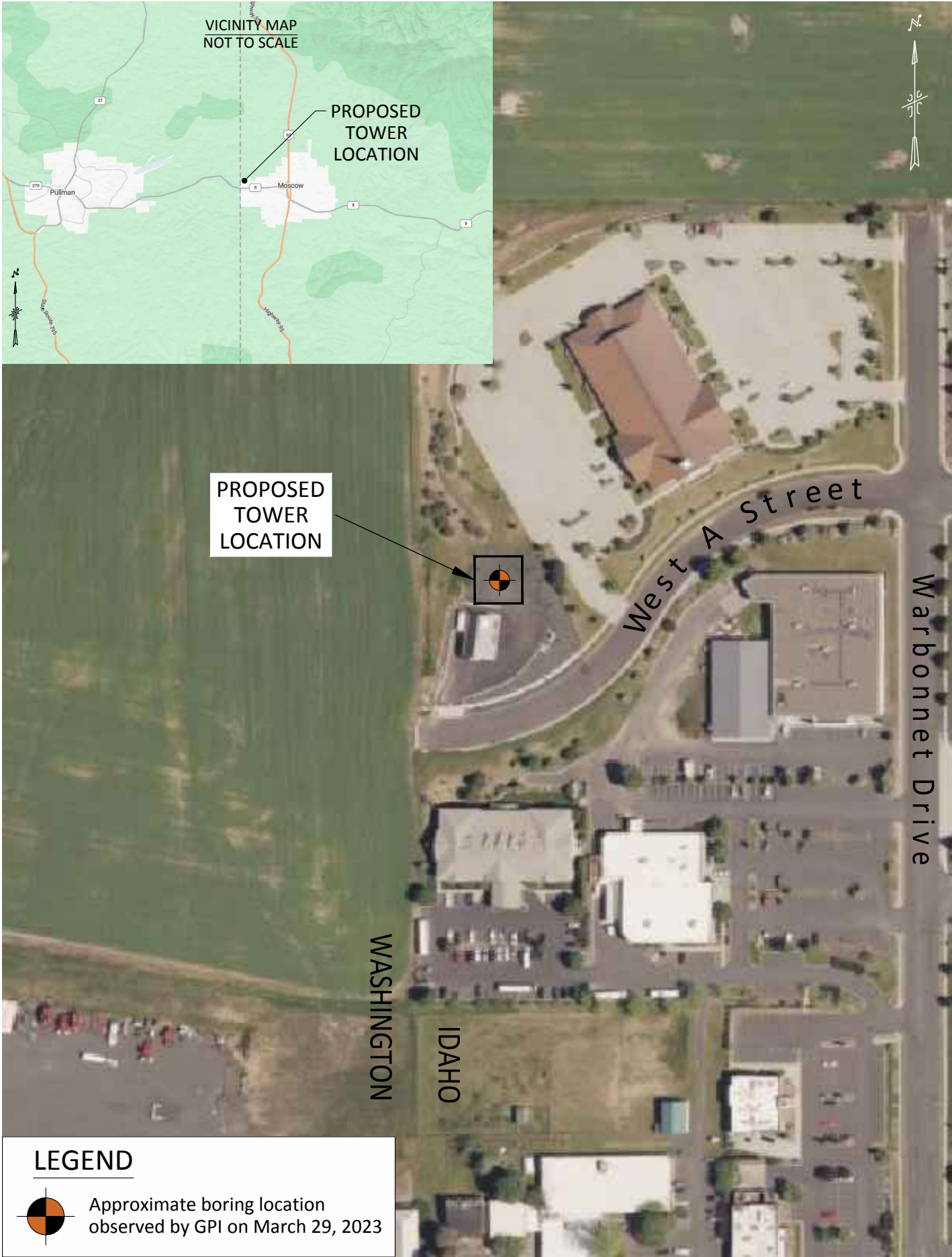


Travis J. Warnbeke, P.E.
Principal Engineer

TJW/mg

Attachments: Well 10 Communications Tower Deliverable

WELL 10 COMMUNICATION TOWER



1

PROJECT UNDERSTANDING

Existing Site Conditions
The proposed cellular tower location is adjacent to the Well 10 pump station at the western terminus of West A Street on the Idaho-Washington border in Moscow, Idaho. The project site's vicinity is among the Palouse rolling hills with variable surrounding topography and an approximate elevation of 2,615 feet above mean sea level. Approximate latitude and longitude for the site is 46.735232° North and -117.039501° West. Power and communication utilities exist onsite, connecting the existing building to West A Street infrastructure. Surface conditions at the proposed cell tower location include crushed gravel adjacent the pump station and a paved entrance. Access to the site is from West A Street to the south through a gated entrance.

Proposed Construction
The cell tower will be an 85-foot-tall, monopole structure atop either a drilled shaft or mat foundation. Alternative foundations may also be applicable. The tower designer will select and structurally design the foundation. A pre-manufactured equipment cabinet will also be constructed to house the power supply and cellular transmission equipment. This cabinet is expected to bear on a precast mat or conventional skids imposing relatively light structural loads (< 1 kips per square foot). Minor cuts and fills (<1 foot) are anticipated to achieve a level foundation pad for the tower and equipment shelter.

Subsurface Conditions
A single boring was advanced on March 29, 2023 using a G2400 trailer-mounted drill rig operated by GeoWest Drilling, Inc. A 1.0-foot-thick layer of undocumented fill covers the site and is described as Silty Gravel (GM) that is gray to black, loose, and damp. Silt loess was red to brown and moist extended 26.5-feet below the ground surface. The exploration log provided on GT3 describes the subsurface soil profile at the location explored. A copy of the Unified Soil Classification System (USCS) is also included on GT3.

Groundwater nor bedrock were encountered at the location or depths explored. A review of available online geology and well log data suggest groundwater and bedrock exist within 50.0-feet below the ground surface. Groundwater may exist as shallow seeps exposed in excavations and will change dependent on season, fluctuations in precipitation, infiltration, and irrigation.

2

REFERENCES

The field investigation and geotechnical analysis are based upon the authorized geotechnical service dated February 27, 2023, and the current ASTM International (ASTM) standards, Idaho Transportation Department Standards (ITD Standards), Unified Soil Classification System (USCS), and other reference standards:	Laboratory Testing		Results
	• SM 4500-H ⁺ B - pH Level		7.0
	• SM-4500 SO ₄ E - Sulfate Content		6 ppm
	• SM 2510 B - Resistivity		5,560 ohm-cm
Field Exploration - D2487 - Test Method for Classification of Soils for Engineering Purposes (USCS) - D2488 - Practice for Description & Identification of Soil (Visual-Manual Procedure)	Construction Material Standards		91.7 pcf, 24.2% MC
	• 2023 Standard Specifications for Highway Construction, Idaho Transportation Department (ITD)		

3

GEOTECHNICAL DESIGN BASIS

- International Building Code (IBC), 2018
 - IBC section 1613 - Earthquake Loads
 - IBC section 1809 - Shallow Foundations
- GPI's Field Exploration
 - Soil boring on March 29, 2023.
- Minimum Frost Depth Embedment- 2.5-feet
- Estimated tower structural loads from previous monopole tower projects:
 - Vertical maximum axial load: 45 kips
 - Horizontal maximum shear load: 36 kips
 - Overturning moment: 4,060 kip-feet
 - To be verified by structural design**
- Cell Tower Foundation Displacement Tolerances:
 - Maximum total vertical settlement: 1-inch
 - Maximum differential settlement across foundation : 1/2 inch
 - To be verified by structural design**
- Settlement Estimates are unfactored
- Bearing Capacity Failure, Factor of Safety (FOS) = 3 or greater

ISSUED FOR:
DESIGN USE
PRELIMINARY
REVIEW
YOUR APPROVAL
REFERENCE
CONSTRUCTION
DESTROY
PREVIOUS PRINTS

REV	DATE	DESCRIPTION	CHECK: TIW	DRAWN: MB8
1	4/21/23	FINAL	FILE: MO23066A	DESIGN: TIW
2	4/24/23	REV 1	PROJECT: WELL 10 COMMUNICATION TOWER	PREPARED FOR: CITY OF MOSCOW
			PROJECT: WELL 10 COMMUNICATION TOWER	2023 THIRD STREET
			GEOTECHNICAL	MOSCOW, ID 83843
			ENGINEERING EVALUATION	
			MOSCOW, IDAHO	ATTN: MR. SCOTT BONTAGER, PE

GPI 6 O'Donnell Road Pullman, WA 99163 509.339.2000

GEOTECHNICAL DELIVERABLE

GT1 of 3

Site Preparation/Subgrading

- 1. Remove undocumented fill or otherwise unsuitable soil that includes vegetation, organics, trash or debris, from beneath planned foundations plus 5-feet laterally. Loose undocumented fill is anticipated in proposed foundation locations and must be removed.
- 2. Excavate to expose undisturbed silt subgrade free of loose soil and debris. Pocket penetrometer measurements shall be a minimum of 2.0 tsf.
- 3. After achieving subgrade, the contractor shall protect the subgrade from becoming disturbed or frozen. The contractor must limit construction traffic to any prepared subgrades and reduce the subgrade's exposure to precipitation and water infiltration.
- 4. The fine grained soil is susceptible to degradation when exposed to water. Grade subgrades and areas surrounding foundations aggressively (typically >5%) to direct surface water away from construction areas to avoid ponding.
- 5. Where soft or disturbed soil are exposed, moisture condition and recompact to Section 5 requirements. Alternatively, over-excavate to firm soil and replace over-excavated soil with crushed surfacing below structures.

Over-Excavation

- 1. In soil areas that do not exhibit the required *Site Preparation/Subgrading* conditions, over-excavate to competent, native soil at the direction of GPI and the City of Moscow.
- 2. Where required, extend over-excavations at least 1-foot below the subgrade and laterally 1/2 the depth.
- 3. Replace these over-excavations with *Crushed Surfacing* (CS-1) as described in the *Structural Fill* section.

Excavation Characteristics

- 1. Bedrock excavation is not anticipated to achieve the planned foundation subgrades.
- 2. Temporarily excavate, slope, shore or brace excavations in accordance with the *Occupational Safety and Health Act* (OSHA) guidelines. Regulations outlined in OSHA part 1926 provide temporary construction slope requirements for various soil types and slopes and configurations.
- 3. The loess soil is classified as Type B soil referencing OSHA, due to its cohesive nature and estimates of unconfined compressive strength. Site soil must be temporarily sloped back no steeper than 1H:1V (horizontal to vertical).
- 4. Construction vibrations, seepage, or surface loading can cause excavations to ravel or cave and should be avoided or construction slopes flattened. Do not stockpile adjacent excavations.
- 5. Ultimately, the contractor is solely responsible for site safety, excavation configurations, and maintaining OSHA-approved personnel for excavation monitoring.
- 6. Shaft excavation characteristics are provided on Sheet GT3, Section 6.

Wet Weather/Wet Soil Construction

- 1. Project construction may occur during wet weather conditions (typically October through June).
- 2. The contractor shall prepare subgrades and stage earthwork noting wet weather and wet soil may exist.
- 3. The site soil surrounding the tower can be susceptible to pumping or rutting from heavy vehicle and equipment loads.
- 4. Complete earthwork by track-mounted equipment that reduces pressure applied to the soil subgrades.
- 5. Stage construction, specifically excavation and backfilling, to avoid traffic on subgrades.
- 6. Coordinate construction activities and excavation backfilling as rapidly as possible following excavation to reduce the potential for subgrades to degrade under construction traffic.
- 7. Surface water is expected during spring and winter months. Plan excavations carefully, allowing water collection points and utilizing conventional sumps and pumps to remove nuisance water from runoff, seeps, springs, or precipitation.
- 8. Drilled shaft contractors shall expect some sidewall seeps at any time of the year.

Site Drainage

- 1. Significant new impervious areas will not occur as part of this project. Site grading design and construction must allow for positive drainage of surface runoff water away from the proposed structures and not be allowed to infiltrate foundation subgrades.
- 2. Maintain existing drainage paths to facilitate positive flow away from new facilities.
- 3. Per IBC Section 1804, slope all surfaces within 10 feet of the structure(s) away from foundations.
- 4. Establish necessary erosion control measures to reduce erosion in newly constructed areas. Excessive water can saturate nearby slopes and cause slope failures, roadbed degradation, and other issues for the contractor.

Material Requirements

- 1. The excavated site soil may be used as *General Structural Fill* (SF-1) outside foundation locations provided it can be moisture conditioned and meet the criteria presented in Table G2.1 and compacted to meet the criteria in Table G2.2.
- 2. Material requirements for structural fill reference the Idaho Department of Transportation (ITD) Standard Specifications for Highway Construction and are specified in Table G2.1 below.

Table G2.1: Structural Fill Specifications and Allowable Use			
NSF	Non-Structural Fill (Landscape, Fill, or Topsoil)	- Any area that will not support foundations, roadway, or other improvements, (typically landscape areas)	- Soil classified as GW, GM, GP, GC, SM, SW, SP, SC, CL, or ML according to the USCS. - Soil may not contain particles larger than 1-foot in median diameter. - Soil must be reasonably free from deleterious substances such as wood, metal, plastic, waste, etc.
SF-1	General Structural Fill	All site grading and backfill outside of foundation areas	- Soil classified as GW, GP, GM, ML, CL, SP, SM, or SW according to the USCS. - Soil must contain less than 3 percent (by weight) of organics, vegetation, wood, metal, plastic, or other deleterious substances. - Soil may not contain particles larger than 0.5-feet in diameter. - Coarse granular soil locally know as "shotrock" or "pitrun" may also be used as SF-1.
CS-1	Crushed Surfacing	-SF-1 uses, foundation support aggregate, over-excavations - Utility bedding within 0.5-feet of the pipe invert and 1-foot over the pipe	- Must meet requirements in ITD Standards <i>Section 703.04 - Aggregate for Untreated Base, Subbase, and Roadmix</i> . - Includes top and base course.

Earthwork Testing

The firm retained to verify subgrade conditions, soil bearing units, and compaction shall become the geotechnical engineer-of-record for construction. At a minimum the following earthwork testing frequencies shall be implemented:

- 1. Experienced geotechnical engineer shall review exposed soil bearing unit to confirm foundation design bearing pressures and settlement criteria.
- 2. Utility Trench Backfill – Minimum 1 compaction test every 100 linear feet (lf) of trench and minimum 3 tests per testing event, whichever results in the greater number of tests, per each fill lift.
- 3. Structural Fill Placement – Minimum 3 compaction tests every fill lift for site grading/foundation backfill.
- 4. Foundation Concrete - 1 set of 5 compressive strength cylinders, including field tests for temperature, slump, and air content for each day's placement.

Required Compaction

Backfill vertically or laterally supporting foundations and other improvements must be compacted to structural fill requirements presented in Table G2.2 below.

Table G2.2: Required Structural Fill Products for Designated Project Areas		
Project Area	Required Structural Fill Product	Compaction Requirement ^A
In-situ subgrades below cell tower and equipment shelter footings.	Native site soil	90% ^B
In-situ subgrades below ancillary structural fill placements	Native site soil	90% ^B
Foundation support aggregate	CS-1	95%
Foundation/utility trench backfill	SF-1, CS-1	95%

Table G2.2 Notes:

- A. Relative compaction requirement compared to the maximum dry density of the soil as estimated by ASTM D 1557 (Modified Proctor).
- B. Soil subgrades that are undisturbed, must be free of loose soil, rock, and debris. Where subgrades maintain soil consistency greater than 2 tsf, they do not require recompaction.

- 1. Fill placed 10-feet laterally outside the cell tower and equipment shelter footings can be placed as non-structural fill (i.e., landscape fill), providing there are no structures planned directly above the landscape fill and the landscape fill is not on a slope greater than 5H:1V (horizontal:vertical).
- 2. Structural fill shall not contain particles of frozen soil, mud, snow, or ice. Structural fill shall not be placed on frozen subgrades.
- 3. Structural fill products must be moisture conditioned to near optimum moisture content, placed and compacted in maximum 1-foot-thick, loose lifts, providing compaction equipment weighs a minimum of 5 tons. If smaller or lighter compaction equipment is provided, reduce the lift thickness to meet the compaction requirements presented herein.

Coarse Fill

- 1. Any material with greater than 30 percent retained above the ¾-inch sieve is too coarse for Proctor density testing, but may be used as SF-1. Coarse fill must be compacted using a “method specification” developed during construction that is based on the material characteristics and the contractor's means and methods.
- 2. At a minimum, place all oversize material in maximum 1.5-foot lifts and compact with 5 complete passes of a 10-ton vibratory roller.
- 3. Vibratory rollers must have a dynamic force of at least 30,000 pounds per impact per vibration and at least 1,000 vibrations per minute. Coarse fill must be compacted to a dense, interlocking, and unyielding surface. Vibratory rollers can negatively impact nearby structures and must be used with caution.

Utility Trench Backfill

- 1. Remove all saturated, loose, or disturbed soil from the bottom of the utility trenches prior to placing *Pipe Bedding*.
- 2. Accomplish bedding for conduits and utility trenches in accordance with the City of Moscow's Standard Construction Specifications.
- 3. Backfill the remainder of the trenches in accordance with the *Structural Fill* specifications, in Table G2.1 and compaction specifications in G2.2.

ISSUED FOR ☒ DESIGN USE ☐ PRELIMINARY REVIEW ☐ YOUR APPROVAL ☐ REFERENCE ☒ CONSTRUCTION ☐ DESTROY PREVIOUS PRINTS		4/21/23	FINAL	FILE: MO23066A	DESIGN: TJW
		4/24/23	REV 1	PROJECT: WELL 10 COMMUNICATION TOWER GEO/TECHNICAL ENGINEERING EVALUATION MOSCOW, IDAHO	PREPARED FOR: CITY OF MOSCOW 206 E. THIRD STREET MOSCOW, ID 83843
					ATTN: MR. SCOTT BONTAGER, PE



GPI 6 O'Donnell Road Pullman, WA 99163 509.339.2000

The foundation approach will be selected by the tower designer. Construct footings on subgrades prepared per the *Site Preparation/Subgrading* section on sheet GT2. Expose undisturbed silt as cell tower and equipment shelter (cabinet) foundation subgrades. Schematics illustrating the tower and equipment shelter foundations are shown in Figures G3.1 through G3.3 below. **Figures G3.1 and G3.2 are not structural details and must be verified by the structural designer and manufacturer.**

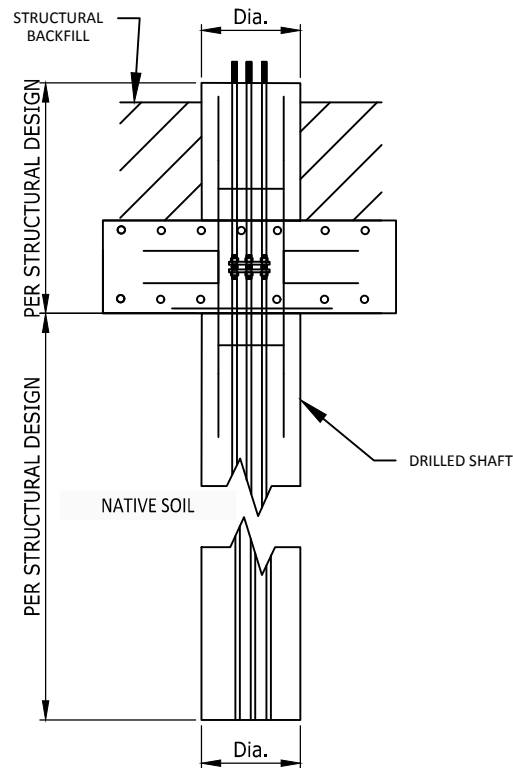


Figure G3.1: Tower Drilled Shaft Foundation Schematic

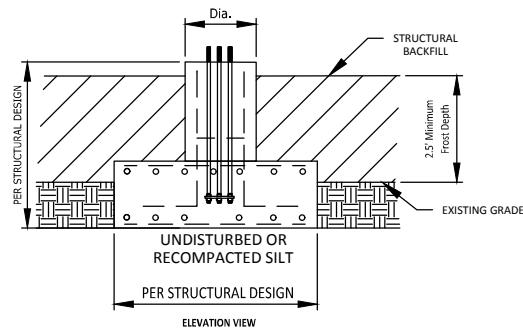


Figure G3.1: Cell Tower Mat Foundation Schematic (Elevation View) to be verified and dimensioned by Tower Designer

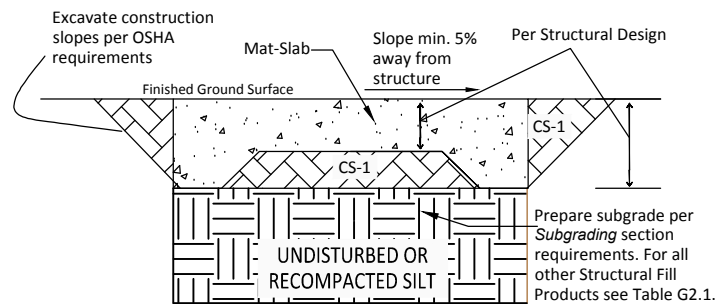


Figure G3.3: Typical Mat-Slab Foundation Schematic

Mat Foundation Parameters

- Maximum allowable cell tower mat foundation bearing pressure on undisturbed or recompacted silt free of loose soil and debris (exposed in cut): 3,000 psf
- Maximum allowable equipment shelter foundation bearing pressure on recompacted silt, or native, undisturbed soil (exposed in cut): 1,500 psf
- Maximum 33 percent increase allowed for short term load increases such as wind or seismic.
- Estimated tower mat foundation vertical settlement:
 - Total vertical settlement: 1-inch
 - Differential settlement: Up to 0.75-inches (15-foot span)
- Estimated equipment shelter foundation vertical settlement:
 - Total vertical settlement: 1.5-inches
 - Differential settlement: Up to 0.75-inches (15-foot span)
- Lateral load resistance:
 - Foundation base friction coefficient:
 - 0.3 for tower foundation cast directly on undisturbed or recompacted silt free of loose soil and debris. Reduce friction coefficient by 1/2 for precast concrete.
 - Passive soil resistance on foundation sides:
 - Equivalent fluid unit weight: 280 pcf on-site soil (SF-1)
 - Requires 0.75-inch lateral movement to mobilize full resistance.
 - Reduce proportionally for less allowable lateral moment.
- All footings are considered exterior and must extend at least 2.5-feet below the final ground surface grade to help protect against frost action.
- The structural engineer must calculate the soil backfill thickness required to resist lateral and overturning loads applied to the cell tower foundation. Utilize a moist unit weight of 120 pounds per cubic foot (pcf) for site soil compacted over the planned cell tower footing.

Drilled Shafts

- Drilled shaft foundations may be specified by structural design to resist uplift and overturning forces applied to the tower mat foundation.
- Design drilled shafts using the following criteria per selected hole diameter:
 - Allowable Shaft Concrete to Soil Adhesion Strength: 0.5-kips/ft² (includes Factor of Safety = 3.0)
 - Minimum Shaft Diameter: 3-feet
- Maximum allowable drilled shaft tip bearing capacity: 6,500 pcf.
- Tip bearing capacity will not be realized until 0.75-inches of settlement is realized.
- Neglect upper 5 feet of bond length.
- Lateral loads may be resisted by passive earth pressures on the shaft sides opposite the load direction. Passive earth pressures can be estimated at 200 pounds per square foot, per foot of embedment depth. The passive resistance increases by 200 psf for every 1-foot of additional depth to a limiting value of 3,000 psf. Lateral deflection of 1/2-inch is required to mobilize this passive resistance. Ignore passive resistance within the upper 5-feet below the existing ground surface due to the site specific soil conditions.
- Allowable bearing pressure assumes at least 20-feet of embedment.
- Embedment length must be calculated by the structural engineer using the provided allowable bond strength.
- Based on exploration, bedrock is not expected within 25-feet of the surface.
- Groundwater was not encountered at the time of drilling but seeps may be encountered at any depth.

Seismicity

- Site geology correlates to a seismic Site Class D soil profile.
- Seismic design shall reference the parameters provided in Table G3.1. based on the soil conditions and project location.
- Subsurface conditions are comprised of medium dense silt overlying basalt bedrock at an unknown depth. Consistent groundwater is estimated to be within 50-feet below the ground surface. Based on these conditions, liquefaction potential is considered to be minimal at the site.
- The risk-targeted maximum considered earthquake (MCER) spectral response acceleration parameters provided have been modified from a Site Class B to a Site Class D.
- The design spectral acceleration parameters provided in Table G3.1 are equal to 67 percent of the Risk Targeted MCER acceleration parameters.

Table G3.1: Seismic Response Criteria (ASCE 7-22)¹

Period (seconds)	Standard Acceleration Coefficients for Site Class B (g) ²	MCER Spectral Acceleration Parameters for Site Class D (g) ³	Design Spectral Acceleration Parameters for Site Class D (g)
0.0 (Peak)	-	PGA _M = 0.18	-
0.2 (Short)	S _s = 0.31	S _{MS} = 0.45	S _{DS} = 0.30
1.0	S ₁ = 0.09	S _{M1} = 0.24	S _{D1} = 0.16

- Values for location Latitude: 46.735232°N, Longitude: -117.039501°W.
- Acceleration based on 2% probability of exceedance in 50 years (2,475 year return period).
- Values for an ASCE Risk Category III.

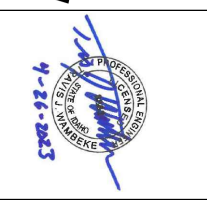
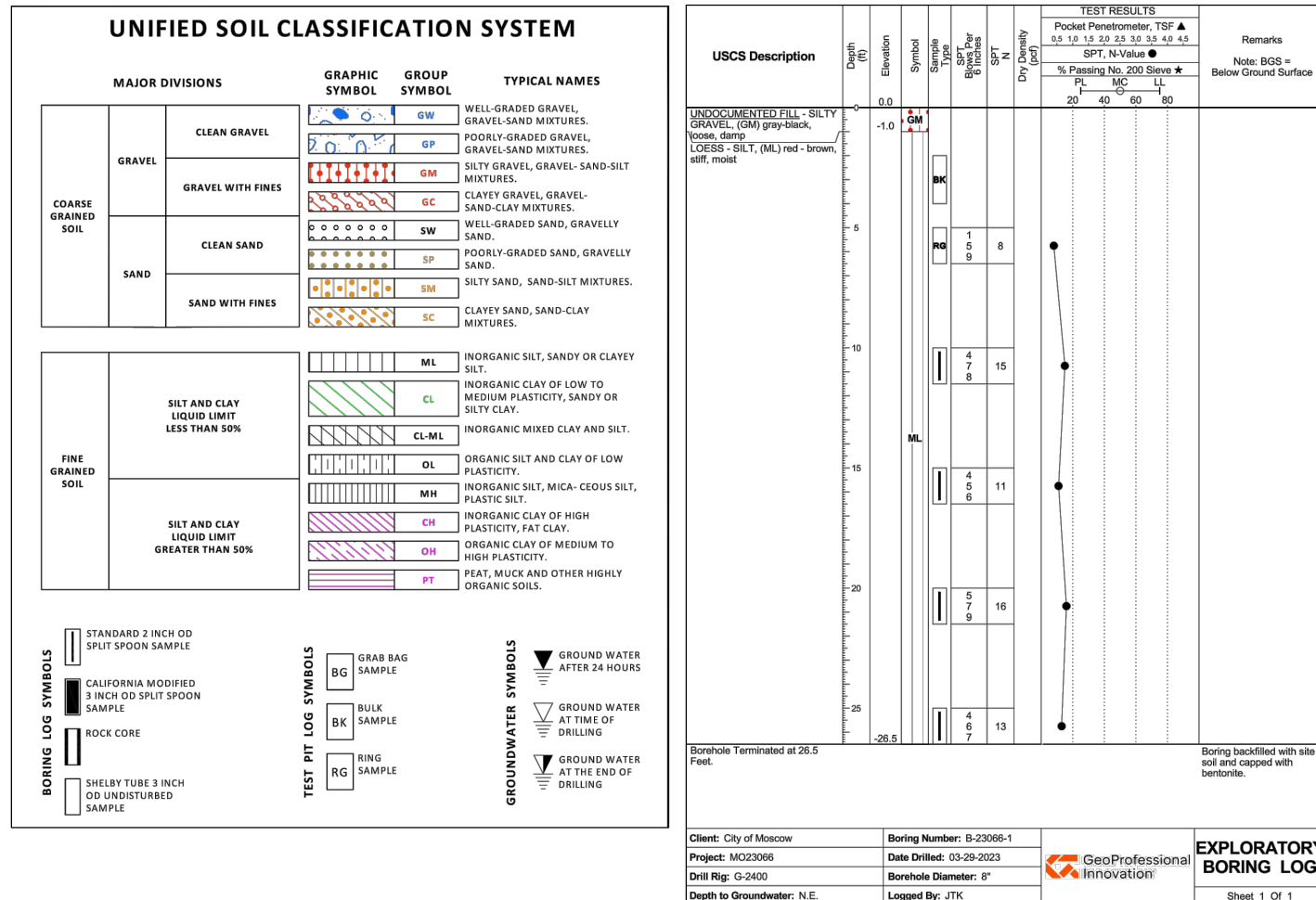
Soil Corrosivity

- pH = 7.0
- Resistivity = 5,560 ohm-cm - moderately corrosive
- There appears an adequate column of soil to install grounding apparatus.
- Account for the soil's moderate corrosion potential in reinforcing steel spacing. Whenever possible, place steel with maximum clearances established through structural design.
- Based on these corrosion parameters, special cathodic protection or other methods of corrosion protection for buried structures will not extend their practical useful life.
- Applicable for Type I/II cement.

Road Construction

- Currently, an unpaved road connects West A Street to the proposed tower location. An asphalt paved section of the site is adjacent the tower location.
- If the gravel area is to be paved, City of Moscow's Standard Construction Specifications shall be followed with at least 3-inches of asphalt.
- For maintaining the gravel access road, place a minimum of 1.0-foot of CS-1 for road surfacing referencing Table G2.1.
- Elevate the road profile at least 0.5-feet above the surrounding surface for drainage.

Test Results Summary											
Boring	Depth	Lab	Description	In situ	In situ Dry	Atterberg Limits		pH	Resistivity	Sulfates	Cation Exchange
B	(feet)	Number	(U.S.C.S. Classification)	Moisture, %	Density, pcf	Liquid Limit	Plasticity Index		Ω-cm	ppm	Capacity (meq/100g)
B-23066A-1	2.0-4.0	-	Silt (ML)	-	-	-	-	7.0	5560	6	24.7
B-23066A-1	5.5-6.0	14562	Silt (ML)	24.2	91.7	-	-	-	-	-	-
B-23066A-1	10.0-11.5	14563	Silt (ML)	25.1	-	-	-	-	-	-	-
B-23066A-1	20.0-21.5	14564	Silt (ML)	24.3	-	-	-	-	-	-	-



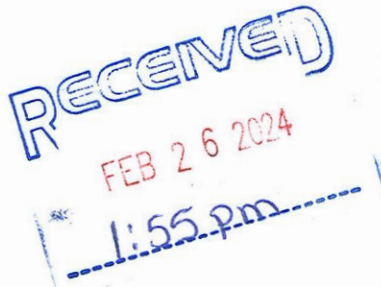
Attachment 'B'



“Bid Enclosed – RADIO SYSTEM UPGRADE PROJECT”

2/27/2024

**Proposal
for**



**The City of Moscow
Community Development Building
(Engineering Division)
504 South Washington Street
Moscow, Idaho 83843**



PROPOSAL

CITY OF MOSCOW, IDAHO

RADIO SYSTEM UPGRADE PROJECT

February 27, 2024



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EXECUTIVE SUMMARY

CITY OF MOSCOW, IDAHO

RADIO SYSTEM UPGRADE PROJECT

February 27, 2024



MEETING YOUR NEEDS – FULLY COMPLIANT AND EXCEEDING THE RFP REQUIREMENTS

Thirty-five years of lessons learned, designing and operating radio networks, has been utilized in preparing a proposal to modernize and improve the telecommunications capabilities of vital City of Moscow emergency services.

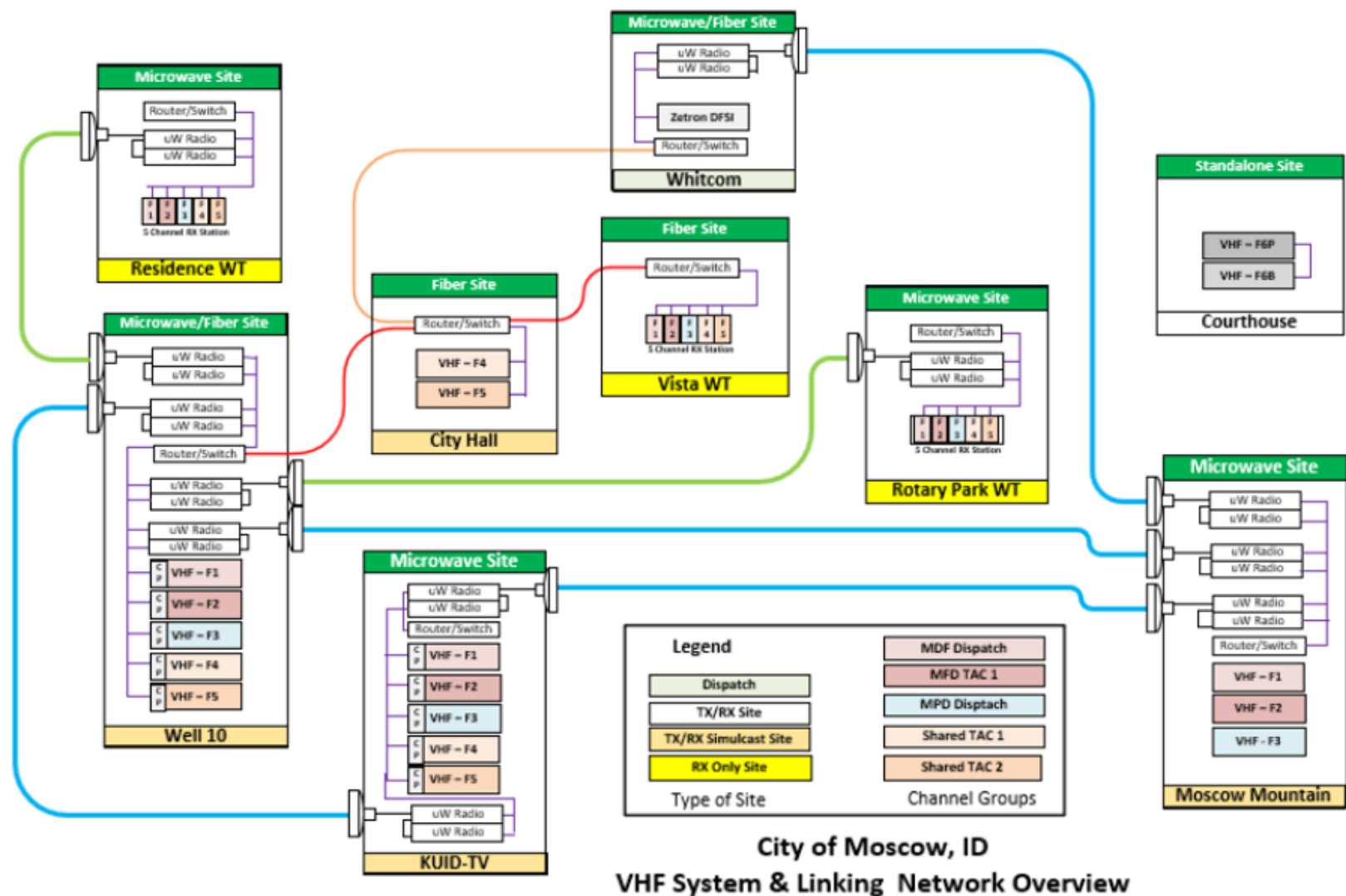
What you requested:

- Furnish and install a system of base station repeaters, microwave radios and their associated antennas/VHF voting receivers
- A systemwide interface across 9 sites within the region
- Provide design-build services for an 85' monopole capable of supporting the antenna and transmission line systems
- Full and complete systemwide integration, configuration, testing, programming, optimization, documentation etc. as required for a fully complete, fully-operable, turnkey system meeting project specifications

Our proposal is in full-adherence to the RFP's Project Manual, Project Plans, and the to the project specifications, ANSI/TIA 222, and all other applicable codes and standards.

EVERYTHING YOU WANT!

- A seven (7) site TaitNet ASIP Analog simulcast system consisting of four (4) transmit and receive (TX/RX) sites and three (3) received only (RX) sites
- One (1) standalone TX/RX site with primary and backup station
- Three of the sites, Well 10, KUID and Moscow Mountain will have three channels and City Hall plus Well 10 and KUID sites will have two channels
- All five channels will have receivers at the following water tanks: Residence, Vista, and Rotary Park
- The sites will be connected using six (6) new microwave links using public safety grade linking equipment by Aviat and three (3) existing fiber links
- The overall system will be monitored by Tait's Enable Monitor applications



EVERYTHING YOU SPECIFIED AND MORE!

Why RACOM?

- Largest Tait dealer and distributor in the world means best pricing and manufacturer influence to ensure the City of Moscow's needs are a priority.
- Installed 100+ TAIT ASIP systems throughout North America, means more SME's and less problems for you.
- Only 24x7x365 network monitoring offered = immediate problem resolution.
- Simpler installation and remote maintenance abilities will save the City of Moscow considerable time and operations costs. You can spend less time working on radio systems, and more time protecting your community.
- RACOM has installed more Tait ASIP solutions than any other provider in the world, reducing risk and assuring your system will be implemented correctly, on budget, and on-time.

We have hand-selected a team and custom-crafted a proposal to address the shortcomings of your existing system and to meet the future needs of you and your agencies. Our approach is different. It's focused on you. We design for you. We implement for you. We support you.

We've identified the key criteria for our design, and clearly the most important is coverage. Meeting your expectations can be a lot harder than meeting the specifications. We've exceeded your requirements because it's that important, and we know your expectations are high.

I personally guarantee that we will work endlessly and tirelessly to meet your needs, and our dedicated and experienced team will never leave your side.



Mike Miller, President RACOM

CHOOSING A TRUSTED PARTNER:

1

LOCAL/TRUSTED

Agencies demand local support that will always be there for them through the entire life of the system

2

DEDICATED TO PUBLIC SAFETY AGENCIES

Agencies demand their partners have knowledge and expertise that is specific to the challenges & needs of Public Safety

3

EXPERIENCE

Today's technology is more complex and integrated requiring greater expertise in radio, IT, software, hardware & other Public Safety applications

4

24x7x365 SUPPORT

Public Safety is a 24x7 operation. System monitoring and emergency response should be too

THE CITY OF MOSCOW CAN HAVE A KNOWN TRUSTED PARTNER WITH CONTINUED SUPPORT OF THEIR CRITICAL COMMUNICATIONS



RACOM SERVICE AND SUPPORT IS STANDARD

- ✓ All of your calls for support are answered live by RACOM employees, never by voicemail, and never by a third-party answering service. Our live system monitoring and 24x7 customer support combine to provide an immediate response to all your issues.
- ✓ Emergency on-site support (optional) results in the immediate dispatch of a local service technician. Our factory-trained technicians and system engineers are on call, 24 hours a day, 7 days a week, 365 days a year to serve you.

PROJECT MANAGEMENT & IMPLEMENTATION – WITHOUT RISK

TRUSTED



We provide Contract Language that is Simple and Straightforward with No Risk.

The industry is notorious for contract language that is skewed toward the manufacturer at the expense of the end user.

We'll be committed to you every step of the way

Migration does not have to mean interruption

It's important to minimize the impact of transition to your Simulcast System. We'll collaborate and agree on a migration plan that allows the implementation to happen in parallel with using your current systems. Both systems can be fully operational during the transition and your newer radios can be preprogrammed and ready for use.

● MINIMAL DISRUPTION

Your users need to talk to each other and dispatch throughout the entire build process. We'll keep your existing system operational until all sites, channels and users are migrated.

● EXPERIENCE

We've successfully upgraded and migrated more agencies to AS-IP than any other integrator in the US. We'll leverage the tools and strategies we've developed over the years, along with the initial phase upgrades you've already accomplished with radios, stations and consoles to make the migration a success.

● CRITICAL ELEMENTS

SCOPE

We'll collaborate and mutually agree on your required scope through a detailed design review process.

TIME

A realistic time-frame that meets your needs.

QUALITY

We should all demand Public Safety-Grade products and implementation services.

COST

Our proposed costs are transparent, without hidden fees or unanticipated change orders.

WE HAVE YOU COVERED



IMMEDIATE LOCAL RESPONSE



All of your calls for support are answered live by RACOM employees, never by voicemail, and never by a third-party answering service. Our live system monitoring and 24x7 customer support combine to provide an immediate response to all your issues. Emergency support results in the immediate dispatch of a local service technician. Our factory-trained technicians and system engineers are on call, 24 hours a day, 7 days a week, 365 days a year. to serve you.

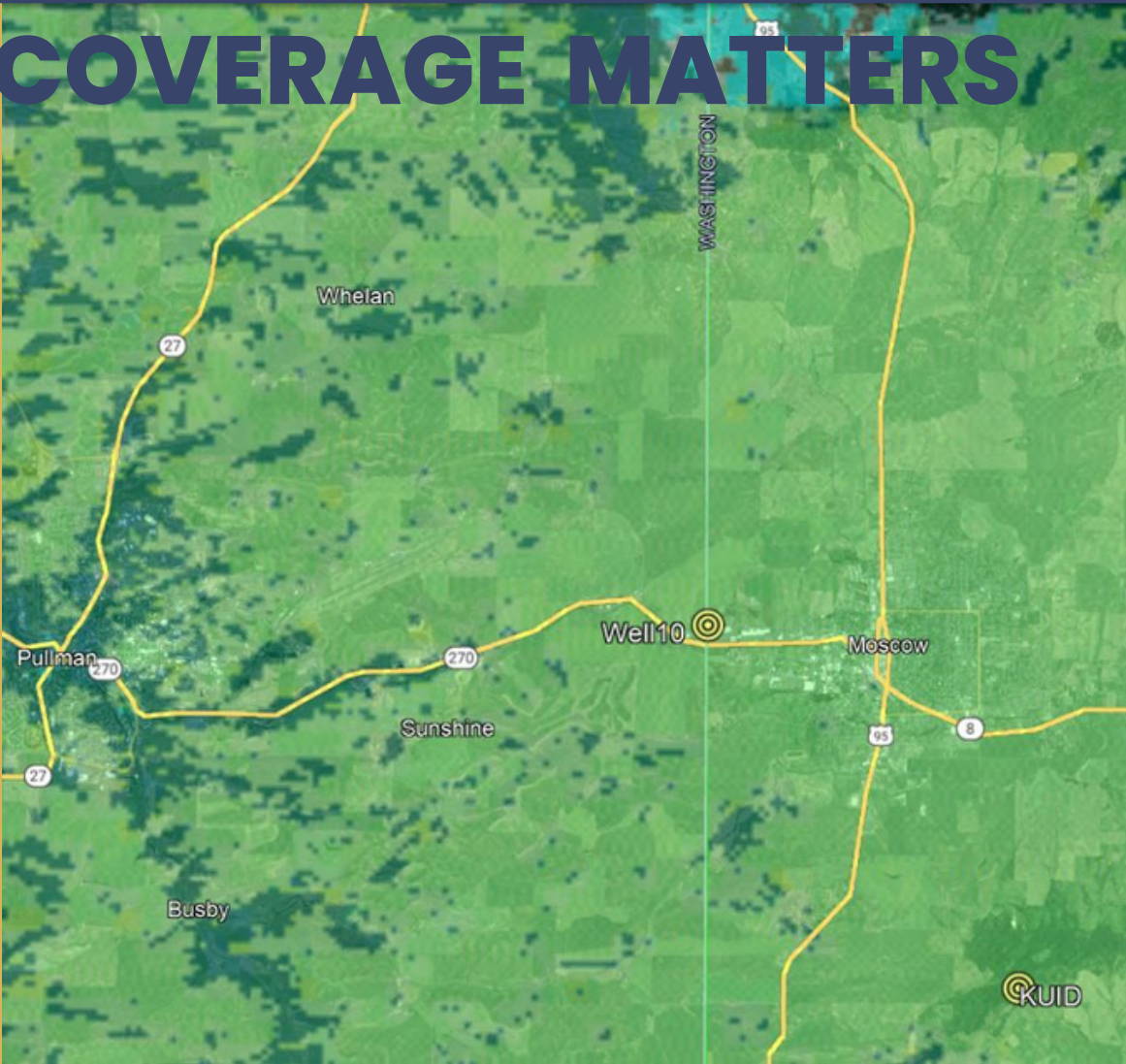
With four Washington Service Centers, we are able to respond to your location in 1-2 hours with on-site support (optional) when you need us.

RADIO COVERAGE MATTERS

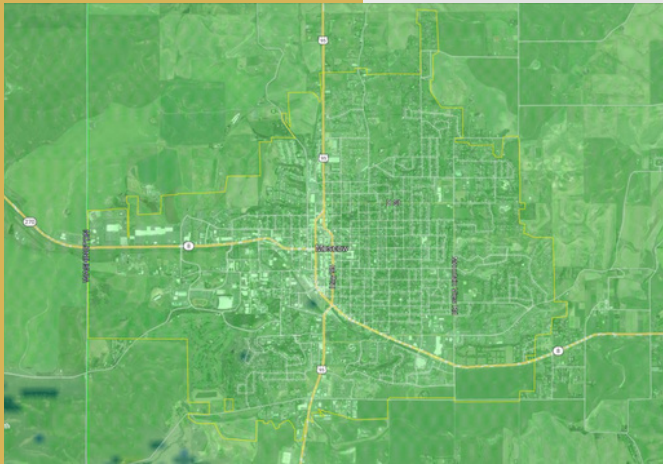
**SIMULCAST
ALLOWS
MULTIPLE SITE
COVERAGE
WITHOUT THE
USERS NEEDING
TO CHANGE
CHANNELS**

SITE SELECTION

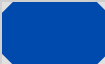
The main objective of the coverage design was to meet or exceed coverage requirements by optimizing antennas and equipment at your identified tower sites.



*Moscow & Pullman Area
Portable Talk-Out Outdoor On the Hip
Bounded Area Coverage >95%*



*Moscow
Portable Talk-Out Outdoor On the Hip
Bounded Area Coverage >95%*

SIGNAL LEGEND	SIGNAL LEVEL	DAQ LEVEL
	< 0 dBm	4.5-5
	< -80 dBm	3 - 4.5
	< -95 dBm	2 - 3
	< -107 dBm	0 - 2

WHERE YOU NEED IT

tait AS-IP

BETTER COVERAGE | BETTER MIGRATION PATH | INTEGRATED EQUIPMENT

Tait AS-IP networks deliver a lower total cost of ownership by providing advanced functionality with less equipment, better coverage on a single frequency, and investment protection for your future needs.



BETTER COVERAGE

Our Linear Simulcast technology and design provides the best mobile, portable and paging coverage

EASY MIGRATION PATH

It's the same hardware platform for AS-IP and P25. Migration to P25 conventional and/or trunking is accomplished with low cost software options

INTEGRATED EQUIPMENT

Integrated voting and site control makes your system more reliable and less costly to operate and support



ADVANCED FUNCTIONALITY - The Tait AS-IP system architecture is composed of a master base station with multiple satellite base stations forming a channel group. Connection to Whitcom's Dispatch Consoles will be provided through a DFSI connection. The overall system will be monitored with Tait's Enable Monitor Application.

INVESTMENT PROTECTION - The Tait AS-IP network portfolio is based on the latest 9400 Tait products, providing a compact solution that can grow with your customer's needs for both Analog and P25 solutions.

YOUR tait AS-IP Solution



A BETTER INSTALLATION

Tait has taken several steps to ensure the transition from your VHF Repeater System to Tait AS-IP is as quick and painless as possible.

Historically, simulcast networks have been notoriously difficult to build and sync correctly.

We've removed the need for a 3rd party voter, simplifying the initial setup and reducing the equipment required. This also saves rack space, power consumption, and system reliability. There are fewer points of failure.

Another major setup challenge with simulcast is tuning. If every site isn't tuned perfectly, reception will be erratic. Even a microsecond of difference can ruin the signal.

Tait's new transmitter design removes all tuning and equalization. Syncing of all sites happens instantly through IP connectivity and internal GPS. This results in an easier set-up, less user training, and better audio quality.

BETTER REDUNDANCY & RELIABILITY

Voting is key to effective simulcast networks and ensures that each radio user gets the best possible reception.

Every Tait AS-IP system has a primary central voting site and backup site voter, to provide unparalleled voting redundancy. Should voting on the central site fail for any reason it is automatically detected and the backup site voter will seamlessly take over. You have the flexibility to choose the backup voting site to ensure this functionality is transferred to the most robust site available.

MORE UPGRADEABLE... P25

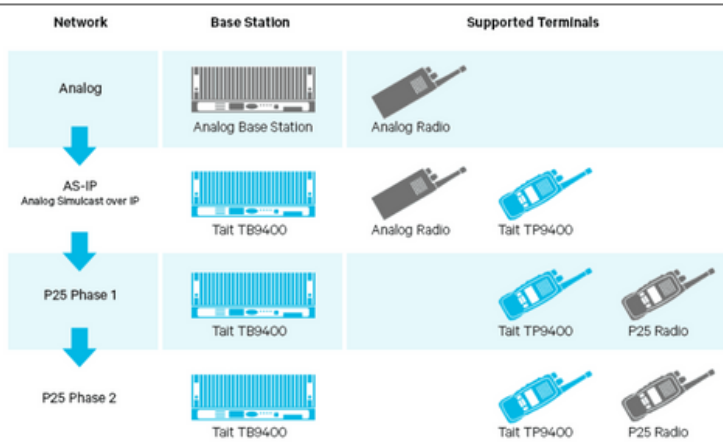
Tait AS-IP provides the best migration to P25. Imagine it's 2 or 3 years down the road, and your organization decides to upgrade to P25. You can upgrade your entire network and all TB9400 terminals in your fleet to P25. All you'll need to do is add new feature software licenses. It just doesn't get any easier.

MIGRATE TO P25 WHEN YOU'RE READY



If ever or whenever you want to migrate to P25, you can keep all your same hardware - sites, stations, and radios.

Many of our customers migrate a channel at a time to accommodate different agency needs.



WHY UPGRADE TO P25?



**INTEROPERABILITY
BETWEEN
AGENCIES**



**GREATER
CHOICE OF
DEVICES**



**INCREASED
SECURITY
THROUGH
ENCRYPTION**



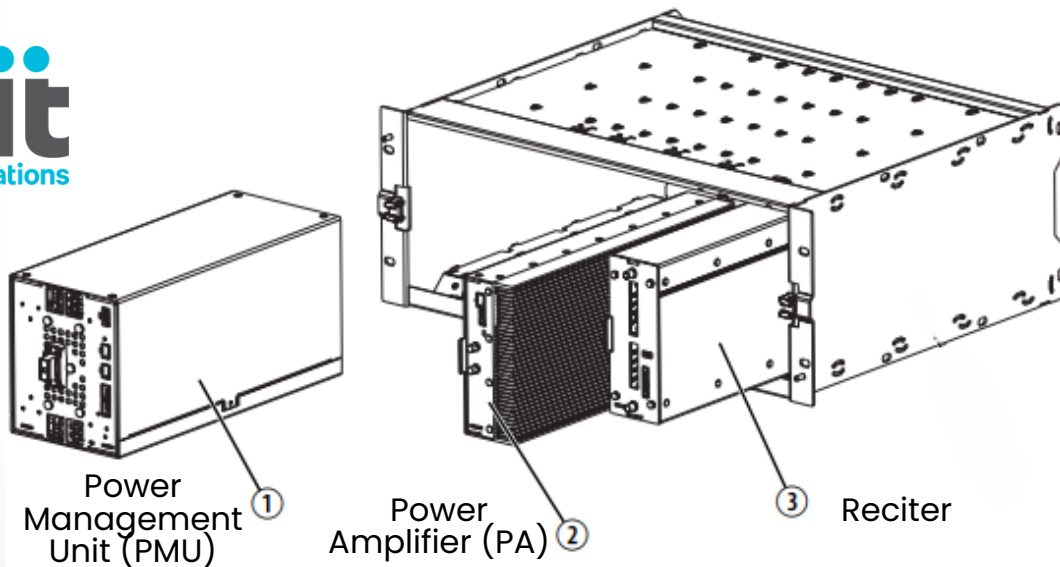
**NEXT
GENERATION
DIGITAL
FEATURES**

- P25 is an open standard for public safety digital radio. Its real beauty is interoperability, allowing different departments to coordinate in emergency situations.
- P25 devices from different vendors are compatible, and there is a wide range to choose from. This offers peace of mind to agencies that need specific features within budget restrictions.
- To facilitate the need for security in public safety, P25 includes a robust encryption standard. In a sensitive law enforcement situation, users can communicate with confidence that their calls are only being received by intended recipients.
- P25 takes advantage of modern features that add convenience and life-saving capability to your network. GPS location services, Man Down and Lone Worker functionality protect the safety of your staff in the field.

CHOOSING THE BEST

TAIT TB9400 BASE STATION

There are only three parts you need to stock



TAIT ENABLE MONITOR

Tait EnableMonitor watches the health of your network and associated equipment using SNMP. EnableMonitor helps us anticipate and resolve issues before they threaten your communications. This provides all the tools needed to monitor the health of your radio network and reduce downtime.



KEY FEATURES & BENEFITS

- Real-time system health status for early issue diagnosis
- Proof that your network is operating correctly
- Alerts and alarms when there is an issue
- Secure access to performance data anywhere, anytime
- Automatic discovery and configuration for easy setup
- Standards-based technology for interoperability
- Redundancy options for guaranteed performance

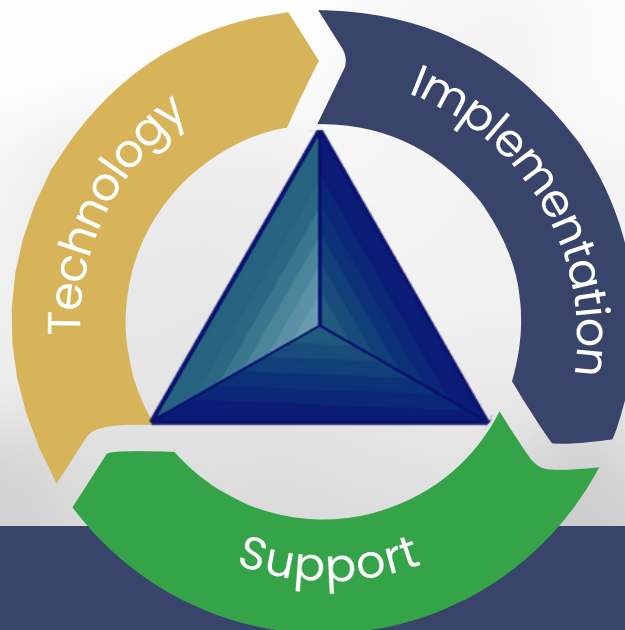
WE UNDERSTAND YOUR PROJECT

We recognize you can't perform a major upgrade on your land mobile radio system very often, so it better be done right the first time. Everything about this upgrade is **Public-Safety-Grade** - to ensure it meets and exceeds all the needs of your city and each of your user agencies.... Now, and for the next generation. We've taken no shortcuts to make sure you have a comprehensive solution that brings three critical elements together. **It takes all three!**

TECHNOLOGY | IMPLEMENTATION | SUPPORT

Technology

- Tait Simulcast for better coverage
- Software Upgradeable
- Multimode Analog + P25
- Environmentally Friendly



Implementation

- Project Management Expertise
- More installation experience than any other U.S. company
- Distinguished and Certified by Tait

Support

- Our Spokane staff of 20 is within one hour to support the City of Moscow and all your responders
- Your system can be monitored and protected 24x7x365, and we'll customize notification and response procedures for Moscow
- Comprehensive Maintenance is available as an option to include - immediate emergency response 24x7, PMs, all parts, labor, software upgrades and travel.

SECURE, RESILIENT AND DEPENDABLE

Local **Ownership** and **Control**

This means you decide what's best and get to make all the decisions – technical, financial, and operational. No restrictions, no delays.

Redundant voters and redundant controllers maximize uptime.

Always on, Always Ready

PUBLIC-SAFETY GRADE

Upgrading your existing Zetron Console means little to no additional training for your dispatchers.

Simplify The Migration

Leverage Your Current Investments

Leverage the investment you've already made in your existing radio equipment.

LOCAL TRAINING

In addition to the proposed training as part of the project, we can provide ongoing retraining of your personnel by our local technicians, through web-based classes, in-person classes in Moscow or our Spokane Service Center.



TECHNICAL EXPERTS AVAILABLE AROUND THE CLOCK

When critical communication systems malfunction, you'll want fast, responsive support to get your equipment back up and running. Our Optional Network Monitoring provides immediate response to your team and activates on-site emergency support by our local technicians 24/7/365.

OUR COMPREHENSIVE MAINTENANCE PROGRAM
ENSURES YOUR SYSTEM OPERATES AT A

PUBLIC SAFETY GRADE OF SERVICE

NETWORK MONITORING (OPTIONAL)



24/7/365 REAL-TIME REMOTE MONITORING

Proactive monitoring

helps us identify and address issues before they become larger problems for you.

To keep you updated on the status of all issues and resolutions, we'll customize notification processes for you and your team based on time/shifts and types of events.

Safety is no
accident
Critical
Communications
should be
monitored 24 x 7

CUSTOMIZED Standard Operating Procedure (SOP) Examples:

- Notification processes
- Response requirements
- Escalation procedures
- Dispatching service
- Call tracking
- Verification of cleared alarms
- Resolution/Disposition

RACOM REFERENCES

TAIT AS-IP OR SIMULCAST INSTALLATIONS



Bonner County,
Idaho



Umatilla-Morrow Radio
Data District (UMRDD)
Oregon



Walla Walla,
Washington



Columbia County 911,
Washington



Boundary County,
Idaho



Avista Utilities,
Washington



Washington
Department of
Transportation
WSDOT



Klickitat County 911,
Washington



Pepin County,
Wisconsin



City & County of
Eau Claire, Wisconsin



St. Croix County,
Wisconsin



Marathon County,
Wisconsin

TESTIMONIALS



**Shane Bazile – Communication Captain
Waupaca County, Wisconsin**

"We've been a RACOM Customer for over five years. Having one local number to call with a live person to help us is invaluable. RACOM monitors our system 24/7/365. Often, they are working on a problem before we know there is one. One vendor under the same roof means no finger-pointing, as we've had in the past. It's great insurance knowing RACOM can get the job done."



**Charlie McClintock – Communications Director
City of Cedar Rapids, IA**

"RACOM's implementation of our P25 system was outstanding. They were always there. The ongoing support received was prompt, proficient and professional. I've never experienced this level of service before."



**Andrew Carlin – Emergency Management Director
Waupaca County Emergency Management | Wisconsin**

"Waupaca County Sheriff has been using the Tait TB9400 Base Station for analog simulcast and RACOM performed a flawless install. Because of the professionalism of the employees and exceptional service, the system has continuously performed beyond expectations."..



**Terry Andersen – Emergency Communication Manager
St. Croix Emergency Support Services | Wisconsin**

"RACOM installed our 5-channel, 14-site Tait system. During the entire project, we never had a change order for additional money on what was quoted. The ongoing support has been fantastic. They monitor our system 24/7/365. Their people are on site supporting our system automatically as needed if an issue comes about."

OUR BEST TEAM



Adam Crippen

Business Development Manager

Rod Ekholm

System Solutions Engineer



Ron Bender

General Manager - RACOM NW



Kevin Timmons

Senior Systems Technician



Phil Carey

Project Manager



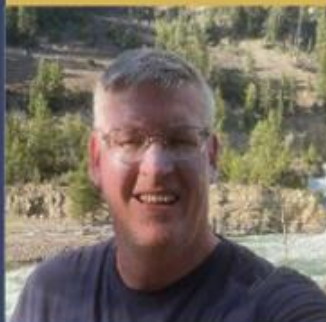
Mike Miller

President



Thor Wiegman

Senior Systems & PSAP Technician



Scott Skibness

Business Development Manager



BEYOND NATURAL DISASTERS



Forest Fires, earthquakes, floods, hurricanes, volcanic eruptions, landslides, or any other phenomena are considered when engineering any RACOM system.

Going above and beyond is part of RACOM's everyday life. Natural disasters of any size present significant challenges to any business and often strain the procedures and systems they use to communicate and coordinate.

RACOM has personal experience navigating a natural disaster. It's important to have redundant equipment and standard operating procedures. We design and engineer all of our systems with worst-case scenarios in mind.

The RACOM Headquarters building experienced a direct hit by an EF3 Tornado in July 2018. The RACOM network NEVER blinked during or after the tornado.

This picture sequence tells the story of the damage, the rebuild, and the status of the headquarters building today.



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February 27th, 2024

Britany Luft
Administrative Assistant of Capital Projects
City of Moscow
504 South Washington Street
Moscow, Idaho 83843

Subject: Radio System Upgrade Project | Request for Proposal

Dear Ms. Britany Luft,

Enclosed is our response to your Request for Proposal for a Public Safety Grade Citywide Radio Communications System. We thank you for the opportunity to bid on this project and to provide a comprehensive public safety grade radio system for the City of Moscow's Public Safety Community.

RACOM's storied history of partnering with customers nationwide enables us to understand and execute, on the main pillars of our proposed solution for you – the best coverage, the most comprehensive reliability, and an unmatched system performance always at the ready to serve the City of Moscow and your users.

Your solution has been optimized to provide the following:

- 1. Enhanced Radio Coverage** – Nothing is more important than radio coverage, and your users will rely on that coverage daily. By deploying state-of-the-art Tait base stations, you'll have better receive sensitivity to capture those important radio calls for assistance.
- 2. Increased System Reliability** – Your users won't have to worry about their radio system functioning correctly. We deploy Public-Safety Grade Communication Systems with redundancies to maintain normal user operations even when something fails, while also monitoring them to proactively address issues before they could impact you.
- 3. System for Today and Tomorrow** – Your new system assures your users of improved radio communications today while providing a platform for future enhancements to comply with nationally recognized P25 standards-based technology when needed for maximum interoperability in the future when terminal support it.

Our team of engineers here at RACOM have worked to put together both a VHF simulcast and a 700MHz simulcast solution that is built around critical communications equipment that will serve the City of Moscow well into the future. Our team feels that whichever solution is chosen, the users will have excellent handheld radio coverage throughout the City of Moscow. The RACOM Projects Team will help to implement and adapt the system to meet all your operational needs, not just provide you with equipment. Our culture of support expands well beyond the four walls of our nationwide service centers – We put your needs first and are proud to support public safety professionals' mission to serve and protect their communities.

Users demand the best in-class implementation experience with a seasoned team. As the country's largest and most-experienced systems integrator of Tait solutions, we would be honored to continue working with you on this next phase of your communications upgrade. Thank you for this opportunity, and we look forward to a long-term partnership with the City of Moscow and your entire Public Safety Community.

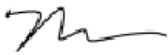
Kindest Regards,



Adam Crippen
Business Development Manager



Mike Miller
RACOM President
Head of Business Development



Mark Peters
Vice President of Sales

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Section 5	PRODUCT LITERATURE •Manufacturers Data Sheets and Brochures
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RACOM QUALIFICATIONS

- RACOM Company Background
- RACOM References

CITY OF MOSCOW, IDAHO

RADIO SYSTEM UPGRADE PROJECT

February 27, 2024



RACOM QUALIFICATIONS

City of Moscow, Idaho

At RACOM, we understand that our communications solutions and equipment play a vital role in our customers' lives every day. Leveraging the latest technologies, listening, responding to our customer's needs, and continually seeking ways to improve - this is who we are. It shows in the value we create today and the progress we are making for tomorrow. It's the kind of innovative thinking that has led customers to choose the technology and services we have to offer.

We've included a synopsis of RACOM on the following pages:

1. RACOM History/Company Background
2. RACOM Manufacturer Relationships
3. RACOM Network Monitoring
4. RACOM Experience
5. RACOM References



RACOM is a systems integrator that designs, installs and maintains all the technologies used to respond to E911 calls and emergencies

...providing everything from NextGen E911 phone systems to console furniture, fire pagers to station alerting, radios and dispatch consoles to logging recorders, warning lights and sirens.

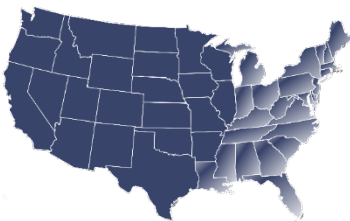
OUR CORE VALUE:

"Our Word is Our Bond"

The RACOM Story

Our History...

RACOM is an Iowa-based company nationally recognized for innovation and a history of being the first to bring advanced capabilities to the communications industry. We have been serving Public Safety Agencies and Utilities in the upper Midwest for nearly 50 years. There are 15 RACOM Service Centers sprinkled throughout the United States and 60 plus dealer partners to respond to your needs.



RACOM Territory –U.S.A

RACOM has been a technology innovator, designing and delivering end-to-end solutions that meet customers' mission-critical needs since 1972. We provide dependable solutions for Public Service and utility customers - tools for those who provide the critical services that our communities rely upon every day – water, electric, gas, telephone, and street services.

RACOM has years of experience in designing, installing and maintaining IP networks for Analog, DMR, SCADA and Project 25 solutions. Combined with local project resources for implementation and support, the results are cost-effective solutions that meet the demanding needs of system coverage and performance for voice and data communications.

As part of Eastern Communications, we are 200+ full-time workers, including over 100 engineers and technical staff.

24x7 Network Monitoring



Public Safety-Grade

Today's advanced systems provide unparalleled levels redundancies to avoid catastrophic failures. But by design, underlying issues are masked and transparent to the users. Instead, they are alarmed and logged for the technical support personnel.

For your system to be considered **Public Safety-Grade**, it should be live-monitored 24x7x365 to proactively address these minor issues before they result in unacceptable downtime.

When alarms are generated or back-up systems have been activated, it is imperative that technical support evaluate these issues immediately to determine their severity and the appropriate course of action. A system operating in a backup condition is vulnerable to further failures if not addressed.

At the core of RACOM's Customer Support offerings is the Network Operations Center (NOC). It operates 24x7x365 to monitor, manage and maintain solutions on behalf of public safety agencies.

Services include a customer-support hotline, live network monitoring, network management, performance reporting, remote surveillance, service response and trouble-ticket escalation, response notification and updates.

All services are customized to develop a set of SOPs specific to your organization and needs.

The NOC is staffed 24x7 and will promptly answer your phone calls and emails. You will never be sent to voicemail or a 3rd-party answering service.

RACOM is owned by Eastern Communications, Queens, NY.

RACOM Industry-Leading Solutions

- **Mission Critical Voice Communications**

From conventional operations to advanced P25 and DMR trunking protocols. Complete system design, sale, construction, maintenance and financing

- **Dispatch Center Solutions**

NextGen 911 Telephone systems, Dispatch Consoles, Console Furniture, Logging Recorders, Fire Station Alerting and Paging

- **Video Surveillance**

Including video courtroom, jail security, tower-site and exterior surveillance

- **Wireless Communications**

Narrowband and broadband applications

- **LAN and wireless LAN expertise**

Including IP networking and routing

- **GPS and AVL solutions**

For user safety and productivity.

- **Premier Upfitting Solutions**

Of Police, Fire, EMS, Municipal, Utilities and Specialty Vehicles

- **FCC Frequency Coordination and Licensing Services**

- **The SARA/RACOM Network**

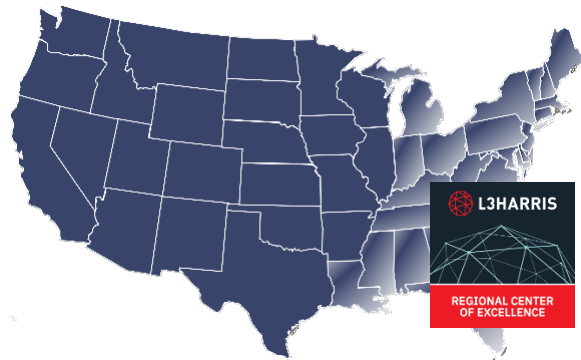
The Shared Area Radio Agreement (SARA) Network is the largest P25 trunking network in Iowa. It's shown to be the best model of local reliability, ownership, and control with maximum in-building coverage interoperability for local police, fire and EMS.

BEST-IN-CLASS PARTNERS



RACOM and Eastern Communications are the Tait Master Distribution Partners and System Integrators for the entire United States. We specialize in engineering, design, and build, as well as technical support services to Tait Major Utility and Public Safety customers.

RACOM and Eastern Communications serve customers nationally with our extensive L3Harris network of partners Serving as the distribution, project implementation, and customer support partners for all L3Harris dealers in the U.S.



Premier Manufacturer Partners



NETWORK MONITORING

INFORMATION SECURITY POSTURE



INFORMATION SECURITY

Information Security is a significant piece of monitoring customer networks. RACOM owns the responsibility of monitoring not only our network but all our customer networks. RACOM is proactive in maintaining a secure environment for both end-customers and RACOM Corporation itself. The tools available to malicious-intentioned individuals are numerous in today's age of the internet of things (IoT). By maintaining a proactive posture, protection is at its highest level for Network Monitoring.



RACOM NETWORK MONITORING

The RACOM monitoring network is a privately addressed network that is not allowed access to the internet except through secure Site-to-Site VPN tunnels, defining permitted traffic. By excluding access to the internet, RACOM provides a much smaller attack vector by which malicious individuals can attempt access and destruction on the network.

The background of the advertisement features a close-up, slightly blurred view of several computer monitors. One monitor on the right shows a web browser window with a large green header, a red section, and a yellow section. Another monitor below it shows a Windows-style taskbar with a menu bar containing 'File', 'Edit', 'View', and 'Operations'. The Racom logo, consisting of a circle with a triangle inside, is positioned to the left of the company name 'RACOM' in a bold, italicized sans-serif font. Below the name, in a smaller font, is 'AN EASTERN COMMUNICATIONS COMPANY'. A thin blue horizontal line runs across the top of the image, just above the logo.



PENETRATION TESTING

INTERNAL

RACOM is routinely performing internal penetration tests to find possible avenues of attack within our networks. Once identified, these avenues are rectified immediately to ensure the continuity of our trusted network.

EXTERNAL

RACOM performs periodic external double-blind and single-blind penetration tests. These tests are designed to test our systems and help ensure that the highest level of security is being met. Reports from these external tests are used to remediate any missed shortcomings.

REMEDiation

EXTERNAL

RACOM performs off-site backups for data to ensure protection from natural disasters and data corruption/exploitation. These backups are available at any time of the day to remediate file systems that RACOM manages. These are a way to repair a system in cases of disaster or attack.

THE THREE STEPS OF REMEDIATION

01

ISOLATION

In the unlikely event of an attack on a RACOM network, the attack vector is isolated to include the PC/Servers, the network leg itself, and any other involved devices.

02

FORENSICS

After isolation, the devices/networks in question are analyzed to help provide insight into remediation against future attacks.

03

REPAIRS/ADJUSTMENTS

After a forensics period, the devices/networks are adjusted to protect against future attacks of a matching nature. Data files are restored from backup as needed, and any user training required is provided.





THE RACOM STORY

RACOM is an Iowa-based company nationally recognized for innovation and a history of being the first to bring advanced capabilities to the communications industry. We have been serving Public Safety Agencies and Utilities in the upper Midwest for nearly 50 years. There are 15 RACOM Service Centers sprinkled throughout the United States and more than 60 dealer partners to respond to your needs.

RACOM has been a technology innovator, designing and delivering end-to-end solutions that meet customers' mission-critical needs since 1972. We provide dependable solutions for Public Service and Utilities customers - tools for those who provide the critical services that our communities rely upon every day.

RACOM has years of experience in designing, installing and maintaining IP networks for Analog, DMR, SCADA and Project 25 solutions. Combined with local project resources for implementation and support, the results are cost-effective solutions that meet the demanding needs of system coverage and performance for voice and data communications.

RELEVANT EXPERIENCE

City of Moscow, Idaho



We have installed and maintained numerous simulcast radio systems throughout the Midwest and Pacific Northwest that employ the same technology as the proposed City of Moscow system. We likewise have vast experience with other simulcast technologies.

Below is a partial list of relevant projects to represent the size and scope of projects recently/previously installed or being upgraded.

Customer	Tait Technology	System Size
Bonner County, ID	VHF Analog Multicast	9 Sites, 8 Tait TB9400 base stations
Umatilla-Morrow Radio Data District (UMRDD), OR	700MHz Phase II Trunking	15 Sites, 72 Tait TB9400 base stations
Walla Walla, WA	VHF AS-IP Simulcast	10 Sites, 30 Tait TB9400 base stations
Columbia County 911, WA	VHF Analog Multicast	6 Sites, 18 Tait TB9400 and TB8100 base stations
Boundary County, ID	VHF QS2 Analog Simulcast	4 Sites, 8 Tait TB8100 base stations
Avista Utilities, WA	220MHz MPT & DMR Trunking	27 Sites covering over five states
Washington Department of Transportation (WSDOT), WA	700MHz Conventional Coverage Supplementation	10 Sites, Tait TB9400 base stations
Pepin County, WI	VHF AS-IP Analog Simulcast	4 Sites, 8 Base Stations
Crawford County, IA	VHF Analog Simulcast	7 Sites, 35 Base Stations
Grant County, WI	VHF Analog & P25 Simulcast	11 Sites, 55 Base Stations
Chippewa County, WI	VHF AS-IP Analog Simulcast, VHF Voted Receive	10-Sites, 46 Base Stations
St. Croix County, WI	VHF AS-IP Analog Simulcast	15 sites, 90 Base Stations
Eau Claire County, WI	VHF AS-IP Analog & P25 Simulcast	12 Sites, 48 Base Stations
Burnett County, WI	VHF AS-IP Analog Simulcast	8 Sites, 32 Base Stations
Jackson County, WI	QS2 Simulcast	9 Sites, 36 Base Stations
Waupaca County, WI	QS2 & VHF AS-IP Analog Simulcast	7 Sites, 52 Base Stations
Marathon County, WI	QS2 (p25) & vhf Analog Simulcast	14 Sites, 36 Base Stations
Oneida County, WI	QS2 to AS-IP Analog & Linear CPQSK Simulcast Multi-mode Network	8 Sites, 32 Base Stations
Wood County, WI	VHF Analog Simulcast	7 Sites, 28 Base Stations
Barron County, WI	QS2 Simulcast, Steered Transmit	9 Sites, 6 Base Stations
Winneshiek County, IA	VHF Analog & P25 Simulcast	7 Sites – (Current Project: 2 Site expansion & 2 Site Relocation), 8 Base Stations
Allamakee County, IA	VHF Analog & P25 Simulcast	9 Sites-P25, 8 Sites Analog

RACOM REFERENCES

Tait AS-IP References - Installed by RACOM

Organization	Bonner County, Idaho
Contact Name	Marcus Robbins
Title of Contact	Bonner County Sheriff Technology Manager
Address	4001 N Boyer Ave., Sandpoint, Idaho 83864
Phone & Email	(208) 263-8417 Marcus.Robbins@bonnercountyid.gov
Contract Duration	Ongoing Project, Ongoing Maintenance
Type of System	Bonner County operates a multicast voted VHF analog radio system for all public safety agencies within the County. 9 Sites in all. Ongoing replacement of legacy base stations with Tait TB9400 100W VHF base stations.
Organization	Umatilla-Morrow Radio (UMRDD), Oregon
Contact Name	Brett Mueller
Title of Contact	District Administrator
Address	4700 N W Pioneer Pl., Pendleton, Oregon 97801
Phone & Email	(541) 966-3774 Brett.mueller@umrdd.org
Contract Duration	Project Complete, On-going Maintenance
Type of System	UMRDD operates a Tait P25 700MHz Phase II Trunked Radio System with TB9400 base stations.
Organization	Walla Walla, Washington
Contact Name	Steven Ruley
Title of Contact	Public Safety Communications Manager
Address	15 North 3 rd Ave., Walla Walla, Washington 99362
Phone & Email	(509) 527-1959 sruley@wallawallawa.gov
Contract Duration	Project Complete, Self-Maintained
Type of System	Walla Walla County operates a VHF Simulcast System utilizing Tait TB9400 VHF 100W base stations.
Organization	Columbia County, Washington
Contact Name	Tina Bobbitt
Title of Contact	Communications Supervisor
Address	341 E Main Street, Dayton, Washington 99328
Phone & Email	(509) 382-3928 Tina_bobbitt@co.columbia.wa.us
Contract Duration	Ongoing Project, Ongoing Maintenance
Type of System	Columbia County operates a multisite VHF analog radio system for all public safety agencies within the County. 6 Sites in all. Ongoing replacement of legacy base stations with Tait TB9400 100W VHF base stations.

Organization	Boundary County, Idaho
Contact Name	Andrew O'Neel
Title of Contact	Emergency Manager
Address	6566 Main Street, Bonners Ferry, Idaho 83805
Phone & Email	(208) 290-0406 aoneel@boundarycountyid.org
Contract Duration	Ongoing Project, Ongoing Maintenance
Type of System	Boundary County operates a Tait QS2 VHF analog radio system for Fire and EM agencies within the County. 4 Sites in all. The county is working on a project to upgrade existing TB8100 base stations with Tait AS-IP TB9400 100W VHF base stations & expanding the system capacity to include the Boundary Sheriff's Office
Organization	Avista Utilities (Washington, Idaho, Oregon & Montana)
Contact Name	Scott Grimmett
Title of Contact	RF Systems Engineer
Address	1411 East Mission Ave., Spokane, Washington 99252
Phone & Email	(509) 993-9968 Scott.grimmett@avistacorp.com
Contract Duration	Ongoing Project, Self-Maintained
Type of System	Avista Utilities operates a 220MHz Analog MPT-1327 LMR system with Tait TB8100 base stations and is in the process of upgrading legacy base stations with Tait TB9300 220MHz base stations to support DMR Tier-III Trunking. 27 Sites in all throughout 4 States.
Organization	WSDOT
Contact Name	Tim McDowell
Title of Contact	ITS Communications and Wireless Mgr.
Address	HQ Transportation Operations, 7345 Linderson Way SW, Tumwater, Washington 98501-6054
Phone & Email	360-705-7028 McDoweT@wsdot.wa.gov
Contract Duration	Project Complete, Self-Maintained
Type of System	WSDOT uses Tait TB9400 700MHz base stations to expand LMR coverage into remote locations and for interoperability.
Organization	Pepin County Sheriff
Contact Name	Joel D. Wener
Title of Contact	Sheriff
Address	740 7 th Avenue/PO Box 39, West Durand, Wisconsin 54736
Phone & Email	715-672-3443-Direct 715-279-2997-Cell jwener@co.pepin.wi.us
Contract Duration	Project Complete, Self-Maintained
Type of System	TAIT AS-IP Solution, 4-Sites, 2-Channels, uWave connectivity
Organization	City and County of Eau Claire, WI
Contact Name	Dena Clark
Title of Contact	Director of Emergency 911 Communications
Address	203 S. Farwell, Eau Claire, Wisconsin 54702
Phone & Email	(715)-839-1690 Dena.clark@eauclairewi.gov
Contract Duration	Ongoing Maintenance, System expansion & Support
Type of System	The City and County of Eau Claire operate a 12-site, 4-channel Tait AS-IP system.

Organization	St. Croix County, WI
Contact Name	Terry Anderson
Title of Contact	Emergency Communications Manager
Address	1101 Carmichael Road, Hudson, Wisconsin 54016
Phone & Email	(715)-381-4910 Terry.anderson@sccwi.gov
Contract Duration	Project complete, ongoing maintenance.
Type of System	Modernized St. Croix's existing VHF Analog Conventional LMR and console equipment with a turn-key Tait AS-IP Analog Simulcast solution with a migration path to P25 Digital Simulcast [Phase1], Linear Modulation (LSM) via software upgrade.14 Sites and 7 Avtec console positions.
Organization	Marathon County, WI
Contact Name	William Millhausen
Title of Contact	Captain of Communications
Address	500 Forest St., Marathon County Courthouse, Wausau, Wisconsin 54403
Phone & Email	(715)-261-1200 william.millhausen@co.marathon.wi.us
Contract Duration	Project complete, ongoing maintenance.
Type of System	Upgrade QS2 System to Tait AS-IP simulcast system, 9-site, 1 channel.
Organization	Waupaca County, WI Sheriff
Contact Name	Shane Bazile
Title of Contact	Communications Captain
Address	1402 Royalton St., Waupaca, Wisconsin 54981
Phone & Email	(715)-412-2808 Shanel.bazile@co.waupaca.wi.us
Contract Duration	Ongoing Maintenance, System expansion & Support
Type of System	Tait 7-Site 35 Channel AS-IP System. Two additional sites are to be added for Fire Paging.
Organization	Burnett County, WI
Contact Name	Jim Tolbert
Title of Contact	Director of Emergency Management
Address	7410 County Road L, Siren, Wisconsin 54872
Phone & Email	(715)-349-2171 jtolbert@burnettcounty.org
Contract Duration	Ongoing Maintenance, System expansion & Support
Type of System	Tait 9-Site, 4-Channel VHF Simulcast System
Organization	Oneida County, WI
Contact Name	Ken Kortenhof
Title of Contact	Emergency Management Director
Address	2000 E Winnebago Street, Rhinelander, Wisconsin 54501
Phone & Email	(715) 361-5167 kkortenhof@co.oneida.wi.us
Contract Duration	Ongoing 5-year Contract to upgrade QS2 System to AS-IP TB9400 Simulcast and provide on-site maintenance
Type of System	Formerly, a Tait QS2 System, which RACOM maintained, then Upgraded to Tait AS-IP Analog and Simulcast Linear CPQSK simulcast multi-mode network, 8 Site 24 Channel AS-IP Analogue Simulcast, Tait 8 Site, 1 Channel AS-IP P25 Multi-Mode Linear Simulcast.

Organization	Chippewa County
Contact Name	Tamee Foldy
Title of Contact	Emergency Communications Director, Chippewa County Sheriff's Office
Address	32 E. Spruce St., Chippewa Falls, Wisconsin 54729
Phone	715-726-7989 Office 715-726-7701 #1 Communications Center
Contract Duration	Ongoing Maintenance, System expansion & Support
Type of System	TAIT AS-IP Solution, 10-Sites, 4-Channels, Fiber & uWave connectivity
Organization	Crawford County, IA
Contact Name	Gregg Miller
Title of Contact	Emergency Management Coordinator
Address	1202 Broadway, Denison, Iowa 51442
Phone & Email	(712)-269-2422 ema@crawfordcounty.org
Contract Duration	Ongoing Maintenance, System expansion & Support
Type of System	Upgrade the existing radio system on the VHF band to a current 3-site VHF analog simulcast Tait AS-IP P25 solution. Future plans include a buildout of 7 sites. They recently purchased a Zetron MAX Dispatch solution with installation beginning in October.

INSTALLATION PHOTOS

City of Moscow, Idaho

In accordance with the RFP's request to provide photo documentation of previous installation work comparable to the work called for in the RFP specifications, pictures of such previous installation work appear below.



INSTALLATION PHOTOS

City of Moscow, Idaho



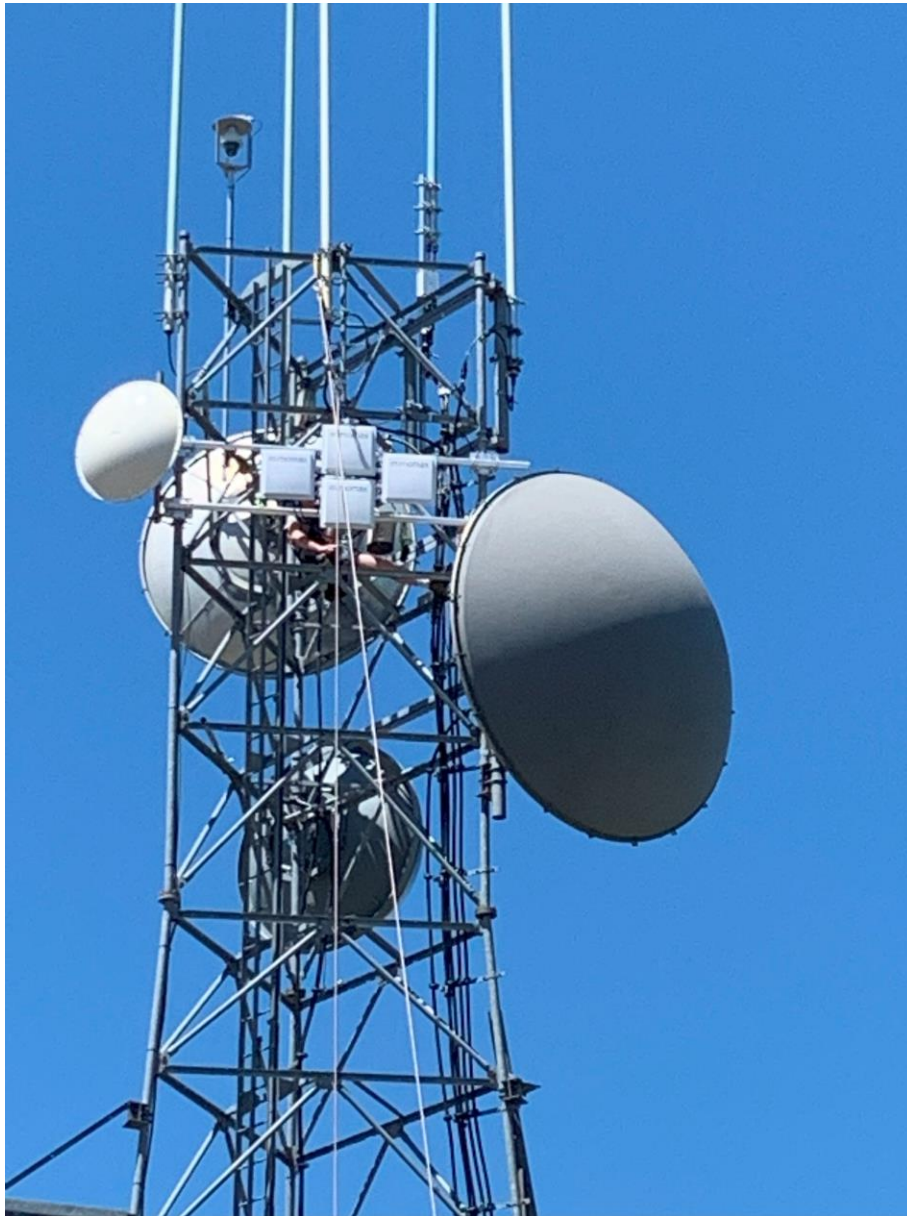
INSTALLATION PHOTOS

City of Moscow, Idaho



INSTALLATION PHOTOS

City of Moscow, Idaho



INSTALLATION PHOTOS

City of Moscow, Idaho



INSTALLATION PHOTOS

City of Moscow, Idaho



INSTALLATION PHOTOS

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INSTALLATION PHOTOS

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INSTALLATION PHOTOS

City of Moscow, Idaho



INSTALLATION PHOTOS

City of Moscow, Idaho



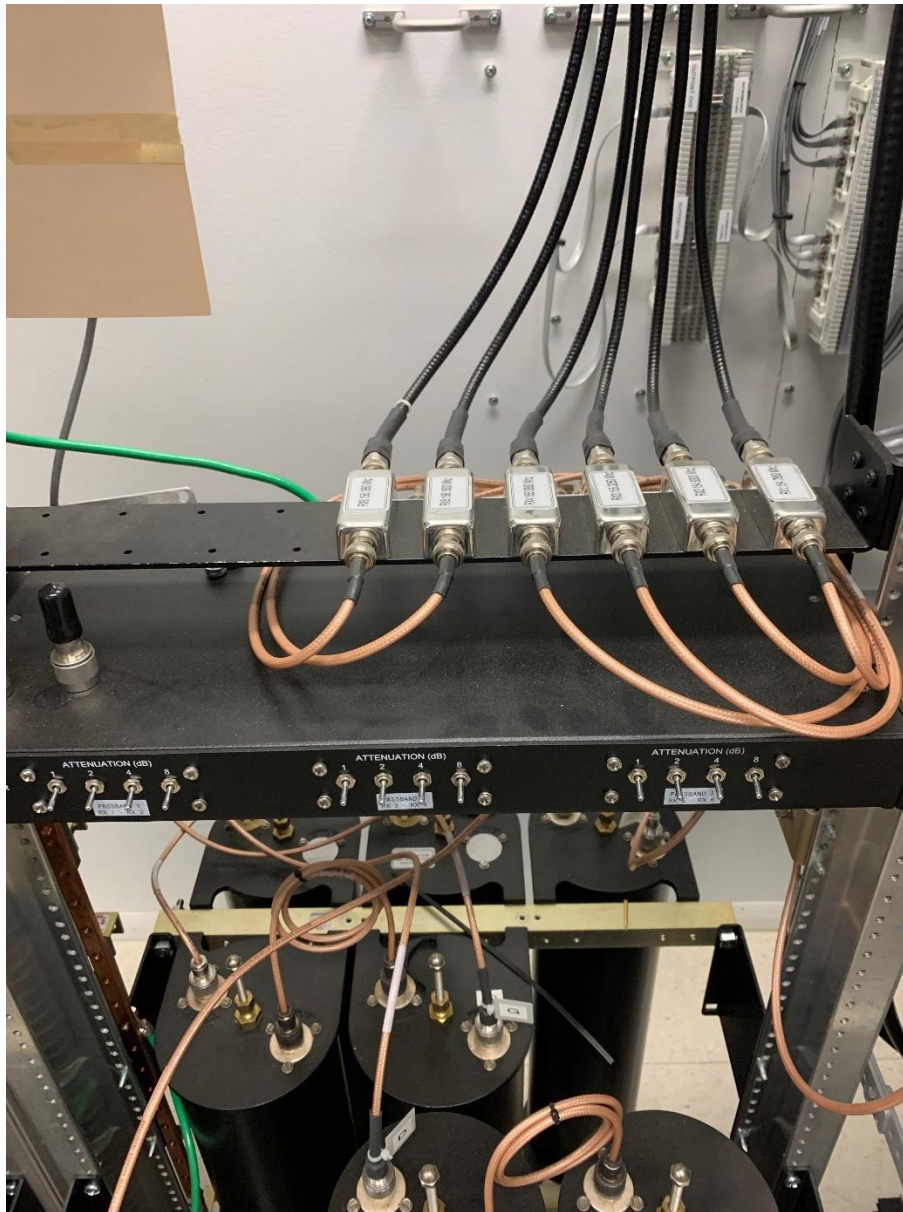
INSTALLATION PHOTOS

City of Moscow, Idaho



INSTALLATION PHOTOS

City of Moscow, Idaho



INSTALLATION PHOTOS

City of Moscow, Idaho



INSTALLATION PHOTOS

City of Moscow, Idaho



INSTALLATION PHOTOS

City of Moscow, Idaho



INSTALLATION PHOTOS

City of Moscow, Idaho



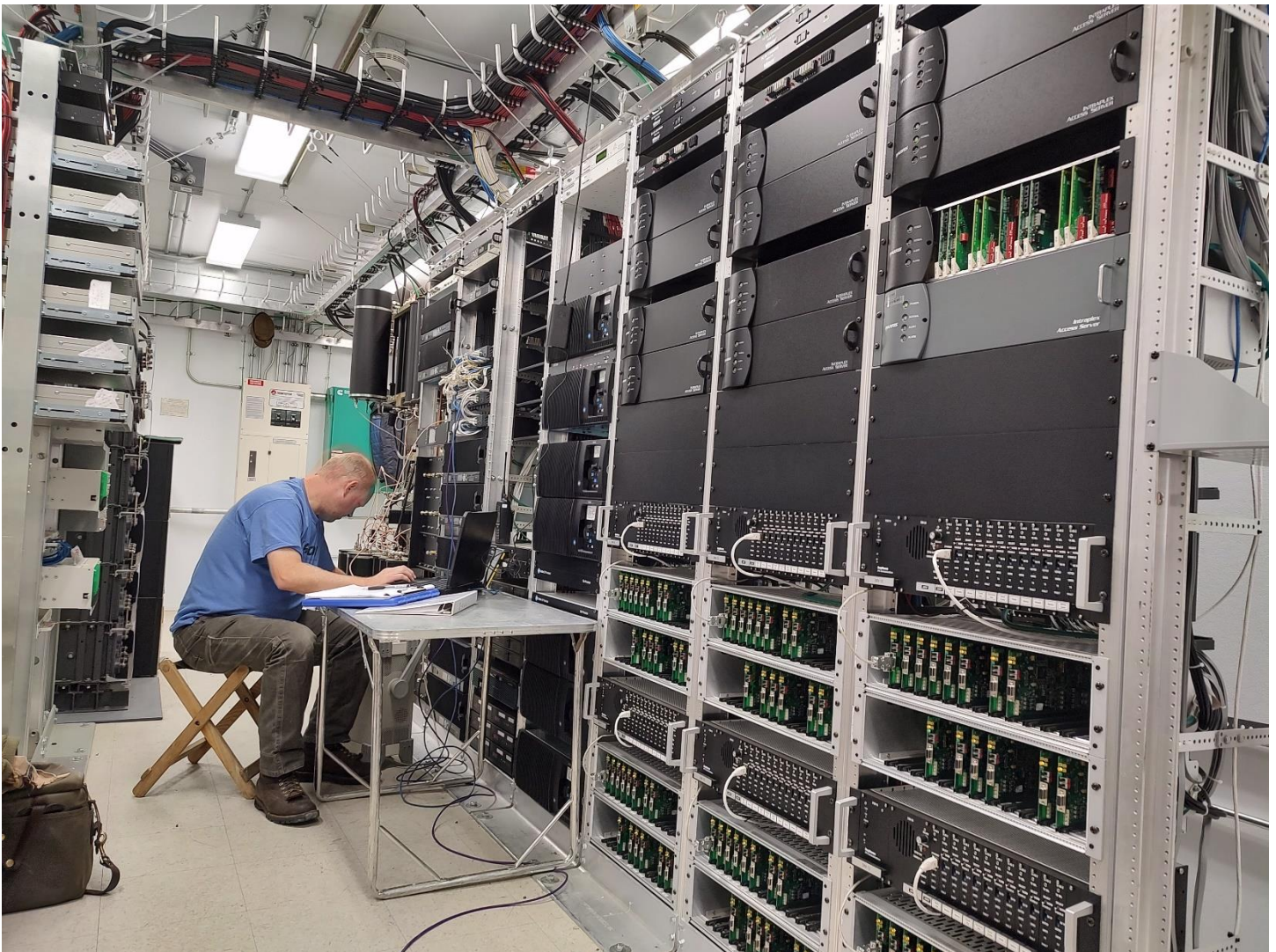
INSTALLATION PHOTOS

City of Moscow, Idaho



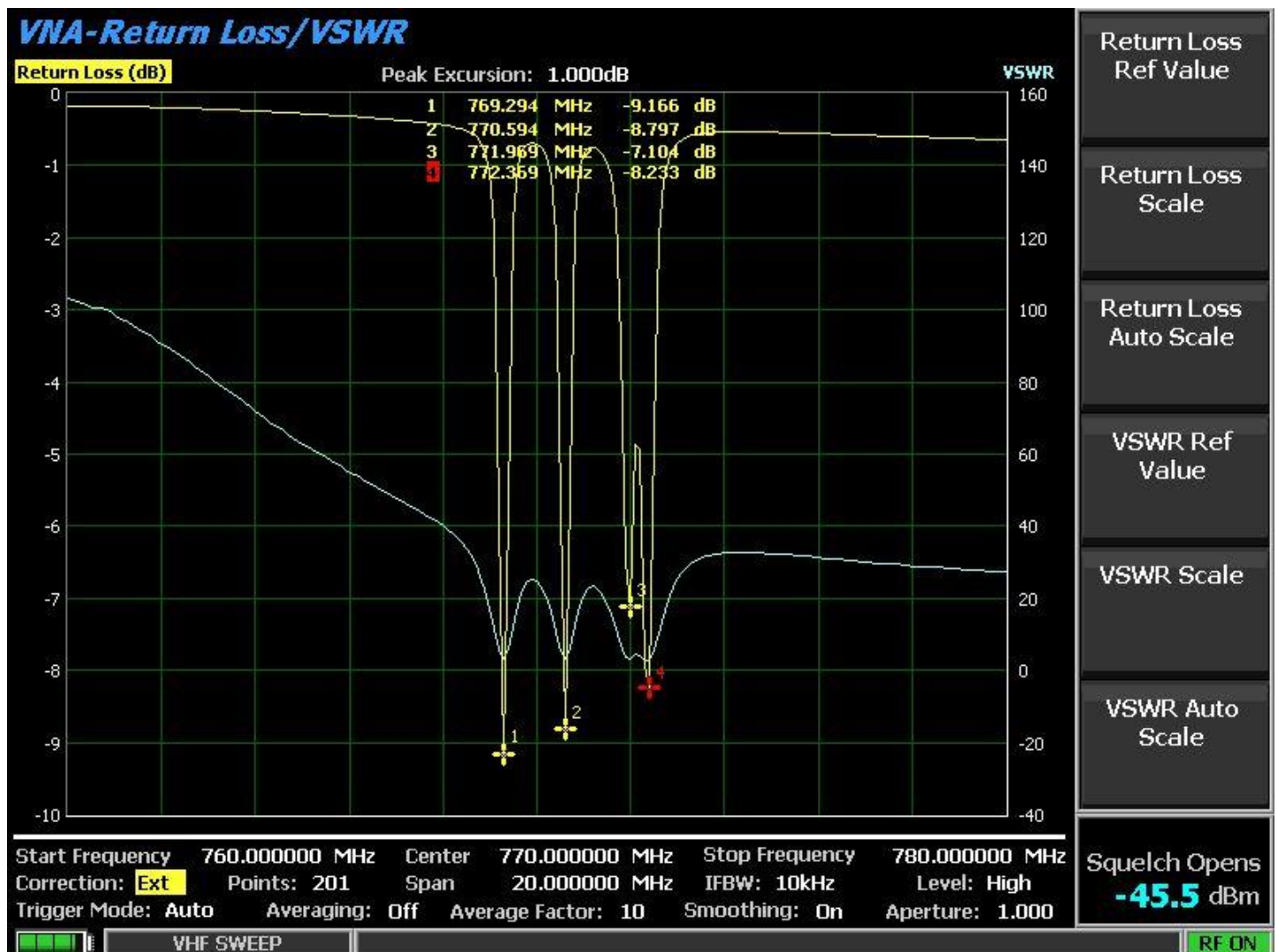
INSTALLATION PHOTOS

City of Moscow, Idaho



INSTALLATION PHOTOS

City of Moscow, Idaho



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TECHNICAL PROPOSAL RESPONSE

- System Description
 - System Block Diagram
 - System Rack Drawings
 - Microwave Paths
 - Coverage Maps

CITY OF MOSCOW, IDAHO

RADIO SYSTEM UPGRADE PROJECT

February 27, 2024



System Overview



A RACOM-Designed System with
GUARANTEED COVERAGE!



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Analog Conventional Simulcast System

Proposed System Overview

RACOM is proposing a seven (7) site TaitNet ASIP Analog simulcast system consisting of four (4) transmit and receive (TX/RX) sites and three (3) received only (RX) sites. In addition to the simulcast sites there is One (1) standalone TX/RX site with primary and backup station. Three of the sites, Well 10, KUID and Moscow Mountain will have three channels and City Hall plus Well 10 and KUID sites will have two channels. All five channels will have receivers at the following water tanks: Residence, Vista, and Rotary Park.

The sites will be connected using six (6) new microwave links being provided by RACOM using public safety grade linking equipment by Aviat and three (3) existing fiber links used by the City.

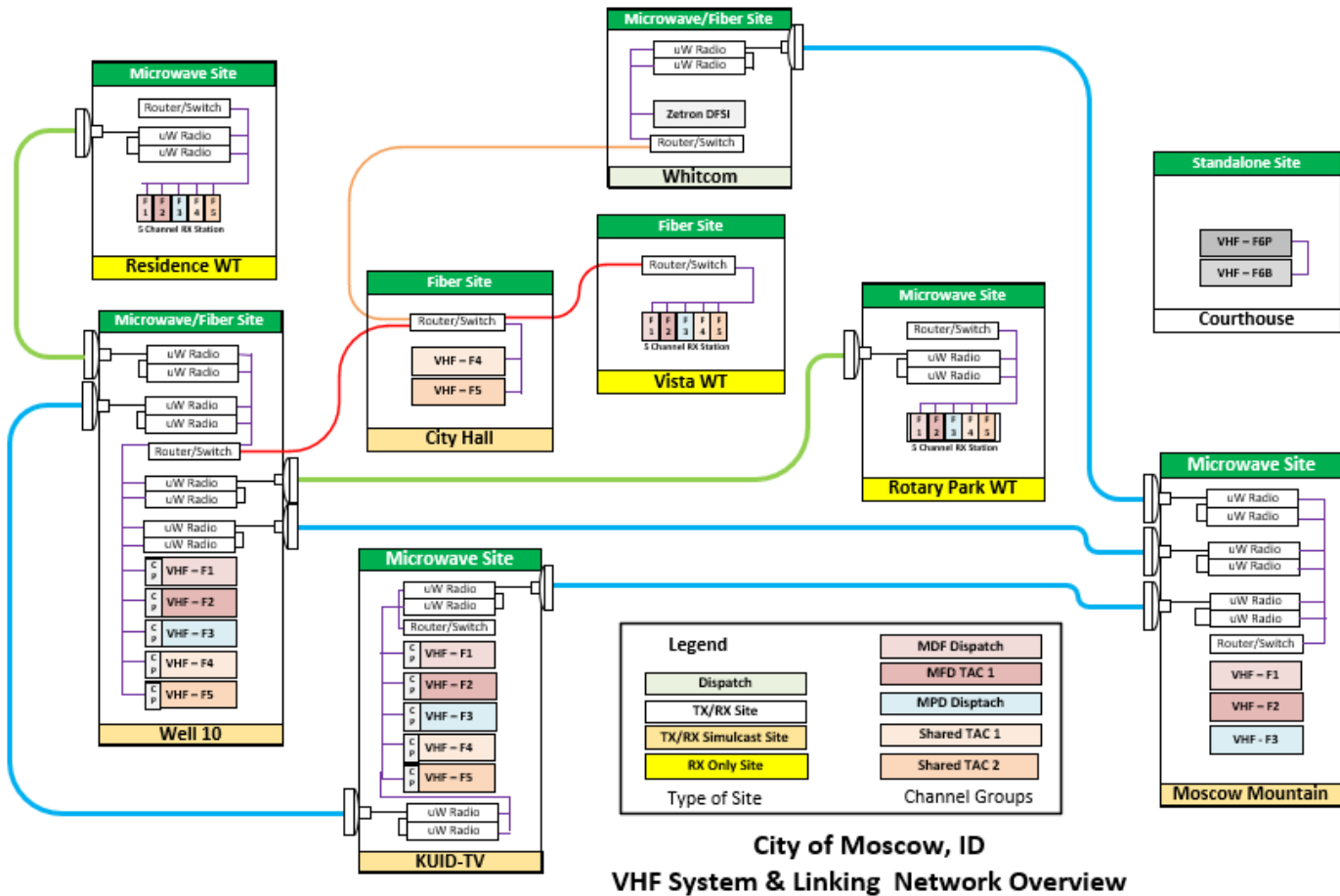
The overall system will be monitored by Tait's Enable Monitor applications. Enable Monitor will provide a single place to view the current status of all the system equipment status and alarms using standard SNMP, syslog and contact closures from the sites.

SIMULCAST SITES

For Public Safety users, Radio Coverage is critical. Our design was built around the coverage requirements outlined in the RFP. RACOM's engineering team has produced a design that meets your requirements. Our design is based on 95% reliability with a 3.4 DAQ for outdoors and in-building coverage. A 95% BAPC within the boundaries provided was the final goal, which was easily met for the area outlined in the RFP along with providing extended coverage within the County and surrounding areas. This simulcast design will help to minimize the number of channels that will be needed to support the system. An outline of the sites being used is in the Coverage section below.

GUARANTEED COVERAGE

Since coverage is important to all our customers, we go above the requirements in our coverage guarantee and not just what is asked for in the RFP, RACOM will commit that each of the agencies outlined coverage matches what we have proposed in each of the areas. If not, we will fix it at our cost.



System Overview

For the Radio System RACOM is proposing a TaitNet ASIP network which is a set of interconnected Tait base stations. Each TB9400 Stations can receive from and transmit to mobile and portable radios, just like any base station/repeater. However, TB9400s also have built-in networking capabilities that enable them to combine to form one or more logical channels (Chanel Groups) with wide area coverage.

For the proposed VHF system, RACOM is proposing a seven (7) site solution as outlined in the RFP. Four of the sites will have TB9400 base stations and three of the sites will have the TB9400 Receiver Only Stations. These stations use the same chassis and power management unit (PMU) as the TB9400 Base Station, but instead of having a transmitter, receiver, and power amplifier, they only have receivers. Each Station can hold up to five receivers.

The connection to the existing Zetron dispatch console will be integrated into the network using the DFSI standard interface.

Proposed 9 Site System

The following outlines the 9-site RACOM is proposing for the project. The table to the left outlines the Type, Channels and Function for each of the sites.

The Sites are divided up into four different types: TX/RX Simulcast, TX/RX Standalone, RX Only, and Dispatch.

Site	Type	Channels	Function
City Hall	TX/RX - Simulcast	2	
Courthouse	TX/RX - Standalone	1	Primary & Backup
KUID - TV Paradise Ridge	TX/RX - Simulcast	5	Control Point
Moscow Mountain	TX/RX - Simulcast	3	
Well10	TX/RX - Simulcast	5	Control Point
Water Tank - Residence	RX Only	5	
Water Tank - Rotary	RX Only	5	
Water Tank - Vista	RX Only	5	
Whitecom	Dispatch	0	DFSI

Some of the sites also include additional capabilities/functions to support the overall operation of the proposed system as requested in the RFP. For the TX/RX site, the function requested was for two stations to be provided, one to be the primary and the other to be the backup.

The simulcast system consists of either TX/RX simulcast or RX only sites. For each Channel Group (the station that share the same frequency across those simulcast sites) have at least one station in the group is configured with a voter and simulcast control capability. This station is commonly referred to as the Control Point (CP). For the City of Moscow's solution, RACOM has included two CPs, a primary and backup for each Channel Group.

Per the RFP, the channels (frequencies outlined in the table on the right) and the sites they are associated with are as follows: F1, 2, & 3 – Well 10, KUID, Moscow Mountain, F4 & 5 - Well 10, KUID, & City Hall, and F6 Courthouse. All five (F1 to F5) are also at the three-water tank sites, Residence, Rotary Park, and Vista.

Freq #	TX	RX	Name
1	153.8000	155.8875	MFD Main Dispatch
2	154.8900	159.0000	MFD TAC Channel #1
3	155.6775	158.9850	MPD Main Dispatch
4	154.4450	154.7250	Shared TAC Channel #1
5	159.2100	154.7100	Shared TAC Channel #2
6	153.9800	155.7750	Public Works

Coverage Analysis

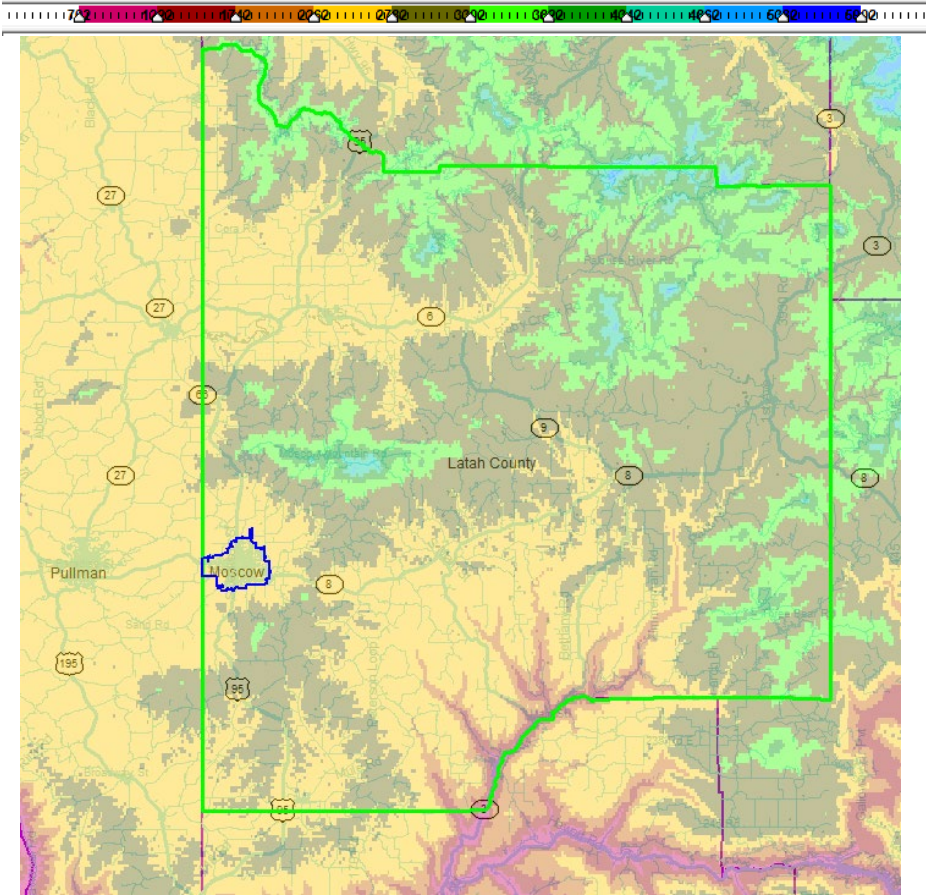
RACOM uses the L3Harris Radio Analysis and Propagation Tool Repository (RAPTR) when designing new radio systems. RAPTR is an advanced propagation and system design tool compatible with TIA TSB88-B and uses the Okumura-Hata-Davidson model for propagation loss, the United States Geological Survey (USGS) Digital Elevation Model (DEM) for terrain elevation data and the USGS National Land Cover Data (NLCD) database for environmental data.

This program is a complete system design tool for the analysis and design of land mobile radio systems. The software incorporates many large databases from the FCC, GIS, Cable Manufacturers and Antenna Manufacturers to bring together every parameter it takes to design a highly reliable RF system model. RACOM's RF Engineer can adjust numerous critical parameters to achieve the perfect site balance for the predicted coverage the system needs to provide. The RAPTR software is constantly being upgraded and adjusted to stay ahead of technology.

Many considerations are used in determining your coverage for the proposed system. The modeling of terrain and environmental data are just two of the characteristics considered in providing the most realistic coverage prediction and solution. The terrain map is a product of the United States Geological Survey (USGS) digital elevation model generated from RAPTR showing the contour of the City of Moscow.

A larger version is at the back of this section, but the levels start at 700' and goes to 6,000' with each color change at 550'. The green boundary is the County and the blue one within the County is Moscow. The elevation changes and the site locations are some of the items that impacted the design.

Environmental data or Land Use Land Clutter (LULC) was used to classify areas based on the way the land is used per NLCD. This allows our coverage model to distinguish areas used for but not limited to agriculture, commercial buildings, residential homes and industrial. This attention to detail ensures that the City of Moscow and its users are getting the most accurate coverage model possible.



City of Moscow Environment Data Used for Maps (dB)				
	Clutter Loss	Street	Additional Loss Added for Inbuilding by Type	
			Default	Category
Water	0	0	0	Lakes
Snow & Ice	0	0	0	Snow Pack
Wetland	3	0	3	Non-forested
Open Land	5	0	3	Bare Land
Rangeland	9	0	3	Herbaceous
Transportation	3	0	3	Roadways
Agricultural	3	0	3	Grassland
Residential	14	0	6	Suburban
Forest	8	0	3	Pine (>30')
Mixed Urban/Buildings	15	0	10	Apartment (<4 stories)
Commercial/Industrial	14	0	15	Commercial Services
High Density Urban	15	0	20	Skyscrapers

This data is used in two ways when predicting coverage, one way is for additional Clutter Loss. TBS-88 defines these losses to be used based on the type of area. The other is for the loss of buildings within that area for additional inbuilding loss. While Moscow has not asked for any inbuilding coverage in the RF, outdoors only. RACOM has included maps based on the default TSB-88 level outlined. The table outlines what RACOM has used for our maps and the percentage of areas

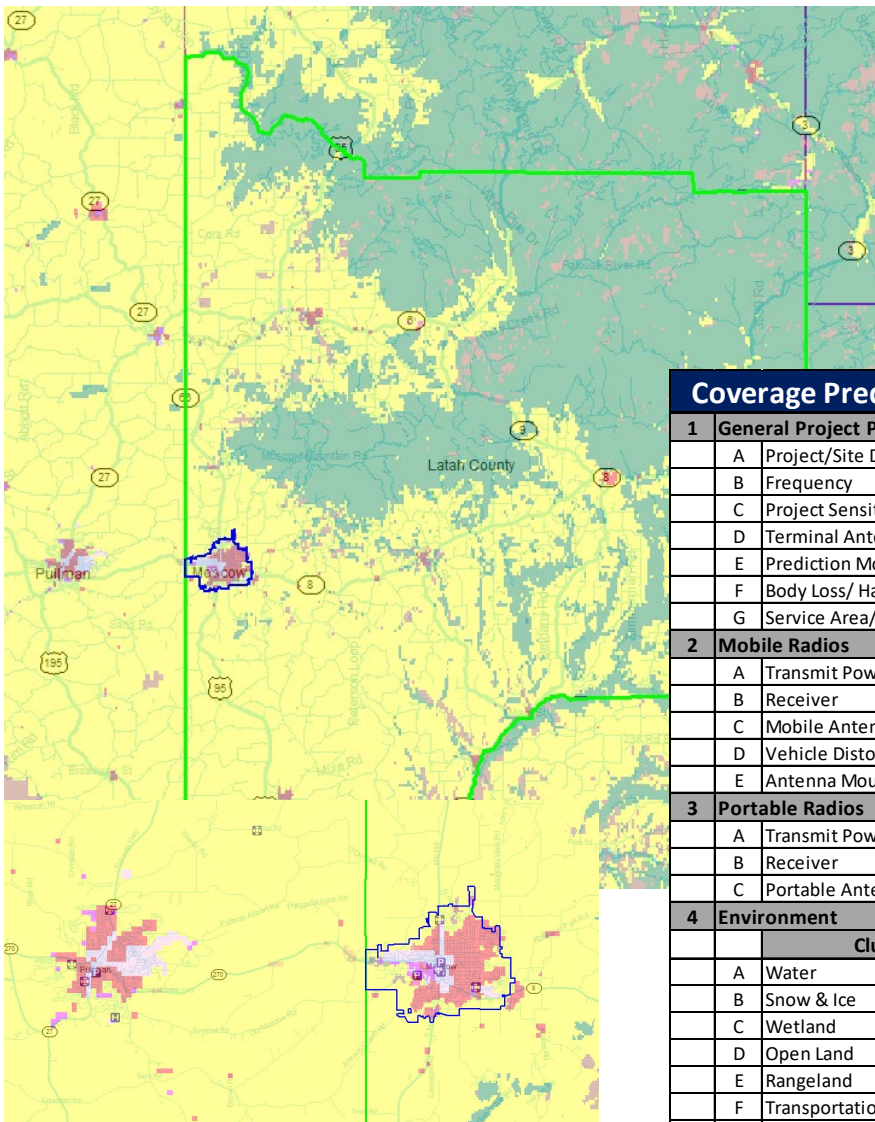
covered information we have included for each. We have included an additional column with an alternative name for the TSB-88 labels for each type, labeled Category, as some people like these definitions of the area better. The more detail area so the LULC levels within the City limits.

The different classifications of environmental data can include water, agriculture, forest, residential, mixed urban and commercial definitions. Understanding how the land is used allows the RACOM Engineer to concentrate coverage where the radio users will need it most. The map below shows the Land

LULC Color Customization		
Color	Description	
	Water	
	Snow Ice	
	Wetland	
	Open Land	
	Rangeland	
	Transportation	
	Agricultural	
	Residential	
	Forest	
	Mix Urban Buildings	
	Commercial/Industrial	
	High Density Urban	

Use Land Clutter data collected for the area in and around the city.

In addition to the environmental and LULC information outlined RACOM has used the additional information outlined for the VHF proposed system and the sites as shown in the following tables.

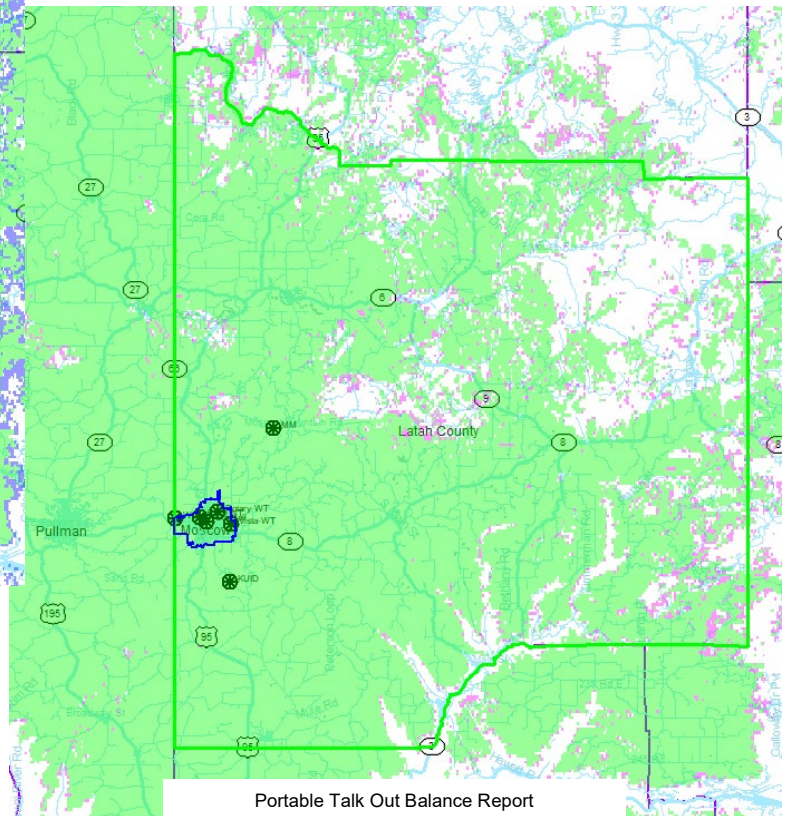
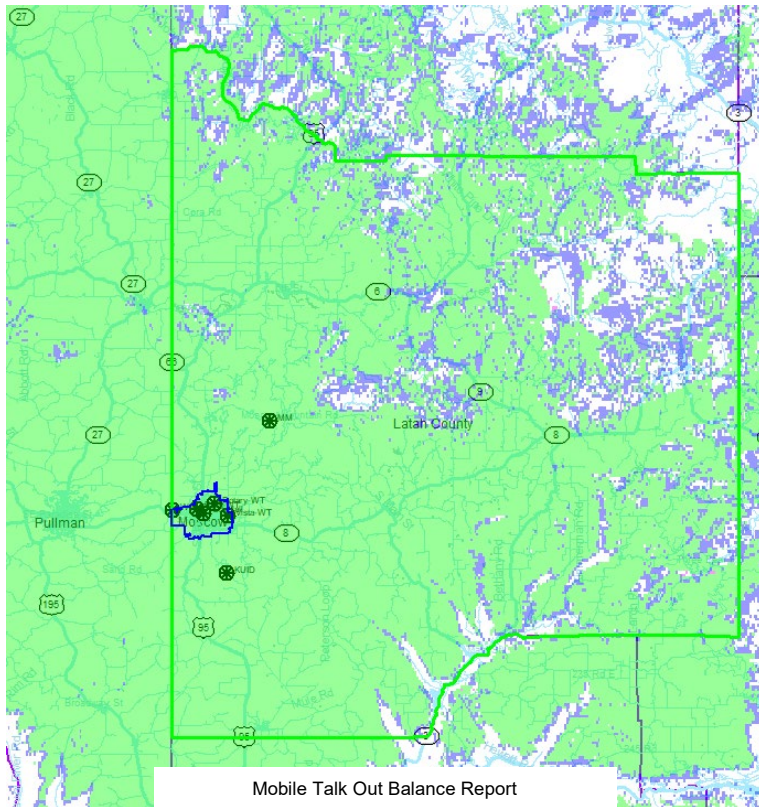


Coverage Prediction Assumptions For City of Moscow					
1	General Project Parameters				
	A	Project/Site Datum	NAD83-CONUS		
	B	Frequency	150-174 Mhz		
	C	Project Sensitivity	a. Mobile -107dBm	b. Portable -107dBm	
	D	Terminal Antenna Height	a. Mobile 5.0 feet	b. Portable 3.5 feet	
	E	Prediction Model	Harris Okumura		
	F	Body Loss/ Harris Portables	Hip: 15dB Head: 8dB		
	G	Service Area/Design Target	Portable 95%/95% Mobile 95%/95%		
2	Mobile Radios				
	A	Transmit Power	50.0 watts		
	B	Receiver	Noise Figure 10 /-107dBm Faded/1.0uV, 50ohms		
	C	Mobile Antenna Gain	-1.0 dB	Net Gain (0dB antenna and -1 line/connector)	
	D	Vehicle Distortion Margin	(-)1.2dB		
	E	Antenna Mounting Position	Center of Roof with a light bar		
3	Portable Radios				
	A	Transmit Power	6.0 Watts		
	B	Receiver	Noise Figure 10 /-107dBm Faded/1.0uV, 50ohms		
	C	Portable Antenna Gain	1/2 wave Unity Gain 0 dB gain		
4	Environment				
		Clutter Loss (dB)		Building Loss - TSB 88 (dB)	
	A	Water	0	0	Lakes
	B	Snow & Ice	0	0	Snow Pack
	C	Wetland	3	3	Non-Forested
	D	Open Land	3	3	Bare Land
	E	Rangeland	9	3	Herbaceous
	F	Transportation	3	3	Roadways
	G	Agricultural	3	3	Row Crops
	H	Residential	14	6	Suburban
	I	Forest	8	3	Pine (>30')
	J	Mixed Urban/Buildings	15	10	Apartments (<4 stories)
	K	Commercial/Industrial	14	15	Commercial Services
	L	High Density Urban	15	20	Skyscrapers

Site Name		City Hall	KUID - TV Paradise Ridge	Moscow Mountain	Well10
Site ID		CityHall	KUID	MM	Well10
Latitude		46° 43' 57.790" N	46° 40' 54.000" N	46° 48' 40.950" N	46° 44' 06.700" N
Longitude		116° 59' 59.020" W	116° 58' 17.000" W	116° 55' 02.940" W	117° 02' 21.700" W
Datum		NAD83	NAD83	NAD83	NAD83
Site Elevation		2589 ft	3547 ft	4442 ft	2589 ft
Base Station		TB9400-Analog	TB9400-Analog	TB9400-Analog	TB9400-Analog
Frequency Range		150 - 174 MHz	150 - 174 MHz	150 - 174 MHz	150 - 174 MHz
Site Transmit	Station Output Power	100.0 W	100.0 W	100.0 W	61.7 W
	Combiner Model	DB4345 (2 ch.)	DB4345 (5 ch.)	DB4345 (3 ch.)	DB4345 (5 ch.)
	Tx to Tx Spacing	200	200	200	200
	Combiner Loss	4.0 dB	5.1 dB	4.5 dB	5.1 dB
	Filter/Duplexer Model				
	Filter/Duplexer Loss	0.0 dB	0.0 dB	0.0 dB	0.0 dB
	Coax Type	7/8" Foam	7/8" Foam	7/8" Foam	7/8" Foam
	Coax Length	105 ft	92 ft	110 ft	110 ft
	Coax Loss	0.5 dB	0.4 dB	0.5 dB	0.5 dB
	Antenna Model	ANT150F2	ANT150F2	ANT150F2	ANT150F2
	Antenna Height (C.L.)	55 ft	42 ft	60 ft	60 ft
	Antenna Azimuth	0°	0°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°	0°
	Antenna Gain (Hzn)	2.5 dBd	2.5 dBd	2.5 dBd	2.5 dBd
	Maximum ERP (Hzn)	81.8 W	50.5 W	56.6 W	30.4 W
	HAAT	-140.0 ft	840.0 ft	1552.0 ft	-89.0 ft
Site Receive	Total System Gain	1.6 dB	1.0 dB	1.3 dB	1.5 dB
	Multicoupler Model	DB7300 (8 ch.)	DB7300 (8 ch.)	DB7300 (8 ch.)	DB7300 (8 ch.)
	Coax Type	7/8" Foam	7/8" Foam	7/8" Foam	7/8" Foam
	Coax Length	105 ft	242 ft	175 ft	135 ft
	Tower Top Amp Model	(None)	(None)	(None)	(None)
	TTA Pad	0.0 dB	0.0 dB	0.0 dB	0.0 dB
	Distribution Pad	0.0 dB	0.0 dB	0.0 dB	0.0 dB
	Duplexer Loss	0.0 dB	0.0 dB	0.0 dB	0.0 dB
	Antenna Model	ANT150F2	ANT150F6	ANT150F6	ANT150F6
	Antenna Height (C.L.)	55 ft	192 ft	125 ft	85 ft
	Antenna Azimuth	0°	0°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°	0°
	Antenna Gain (Hzn)	2.5 dBd	6.0 dBd	6.0 dBd	6.0 dBd
	HAAT	-140.0 ft	990.0 ft	1617.0 ft	-64.0 ft

Site Name		Water Tank - Residence	Water Tank - Rotary	Water Tank - Vista
Site ID		RES-WT	Rotary-WT	Vista-WT
Latitude		46° 44' 12.710" N	46° 44' 27.550" N	46° 43' 50.320" N
Longitude		117° 00' 30.700" W	116° 59' 12.020" W	116° 58' 10.470" W
Datum		NAD83	NAD83	NAD83
Site Elevation		2654 ft	2674 ft	2700 ft
Base Station		TB9400-Analog RX Only	TB9400-Analog RX Only	TB9400-Analog RX Only
Frequency Range		150 - 174 MHz	150 - 174 MHz	150 - 174 MHz
Site Transmit	Station Output Power			
	Combiner Model			
	Tx to Tx Spacing			
	Combiner Loss			
	Filter/Duplexer Model			
	Filter/Duplexer Loss			
	Coax Type			
	Coax Length			
	Coax Loss			
	Antenna Model			
	Antenna Height (C.L)			
	Antenna Azimuth			
	Antenna Mechanical Tilt			
	Antenna Gain (Hzn)			
	Maximum ERP (Hzn)			
	HAAT			
Site Receive	Total System Gain	1.6 dB	1.6 dB	1.6 dB
	Multicoupler Model	DB7300 (8 ch.)	DB7300 (8 ch.)	DB7300 (8 ch.)
	Coax Type	7/8" Foam	7/8" Foam	7/8" Foam
	Coax Length	110 ft	110 ft	100 ft
	Tower Top Amp Model	(None)	(None)	(None)
	TTA Pad	0.0 dB	0.0 dB	0.0 dB
	Distribution Pad	0.0 dB	0.0 dB	0.0 dB
	Duplexer Loss	0.0 dB	0.0 dB	0.0 dB
	Antenna Model	ANT150F2	ANT150F2	ANT150F2
	Antenna Height (C.L)	60 ft	60 ft	50 ft
	Antenna Azimuth	0°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°
	Antenna Gain (Hzn)	2.5 dBd	2.5 dBd	2.5 dBd
	HAAT	-56.0 ft	-91.0 ft	-100.0 ft

The two maps below are the round-trip balance reports for the proposed VHF system. The green is the area the Talk Out and Talk In are the same, the pink is Talk In only and the blue is Talk Out only. Both the mobile is slightly Talk In limited and Portable maps show the system is balanced to slight Talk Out limited.

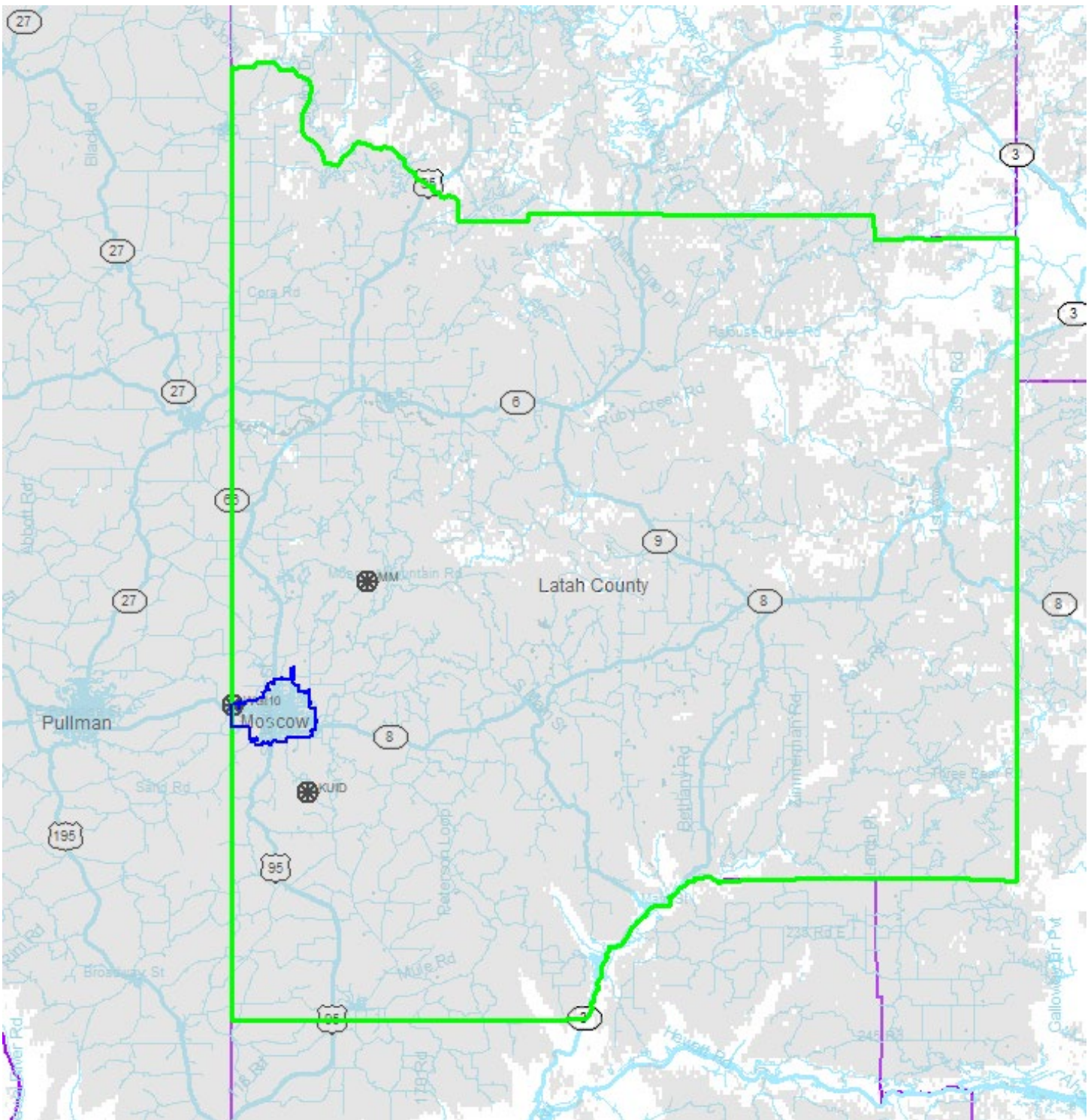


On the coverage maps that follow, the gray areas are covered, and the black/dark is simulcast delay spread areas. Since the system as outlined above is balanced or slightly talk-In limited, the maps shown are for talk-out only. We have provided three different maps, Mobile talk-out, Portable talk-out (on the street, and Portable talk-out (indoors TSB-88 levels). All Portable maps assume the radio is at the hip.

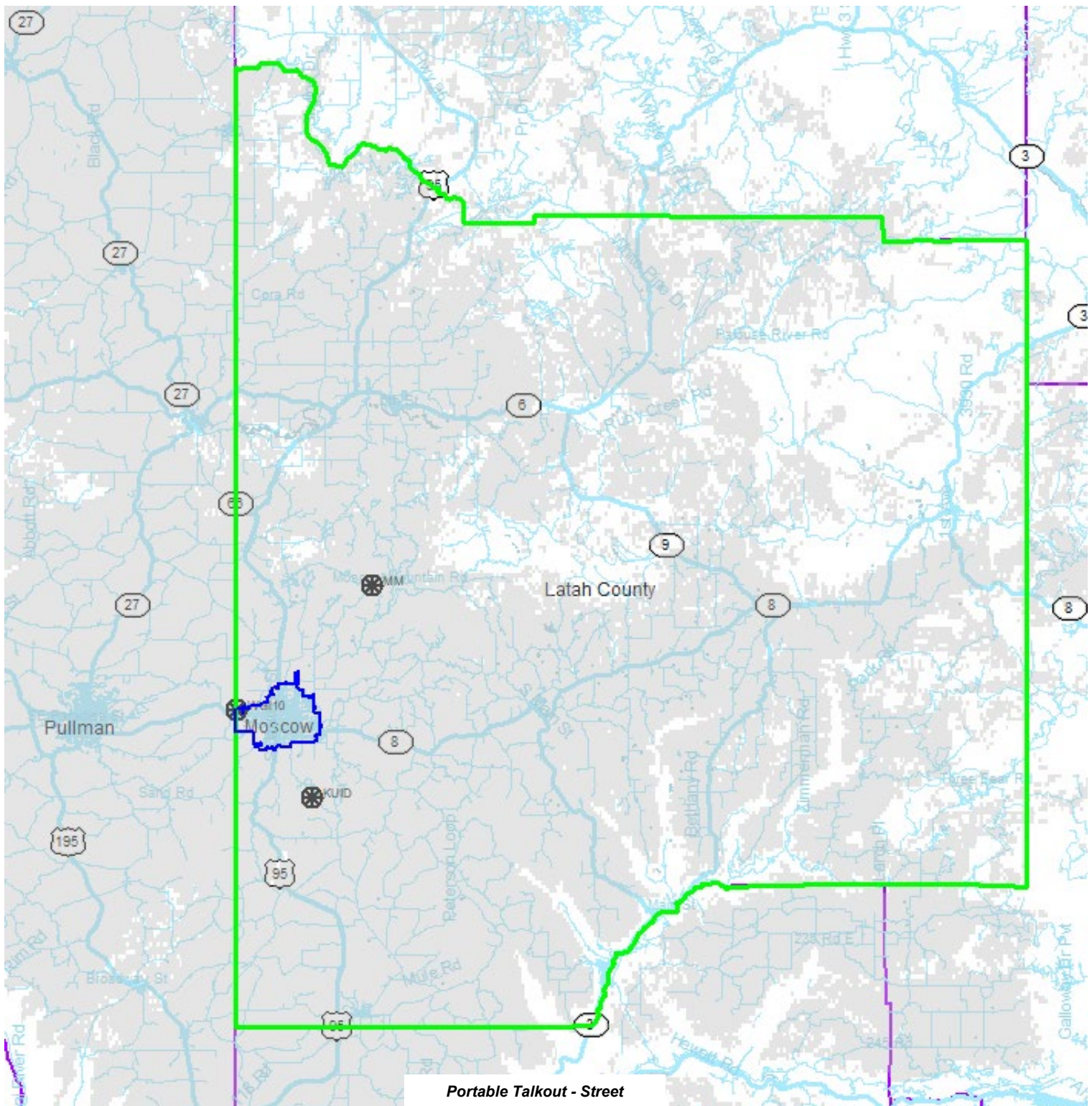
For each of the coverage maps shown, the tool provides the percentage of that area (County and City Limits that is predicted to be covered in each of the areas. These will be listed after each map. The highest level available is 95%. If the level is greater than that we will >95% but not the actual predicted number.

Larger maps are provided at the end of the System Overview in the attachments section.

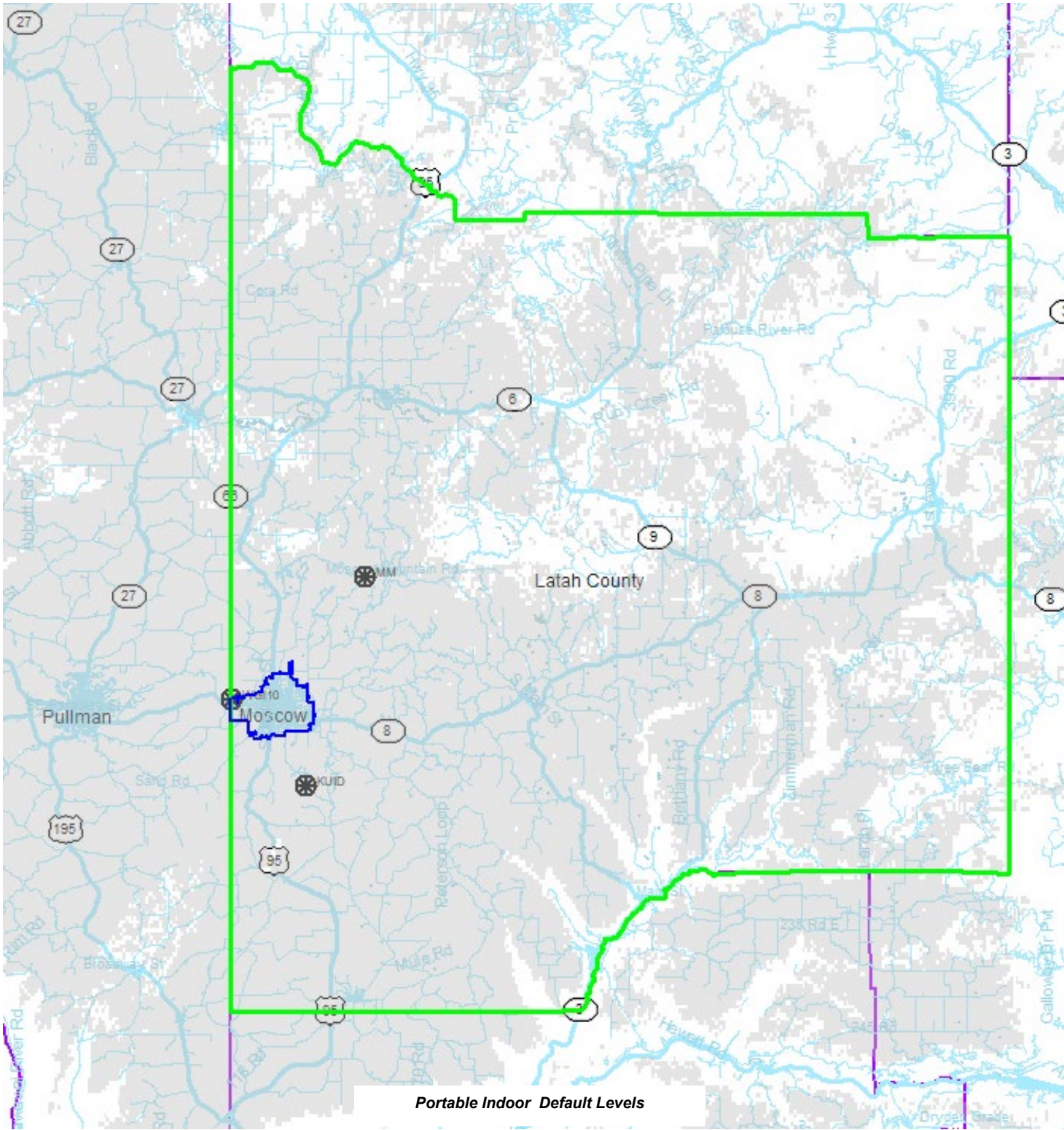
The following maps are for the three Site with F1 – F3



Mobile Talk Out BAPC is >95% for the City of Moscow and 88.0% for the County

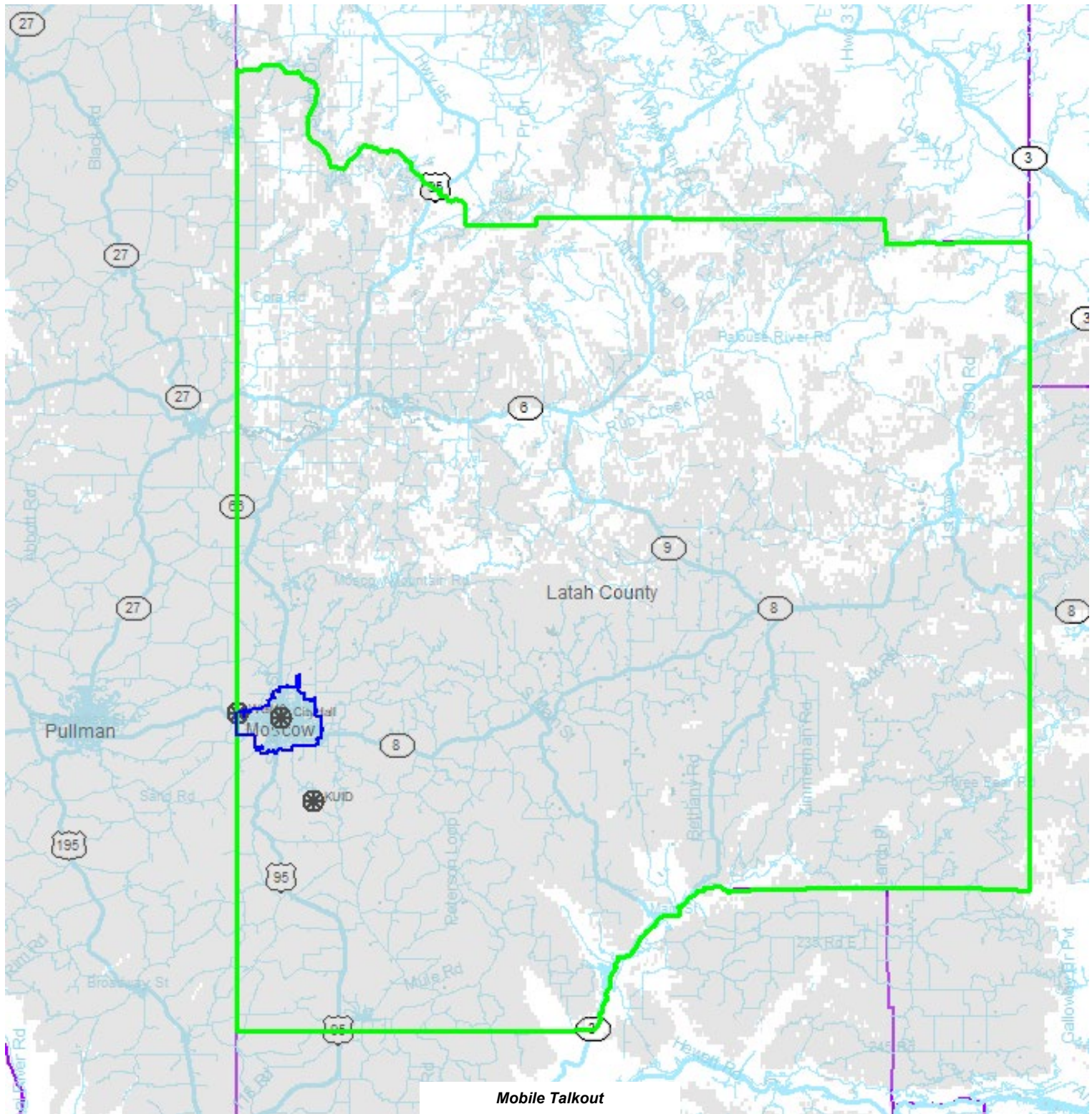


Portable Talk Out - Street BAPC is >95% for the City of Moscow and 72.0% for the County



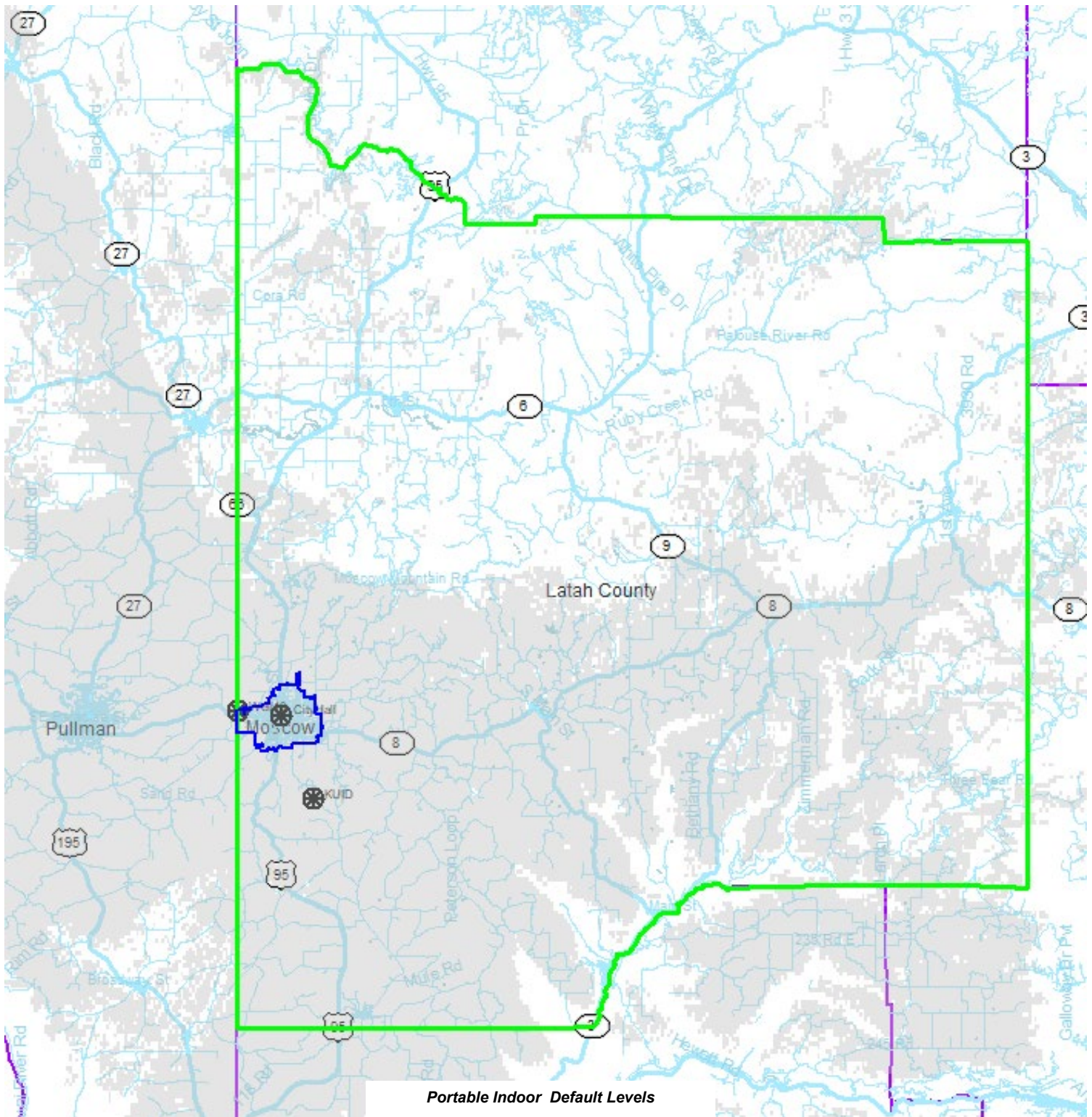
Portable Talk Out - Indoors BAPC is >95% for the City of Moscow and 68.5% for the County

The following maps are for the three Site with F4 – F5



Mobile Talk Out BAPC is >95% for the City of Moscow and 74.5.0% for the County





Portable Talk Out - Indoors BAPC is >95% for the City of Moscow and 47.5% for the County

Overview of the Tait TB9400 ASIP Solution

TB9400 base stations have built voting capabilities and an Ethernet interface, so extra modules such as voting comparators and digital interfacing equipment are not required. They are interconnected over an IP-based linking infrastructure that is part of the County's new linking system being proposed as part of the RFP.

The TaitNet network is managed using a standard web browser to access a TB9400 station. The browser can connect to any Tait network element from anywhere in the network or beyond. It can remotely monitor and configure the connected network element. It can also carry out diagnostic tests and upgrade firmware. The L3H ENM network monitor included in PC1 will provide as an alarm center, receiving alarms and call records from any network element, displaying them, and storing them in the logs.

TaitNet networks comply with the APCO P25 set of standards. This means, for example, that they support dual mode (digital P25 and analog FM) operation and the use of P25-compliant mobiles and portables from other manufacturers.

Network Signal Paths

The base stations receive calls from SUs. In digital P25 mode, these communications are in the IMBE format, with forward error correction added. The base stations correct any errors and remove the forward error correction bits. They put the result on the network as 'voice over IP' using RTP (the Internet real-time protocol). Routers or switches pass the RTP packets to the router, and then over the bearer network to other network elements.

Analog FM calls can also be networked and sent using RTP. The received voice is put into the G.711 digital format and sent out using RTP. G.711 that uses more bandwidth than IMBE for each channel.

In addition to this voice traffic, the linking infrastructure carries alarm messages (SMTP) and management communications with the stations and between them. Alarms and other status indications can be sent to a network monitor.

Dual Mode

The TaitNet network supports dual-mode operation. TB9400s can receive and transmit in digital P25 and in analog FM mode and the network can carry speech for both modes. If a TB9400 receiver's RF interface is configured for dual mode, it listens for digital P25 signals. If it detects them, it switches to digital P25 mode, otherwise it receives in analog FM mode. When a dispatcher initiates a call, the TB9400 transmits in the default mode for the channel, unless the console selects a different calling profile. Base stations operating in dual mode operate to their full specification, even if the analog FM mode is wide-band. An additional filter in the digital front end means that the receiver can listen for analog FM with a wide-band setting and for digital P25 using a narrow-band filter. Sensitivity and selectivity for digital P25 signals are largely unaffected by dual-mode operation.

Encryption

All TaitNet P25 networks support end-to-end encryption between radios. No additional network licenses or configuration settings are required. The network simply passes on the encrypted data or voice.

Simulcast

Simulcast is the simultaneous broadcast of the same signal from several base stations, all of which transmit on the same frequency.

Simulcast brings the following benefits to conventional operation:

- Economical in use of frequencies. The transmitters in a simulcast area all use the same frequency.
- Seamless roving. Users do not need to manually switch channels as they move out of the coverage area of one base station and into another. The SU always receives and transmits on the same frequency. Uplink voting handles the handover from one coverage area to another. Downlink voting is not needed or used.
- All-informed coverage over a very wide area.

Simulcast systems can improve signal quality because the combined signal from several transmitters is stronger. However, there can also be a degradation in signal quality in some parts of the area of overlapping coverage, but this is minimized using a modulation scheme designed for simulcast (such as LSM), by tight control of the carrier frequency and the deviation accuracy, and by careful site planning and managing overlap areas.

Simulcast requires exact timing of transmissions. This timing is provided to each transmitter by a 1PPS pulse from a GPS-disciplined timing reference.

Channel Group Overview

TB9400 base stations are designed to work together as channel groups. A channel group is a single logical channel that provides a distributed RF receive and transmit function. Often, a channel group has one member at each site in the network, so that it can provide coverage over the full network coverage area.

The members of a channel group communicate with each other using an IP-based proprietary Tait protocol. If desired, the channel group can have a voting function enabled by software. This voting provides the best available RF signal for repeating and providing external interfaces.

A channel group member can provide a gateway function, offering an analog line interface, a trunking (TCCP) or a digital dispatcher (DFSI) interface to an external device. This member is referred to as the channel group master, as it exerts control over the channel group, based on commands it receives from the external device.

Channel Group Size

Channel groups normally have up to 14 members. This number can be extended to 30, for example to provide coverage over remote areas with low traffic density or to add receive-only sites to improve uplink coverage. The linking infrastructure must be able to handle the additional bandwidth requirements. A system design with multiple hops can significantly increase call setup time. The central voter can handle up to 14 simultaneous incoming voice streams. If this number is exceeded, for example when a radio is transmitting from a helicopter or a high-powered mobile is at the top of a mountain, voice dropouts can result.

Channel Group Reliability

Channel groups may cease operating as expected due to:

- base station failure (while the channel group re-converges)
- base station going offline or online
- base station configuration change
- base station alarm activating.

As a distributed collection of base stations, a channel group must 'settle' during events before all the base stations can be coordinated. For this reason, the channel group is not reliable during the following events. These can cause the audio to be not guaranteed for periods of around 5 to 10 seconds.

- At start-up of the channel group as all the base stations are powered up
- Following a change of configuration
- When the central voter has disappeared from the channel group and the backup central voter has become the active central voter.
- When the original central voter has been restored to the channel group and is regaining the role of active central voter

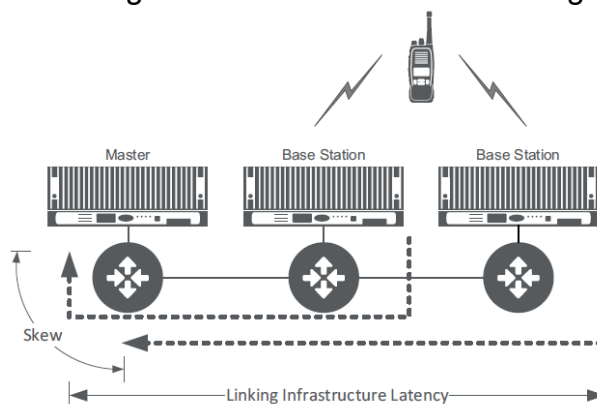
Voting

The channel group itself can continually vote at packet level on the voice streams it receives from its RF interfaces. This enables it to repeat the best possible received signal and to provide that signal to the channel group's interfaces. In effect, voting blends or combines multiple voice streams, always picking the best packet out of those on offer. Voting is centralized at one channel group member, the central voter. This should be positioned centrally, to reduce the maximum network delay for voice streams, which must travel from a receiver to the central voter and then out to all members with transmitters.

Using the DFSI, digital dispatch equipment can override the channel group's normal voting operation. It can select the voice stream from any channel group member or disable any member so that it does not participate in voting.

All voice streams are sent to the central voter. P25 voice streams originating at an RF interface are voted on every voice codeword (20ms), resulting in a high-quality voice stream. Analog FM voice streams are voted 5 times per second. Voice streams that didn't originate at an RF interface also pass through the central voter's switch.

A skew (differences in the arrival time of different streams from the same caller) of up to 100ms can be compensated for in digital P25 mode but not in analog FM.



To avoid having a single point of failure, a second channel group member can be configured for central voting. It will take over as the central voter if the first member fails (this can take up to 30 seconds). When more than one member is configured as a central voter, the member with the lower receiver number becomes the central voter. The other member operates as a satellite voter. RACOM has proposed two voters for each channel being proposed.

The central voter gives optimal results if the longest network delay from a member to the central voter is <40ms and reasonable results if the longest delay is <80ms.

The following criteria determine the outcome of central voting:

- If the streams have the same type, the stream with the best signal quality wins the vote. For analog FM signals, the impairment is used. This is the inverse of signal quality, and its value is included in voice streams. The impairment varies between 0 (best signal quality) and 15 (worst signal quality). The voting of digital P25 streams uses the number of corrected errors instead of impairment.
- If the streams have the same signal quality, the stream at the member with the lowest receiver number wins the vote. However, if the central voter's own stream has no errors, it will be used.

Transmit Timing

When there are multiple transmitters in a channel group, they need to begin transmitting a call together. 'Together' may not mean at the exact same time, but within an appropriate timing window. The size of this timing window varies with the system design.

- If the transmitters use different frequencies, transmit timing needs to ensure that one transmitter does not transmit so much later than the other that it interferes with natural conversation. Network designers should aim for a timing window of around 100ms.
- If the channel group has downlink voting, the transmit timing window needs to be small enough so that when SUs start scanning and voting, all members are transmitting. Network designers should aim for a timing window of a few milliseconds.

- If the channel group is simulcast, transmit timing needs to be exact, so that in areas of overlapping coverage, the signal arrives simultaneously from the transmitters involved. Members have a 1PPS timing pulse that enables timing with microsecond precision. The central voter automatically adjusts the marshalling duration to compensate for network delay and jitter. System installers can adjust the launch time in microsecond increments, to shift the area within which the signal arrives simultaneously.

Transmit timing is adjusted by means of voter configuration parameters. These parameters configure the preamble duration and compensate for network delay and jitter. Channel groups use different parameters, depending on whether they are synchronized or not.

Function of the Transmit Buffer

Each base station has a transmit buffer. This buffer plays an essential role in transmit timing. After the voice stream has begun arriving at a base station and before it's time to start transmitting the call, the transmit buffer stores the arriving packets, later providing them to the transmitter as needed. In this way, it is able to compensate for differences in network delays between members of the channel group so that they transmit together.

The transmit buffer has two other functions: compensating for jitter and storing arriving packets while a call preamble is transmitted. In unsynchronized channel groups, the size of the transmit buffer at the beginning of the call is determined by the configured duration of the preamble.

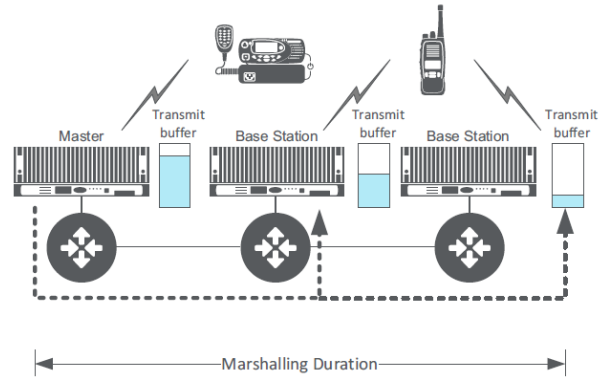
Jitter is the variation in packet arrival time. If packets arrive late, the transmit buffer provides stored packets to the transmitter. It empties until the packets arrive. The larger the jitter, the bigger the jitter buffer needs to be, and the greater the call delay, because more packets need to be stored in the buffer before the call can begin. If the jitter is so large that the buffer runs out of packets, a buffer underflow occurs. The transmitter fills the gap with packets that encode silence. If several silence packets are needed to fill a gap, users notice the glitch.

Jitter has various sources. The network element providing the voice stream produces a jitter of about 10ms. This is the delay variation in clocking out packets onto the Ethernet interface. Switches and routers also contribute to jitter. If there are packets in a queue, the switch or router takes longer to pass a packet through.

Preamble In many networks, transmitters need to preface calls with a preamble. While the transmit buffer is filling, the transmitter transmits a preamble. If there is downlink voting, SUs can scan and vote during the preamble, acquiring a channel before the call begins. Even in networks without voting, a preamble can help SUs to synchronize to the transmission more easily.

In unsynchronized channel groups, the duration of the preamble is determined by the Preamble parameter.

In simulcast networks, a preamble is only required if there are multiple simulcast channels and SUs need to vote between them. If the marshalling time is self-regulating, the duration of the preamble is determined by the Buffer min setting. The regulation process ensures that the base station furthest from the central voter uses a preamble that is about the duration of the Buffer min setting. Other base stations receive the voice stream earlier, start transmitting preamble earlier, and therefore have a longer preamble.

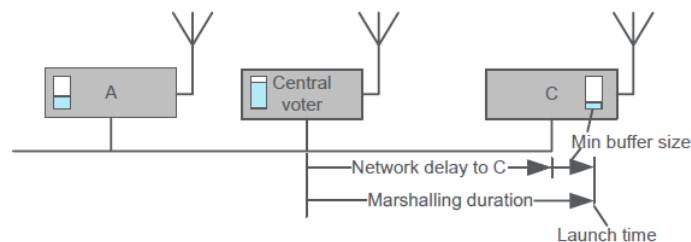


Transmit Timing in Simulcast Channel Groups

Simulcast channel groups are always voted. They are synchronized, which means that transmit timing is under the control of the central voter.

Configuration parameters (other than the local transmit offset) at other members have no effect. All voice streams pass through the central voter and are time-stamped. Members receive these time-stamped voice streams and transmit at the time indicated by the time-stamp. (They can delay transmission by a configurable local transmit offset of a few microseconds.) The time on the timestamp includes an allowance that gives the voice stream time to reach the furthest member and fill its transmit buffer to an adequate level. This allowance is referred to as the marshalling duration.

Normally, the central voter regulates the marshalling duration based on feedback it receives from members. If the size of a member's transmit buffer falls below the configured Buffer min value, the central voter increases the marshalling duration. If the smallest transmit buffer is greater than this value, the central voter reduces the marshalling duration. In this way, the central voter automatically regulates the marshalling duration around the configured minimum buffer size.



Alternatively, the central voter can be configured with a fixed marshalling duration, overriding the automatic regulation.

Under fault conditions, synchronization can be lost. If the transmitter is configured to transmit when unsynchronized, it does not apply any transmit timing but simply begins

transmitting when it receives the voice stream. When synchronization is restored, the transmitter flushes its buffer and transmits based on the timestamp. This causes a glitch.

Dispatcher Control of Channel Group

Channel control messaging is handled by the channel group coordinator in each channel group member. When a member with a DFSI a channel control command, the coordinator acknowledges the command and multicasts it to the channel group. The coordinator also resolves any contention (for example if there is more than one dispatcher connected to the channel group) and ensures that members maintain a consistent state. The coordinators can handle members entering or leaving the channel group because of power failure, channel change, or other uncontrolled activities.

When a dispatch console is connected to a channel group, the dispatch commands to change channel, enable/disable RF repeat, or enable/disable monitor need to be carried out by each member of that channel group. As they are only received by bea base station with an analog line or DFSI, there needs to be a process that passes on these commands to the other channel group members. This enables the dispatcher to exert control over the channel as a whole. This process is carried out by the channel group coordinator.

The channel control coordinator is a software process inside the channel module of each channel group member. The channel control coordinators work together to implement channel control commands and to ensure that the states of all members are consistent. If collective channel control is enabled, a channel control coordinator sends any commands it receives to other members.

Network Design

This chapter presents general considerations regarding bandwidth and QoS, provides generic information about IP address planning, port configurations, and central authentication. The IP network of a conventional network can be very complex beyond older four wire analog circuits. In addition, simulcast systems add an additional layer of design consideration that needs to be taken into consideration during the design phase to minimize issues during and after deployment.

General Bandwidth Considerations

Quality of Service

Quality of Service (QoS) is the ability of the network to transport data packets with low loss, low delay, low variation in delay while preserving packet sequencing. Good simulcast operation requires good network QoS.

To achieve good voice performance, you should configure the network switching fabric for strict priority queuing for real time traffic (service class EF). Base stations in a channel group offer facilities for checking the quality of transmission because of network QoS.

Facility	Description	Advantages	Disadvantages
QoS support	Prioritize the real-time (voice) stream ahead of other traffic	Minimal additional delay when other traffic is present	Requires routers
Switches	Use a VLAN without routers. No other traffic shaping required.	Network is simple and predictable	Cannot use QoS and so must over-provision to accommodate non-voice traffic
		Delays are minimized	

Bandwidth Requirements

Bandwidth requirements vary because the network is host to a range of traffic:

- voice
- control packets for channel groups
- maintenance traffic for SNMP, Syslog, web interface.

SNMP

In particular, the bandwidth required for SNMP traffic among base stations and console gateways is made variable by:

- the number of devices
- the polling period
- the number of monitoring parameters per device
- the period of traps.

Standard Requirements

For a single link (counting all network 'hops') between the base station and another element the standard requirements are:

Parameter	Recommended	Required
Out of order packets	Less than 0.01%	
Packet Loss	Less than 0.01%	
Delay	Less than 40 ms	150 ms max
Jitter	Less than 20 ms	100 ms max
Skew ^d		80 ms max
Minimum bandwidth to carry C+U ¹ traffic	108 kb/s per physical channel	50 kb/s per physical channel
Minimum bandwidth to carry M ² traffic		100 kb/s per site
Minimum bandwidth to meet recommended jitter limits on non-fragmenting link (see non-fragmenting linking and bandwidth below)	600 kb/s per site up to 5 physical channels	

1. C traffic - Control plane traffic such as call signaling, trunked registration, and mode changes. U traffic - User plane traffic, such as voice or packet data from or to subscriber equipment (e.g. portables, mobiles, dispatchers, PSTN, and data terminals).
2. M traffic - Management plane traffic for monitoring and configuration. Includes the aggregation of SNMP, HTTPS, Syslog, firmware downloads, backup/restore, etc.

Notes:

- Parameters within the recommended limit should result in good audio performance.
- Parameters within the required limit should result in correct base station operation.
- C traffic—control plane traffic such as call signaling and mode changes.
- U traffic—user plane traffic, such as voice, from or to subscriber equipment (e.g. portables, mobiles, dispatchers, PSTN, and data terminals).
- M traffic—management plane traffic for monitoring and configuration. Includes the aggregation of SNMP, HTTPS, Syslog, firmware downloads, backup/restore, etc.
- Skew is the allowed differential delay between voter inputs from a satellite close to the central voter and a satellite further away (in term of IP latency) that ensures the input will be voted.
- The channel group master sends voice packets to the other base transceivers in the channel group using multicast. Accordingly, networks, whether simulcast or non-simulcast, must have their linking equipment set up to support IP multicast.
- TN-2532a has advice on network setup and diagnosis of QoS issues.

A few of the possible effects of not meeting the timing requirements are listed below:

- For all systems, increasing network latency causes a direct increase in call setup delay or voice end-to-end delay.
- If the jitter exceeds the specification, the system may not be operational.
- Voice communications can tolerate some loss/late packets.

The table below lists the various packet types carried on Tait networks, together with their recommended DSCP classification, based on their criticality for the network.

Service Class	Packet Type	Protocol/Port Number	DSCP
Expedited Forwarding (EF)	RTP	UDP 9050 [TBC]	46 (EF)
	RTP (channel group)	UDP 27260 UDP 27261	46 (EF)
	Base station/console gateway	UDP 9017 [TBC]	46 (EF)
	NTP	TCP/UDP 123	46 (EF), preferably
Assured Forwarding (AF)	ICMP (echo/ping)	ICMP	26 (AF31)
Best Effort	Web Interface (http/https)	TCP 80/443	0
	Domain Name Server (DNS)	TCP 53	0
	Secure shell (ssh)	TCP 22	0
	Syslog	UDP 514	0
	SNMP	UDP 161/162	0

IP Protocols and Ports

A variety of IP-based protocols are used between network elements. In some situations, firewalls must be configured to allow this traffic to pass across the IP bearer network.

All wide-area communications are unicast IP, and the IP backhaul should not pass the traffic to this unicast IP on to the rest of the network.

The following table lists the default values of ports used for normal communications on the base station only.

Type	Usage	Ports/Protocols
Core Interfaces		
■ DFSI	Communications between console and base station	UDP 7000-7002
■ Console Gateway	Communication between the console gateway and master base station	50,000 UDP and 50,001 UDP
■ NTP	time-stamping for logs and simulcast operation	TCP and UDP 123
Management interfaces		
■ Web interface (https)	Management PC to base stations, NMS, switches and routers	TCP 443
■ Secure shell (ssh)	Base stations, switches and routers to NMS	TCP 22
■ Syslog	Base stations, switches and routers to NMS	UDP 514
■ Simple network management protocol (SNMP)	Base stations, switches and routers to NMS	UDP 161/162 (10161 for SNMP v3)
■ ICMP	NMS and management PC to base stations, switches and routers	ICMP
■ RDP	SNMP Manager Remote Desktop. (Not required but preferred for VPN access if EnableMonitor is deployed.)	TCP 3389

Avoiding Multicast Port Number Conflicts

The channel group protocol allows base stations when operating in a voted channel to communicate their presence and status and agree on which base station is the channel group master. The channel group protocol operates among base stations in one channel group providing one voted channel.

Multicast IP addresses and port numbers do not behave in quite the same way as unicast. It is important to avoid aliases between port numbers with multicast operation. The following rule should help you avoid problems. This advice assumes a switched network without special time-to-live rules: Give all channel groups in the network a distinct channel group IP multicast address. Channel groups that have distinct multicast addresses can use the same port number for channel group operation.

Central Authentication

IT security is essential for police, utility and public safety organizations. Human lives may depend on their ability to block unauthorized access to data and communications. IT security is a standard government requirement for such organizations. AAA stands for:

- Authentication: confirming that a user is who they claim to be.
- Authorization: centralized control over all authentications on a system.
- Accounting: providing an audit trail.

The AAA security feature provides:

- Centralized control over all who use an IT network.
- The ability to grant access to a network and define the level of access.
- The ability to change or terminate the level of access of a specific user.
- A record of all attempts to access the network.

It was designed to comply with NERC CIP-004-3a (Personnel and Training) requirement 4.2, which requires the ability to revoke access to a network within 24 hours.

The existing LDAP system can also be used to manage passwords with the TaitNet System.

Network Time Protocol

Network Time Protocol (NTP) is a software algorithm that keeps computers and other technologies synchronized to within milliseconds of each other. Time synchronization is essential for networks, especially those that conduct time sensitive transactions. Time-stamps are used by computers to identify when a transaction have taken place or need to take place. Different time measurements across a network can cause a range of problems, from transactions not occurring to data being lost. Simulcast and voted channel operation require an accurate source of NTP

Because of the importance of synchronization, a time server system is required, first, to keep all devices on a network running at the same time, and second, to ensure that the different computer networks which speak to each other are also synchronized. This is where NTP comes in. But NTP only works if it has a reliable form of time with which to use as a master time source.

Microwave System

Backhaul

Aviat has the trusted, reliable solutions required for the critical applications to support City of Moscow today and in the future. With over 2 billion in-service operating hours, Aviat's high-performance, mission-critical microwave radios are proven dependable for applications that just need to work.

RACOM is pleased to provide the City of Moscow with the following microwave design as the backhaul solution for their mission-critical needs.

Backhaul System Description

This project will provide a microwave backhaul network for the City of Moscow. The microwave radio platform proposed is Aviat's Eclipse ODU600v2 split-mounted radios that will be paired with the INUe system, which supports hybrid Ethernet or all-IP transport in an efficient nodal architecture that can support up to three (3) 1+1 HSB independent radios in a single chassis based on what work best for the site. Racks, breaker panels, antenna systems, and ProVision NMS have also been proposed.

Thirteen (12) new Eclipse ODU600v2 Eclipse split-mount radio hops:

- 4 links of High Power (HP) 11GHz
- 2 links of Standard Power (SP) 23 GHz

Path details

Preliminary Path Loss and Fade Margin Calculations are provided as part of the documentation for this proposal. The path calculations are based on the data provided and radio guaranteed specifications. It is assumed that sufficient clearance is available on all paths.

Paths have been designed to and equipment selected with the following criteria:

- Software: Pathloss 5.1
- Fading Algorithm: Vigants-Barnett
- Rain Model: Crane 1986
- Availability requirement: two-way 99.999%
- Terrain Data USGS NED 10m elevation
- Clutter Data USGS NLCD 2016 10m
- Path clearance criteria:
 - 60%F1@ K=1.33
 - 100%F1 @ K=1.33 for main-to-main antenna
- ACM enabled, steps at 128QAM, 256 QAM, 512 QAM, 1024 QAM, 2048 QAM and 4096 QAM; reference modulation 128 QAM (155Mbps)

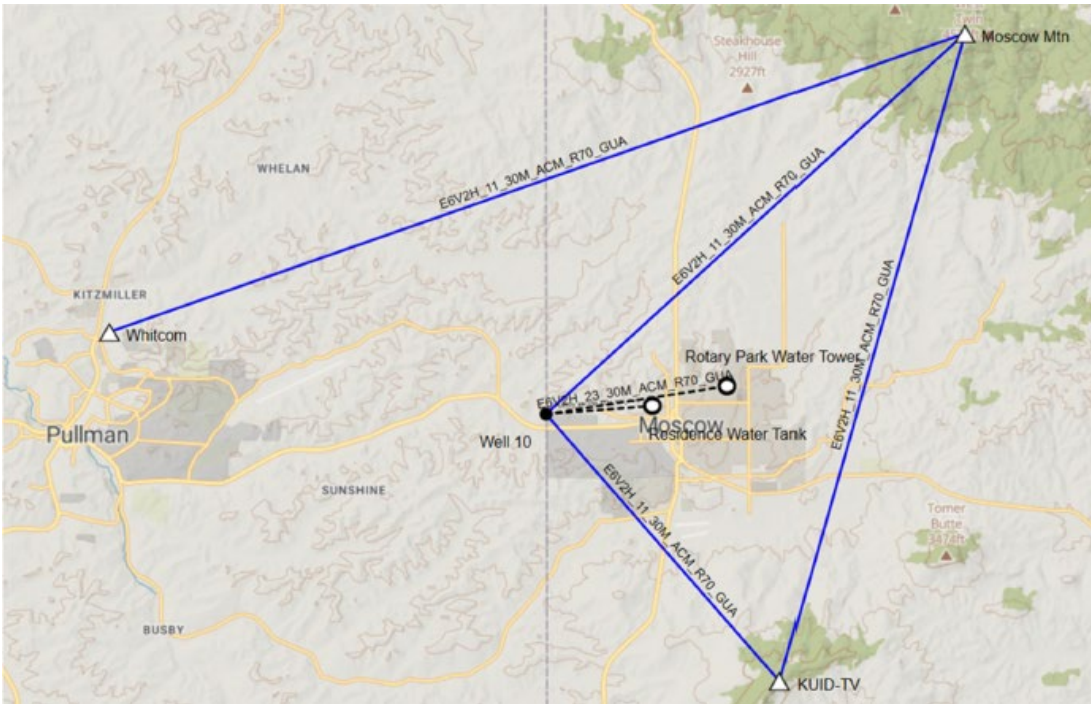
The following table shows the radio hops, including Site Names, Antenna Centerline, Antenna Size, Frequency Band, Reliability, Fade Margin, and Bitrate.

Site A	Antenna C/L (ft)	Antenna Size (ft)	Site B	Antenna C/L (ft)	Antenna Size (ft)	Path Length (mi)	Frequency (MHz)	Two-Way Availability (%)	Fade Margin (dB)	Layer 2 Bitrate (Mbps)
Moscow Mtn	50	3	KUID-TVe	105	3	9.32	11200	99.9999	35.16	155
Moscow Mtn	15	4	Whitcom	110	4	12.56	11200	99.9991	26.36	155
Moscow Mtn	15	3	Well 10	70	3	7.83	11200	99.9998	27.60	155
Well 10	70	3	KUID-TV	45	3	4.92	11200	99.9998	47.00	155
Well 10	85	2	Rotary Park WT	55	2	1.48	23000	99.9999	35.14	155
Well 10	85	2	Residence WT	55	2	9.31	23000	99.9999	28.17	155

Link Summary City of Moscow Proposed Network (At Reference Modulation of 128QAM)

Network Diagram

The following network diagram displays the radio sites and links color-coded by FQ Band.



City of Moscow Network Diagram

The backhaul network for the City of Moscow consists of three (3) links in a Ring Topology operating at the 11GHz frequency bands. Three (3) additional links as single spurs operating at the 11GHz or 23 GHz frequency bands. The channel bandwidth of the links operating within the ring and the spur will be 30MHz. All links will operate with Adaptive Code Modulation (ACM). The following table shows the Ethernet throughput at each modulation step for the City of Moscow System.

Modulation Steps	Throughput 40MHz (Mbps)
4096QAM	267
2048QAM*	245
1024QAM	227
512QAM	200
256QAM	180
128QAM*	155

Modulation Steps for
City of Moscow Network
* - Reference Modulation

Aviat Eclipse Equipment Details

Eclipse Packet Node INUe

The INUe replaces the traditional terminal or single link-based approach to networking with a nodal solution, supporting up to six links in a nodal configuration. Radio paths and customer interfaces are customized by plug-in cards, now supported by two switched planes: packet and circuit. This nodal concept dramatically reduces equipment, cabling, and rack space, delivers superior network flexibility and resilience, and minimizes costs.



Eclipse INUe

Our proposal includes Eclipse Packet Node INUe shelves equipped with the following plug-in units:

- Node Controller Card (NCC)
- Node Protection Card (NPC)
- Radio Access Cards (RAC70)
- Gigabit Ethernet Data Access Cards for 10/100/1000 MBs Ethernet traffic (DAC GEV3)
- Auxiliary Cards (AUX) for third party alarm connections

The NCC provides node management and control, primary DC power, and interfaces for Portal and NMS. A removable Compact Flash card holds configuration data and software License. The NPC provides redundancy protection for the INUe controller and DC power supply.

RAC 70

The RAC70 (Radio Access Card) delivers the latest modem technology for microwave transport. The RAC70 modem can be software configured to support ANSI channels from 3.75 to 80MHz, supports a modulation range of QPSK to 4096QAM (with and without ACM), and can be paired to support hot-standby and diversity configurations. Adaptive Coding and Modulation is an available feature providing hitless modulation switching, which can be enabled by an optional feature license if required.

Our quote includes sufficient RAC70 cards required to support the proposed configurations.



DAC GE3 Card

The DAC GEv3 provides a Gigabit Ethernet interface and advanced packet processing for the Eclipse platform. It includes a 5 Gbit/s Packet Plane that inter-operates with INUe backplane to deliver unmatched flexibility to support hybrid mixed mode TDM+IP or all-IP transport.

The DAC GE delivers Quality of Service (QoS) controls and performance monitoring capabilities and will also support advanced data networking features such as internal link aggregation (802.3ad), Rapid Spanning Tree Protocol (802.1w), and VLAN support.

- Programmable 5 Gbit/s switching fabric
- IPv4 and IPv6 packet handling
- 1+1 redundancy via a stacking switch
- Supports L1 and L2 link aggregation
- Traffic Policing
- Service OAM

Each DAC GE3 has the following ports available:

- Three RJ-45 10/100/1000Base-T ports
- Two ports for optional SFP plug-ins:
 - Optical LC 1000Base-LX 1310 nm single-mode (IEEE 802.3z compliant)
 - Optical LC 1000Base-ZX 1550 nm single-mode (IEEE 802.3z compliant)
 - Optical LC 1000Base-SX 850 nm multi-mode (IEEE 802.3z compliant)
 - Electrical RJ-45 1000Base-T (IEEE 802.3ab compliant)

For the City of Moscow, each INUe shelf will be equipped with two DAC GE3 cards, one facing east and another facing west at each location on the ring hops configured in protected mode. The spur will be configured in an A and B redundant configuration.



Eclipse DAC GE3 card

AUX Cards

The Eclipse AUX card provides synchronous RS-422 and/or asynchronous RS-232 auxiliary data service channels and alarm input/output functions. It can support physical Alarm I/O for up to six (6) alarm inputs or up to four (4) Form C relay outputs and two (2) alarm inputs.

Each INUe includes 1 AUX card to support the requirement for alarms inputs and outputs of the Microwave system.

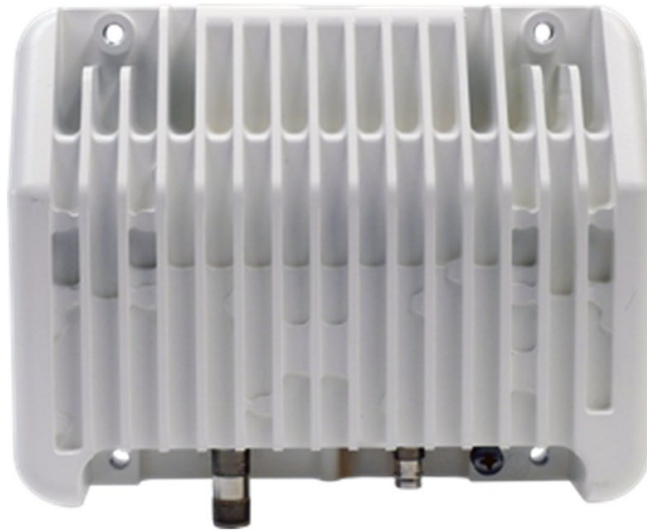


AUX Card

Eclipse's ODU600v2 11&23 GHz split-mount transceiver

Aviat Eclipse ODU600v2 radios deliver best-in-class output transmit power across multiple frequencies, making it a highly attractive and competitive platform that builds on Aviat Networks ongoing radio innovation leadership. Increased power provides the flexibility to adjust for increased availability, throughput and/or distance.

The ODU600v2 is available in two power output levels: Standard Power (SP) and High Power (HP). The ODU600v2 radios will be mounted on the towers at each site and will be connected to the Aviat's Eclipse INUe. Flexible waveguide will be installed between the ODU600v2 coupler and the antenna.



Eclipse ODU600V2

Antenna Systems

Microwave antennas form an essential part of modern mobile communication networks. For the City of Moscow, we are proposing the use of a VHLP3-11W (TR), VHLP4-11W (TR) or VHLP2-23/C (TR) Ultra-High-Performance antennas. All antennas are offered to adhere to the FCC Part 101 Category A performance specification. All antennas proposed are equipment with radomes and support a standard wind velocity survival rating of 125 mph. Ice shields have been included for each of the dishes.

The antenna types, sizes, centerlines, and transmission line lengths are preliminary, subject to the path/site survey verification and frequency coordination / FCC licensing results.

Provision - Network Management System

ProVision monitors the health & performance of the RACOM backhaul network. Our design includes redundant servers. It can provide executive summary reports of the network. When ProVision detects an alarm, the operator can use the ProVision GUI to drill down and examine the location and details of the alarm. The level of detail provided by ProVision allows the City of Moscow backhaul caretakers to assess quickly, respond to, and remedy any failure.

ProVision can also generate inventory reports, perform periodic configuration backup for disaster recovery, and facilitate bulk software upgrades.

Network Assurance features are:

- Highly scalable tree, map, and tabular views of network resources
- Automatic discovery of devices, configurations, RF links
- Event collection with browsers, notifications (email, SMS, etc.), and graphical scoreboards views
- Device and RF (G.826, RX/TX, etc.) performance collection with history and trend views, and alarm thresholding
- Ethernet interface performance collection with history and trend views, and alarm thresholding
- Ethernet bandwidth utilization network analysis
- Automatic backup of changed device configurations with the ability to restore
- RF, Ethernet, and Clock sync network health analysis and reporting

Service Assurance features for Eclipse platforms are:

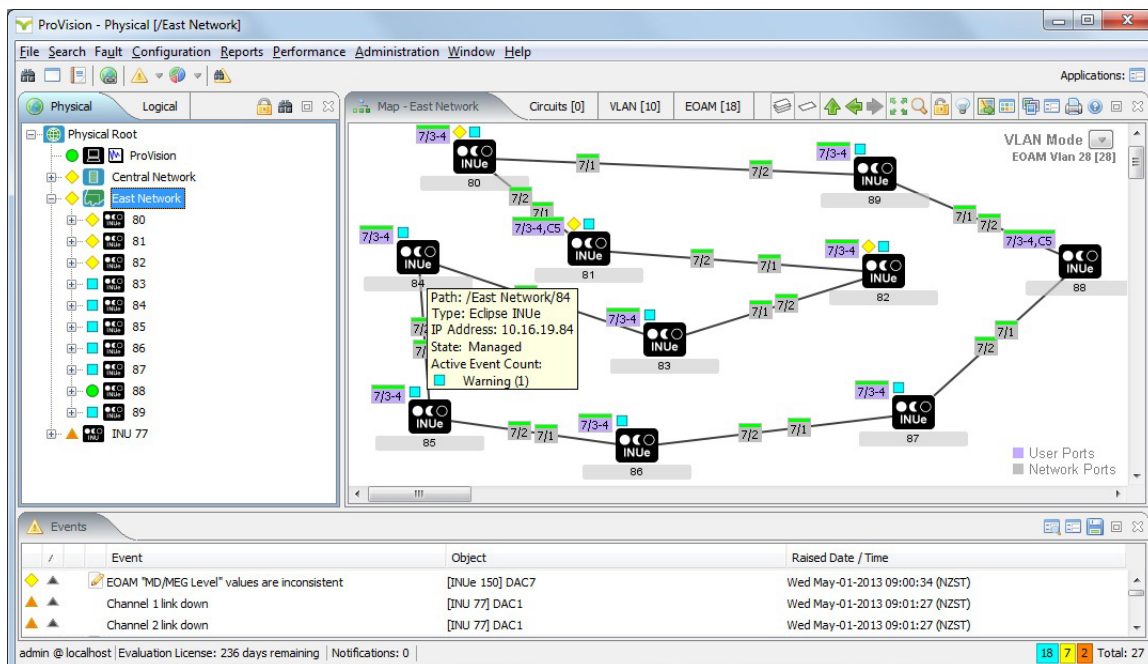
- Ethernet services
- VLAN, Ethernet OAM, and ERPS automated discovery and visualization
- Automated end-to-end continuity testing
- Loopback and Link-Trace diagnostic testing

Provisioning features are:

- Provisioning of settings for multiple devices in bulk through predefined Configuration Profiles
- Software loading of devices in bulk
- License loading of devices in bulk
- Device integration

ProVision User Interface

From the main ProVision interface, users can perform all the required functions to manage network responsibilities quickly and effectively.



Four tabs provide views of ProVision devices:

- Physical - Displays the entire network's complete "tree view."
- Circuits - Displays TDM circuits.
- VLAN - Displays VLAN connections and related devices.
- EOAM - Displays Ethernet OAM connections and related devices.

The Map Viewer provides two different views of the network: Physical and Flat Map. The following object types are supported in the Map Viewer:

- Region
- Site
- Rack
- Device objects
- RF links
- Logical links
- Ethernet cable links

Radio Programming

RACOM understands the scope and requirements outlined in the RFP for the programming of the current Portable and Mobile Radio. RACOM will coordinate with the City to produce a new template for the different user groups and radios.

Since the actual number of radios and types is defined in the RFP, we have included the cost per day for a radio technician to be on site. The number of days to program the radios will be dependent on how many and the availability to access each of them.

RACOM will work with the City to better estimate the effort as more information is known and will be flexible in the scheduling to accommodate different user shifts and the availability of the equipment to program.

DC Power Systems

RACOM understands the scope and requirements outlined in the RFP for the DC Power Systems Installation and following the information outlines what we have proposed to be used for each of the areas outlined. While these are one of several vendors that offer solutions that meet the specification outlined, RACOM is happy to and has work with many of the suppliers if the City has a product, they prefer over one of those proposed.

RACOM has proposed a -48VDC solution and has not included any DC-to-DC converts to support other voltages. If these are needed at a site for other equipment that requires 12VDC or 24VDC, these can be added as needed but have not been included in what we have proposed.

The sizing for the DC Power System proposed is based on the following assumptions as to what will need to be supported at each of the sites and what RACOM has included in our proposed solution. Our expectation is that these will be reviewed and updated during detailed design phase and adjustments made if needed.

Site Power @ -48VDC		5 Channel RX Site		2 Channel Site		3 Channel Site	
Description	Unit Current (Amps)	Qty	Total Current (Amps)	Qty	Total Current (Amps)	Qty	Total Current (Amps)
Network Switch	3.62	1	3.62	1	3.62	1	3.62
RX Multicoupler/TTA	0.60	1	0.60	1	0.60	1	0.60
Spectracom Freq Standard	0.90	0	0.00	1	0.90	1	0.90
Active Channel Repeater	7.40	0	0.00	2	14.80	3	22.20
TB9400 RX Mode	0.48	5	2.40	2	0.96	3	1.44
Max Req'd Power (Amps)			14.33		28.59		36.47
Ave Req'd Power (Amps)			14.33		19.06		22.17
Heat Generation (BTU/hour)			355		1040		1418

Power Distribution

RACOM has include one DC Distribution panel per Rack with DC equipment in it. RACOM will typically use TRIMM Panels but are willing to use other panels if the City has a preference.



Inverters

While RACOM has not included any inverter/convertors as our proposed solution is all 48VDC equipment if it should it be determined that DC to AC or DC to DC are needed RACOM typically will use the Wilmore products unless the City prefers something else.



Rectifiers

RACOM is proposing the Newmar DC Power System with Commander II+ Rectifiers. The Commander II Series offers top of the line power and reliable performance while providing complete customization when it comes to functionality, scale, and management. The system comes with a web-based monitoring and troubleshooting platform that can be entirely tailored to fit individual needs, providing a completely remote management tool that delivers real-time data at your fingertips.

This system offers hot-swappable modules for quick and easy deployment, minimizing installation time and maximizing uptime, and comes with a one-year warranty. When searching for dependable and reliable DC power system for your next deployment, trust the Commander II & II+ to offer The Powerful Difference. unparalleled network availability.



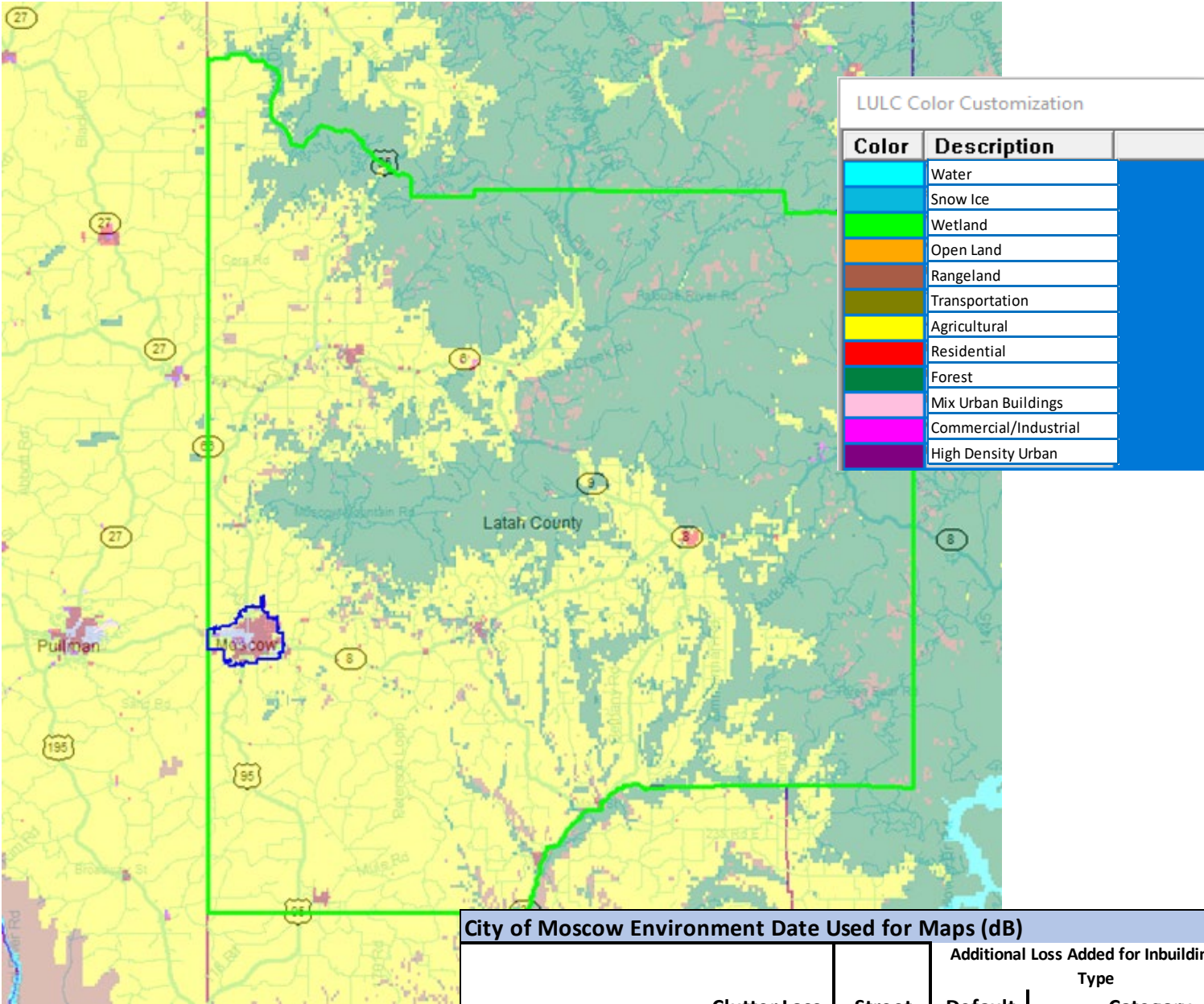
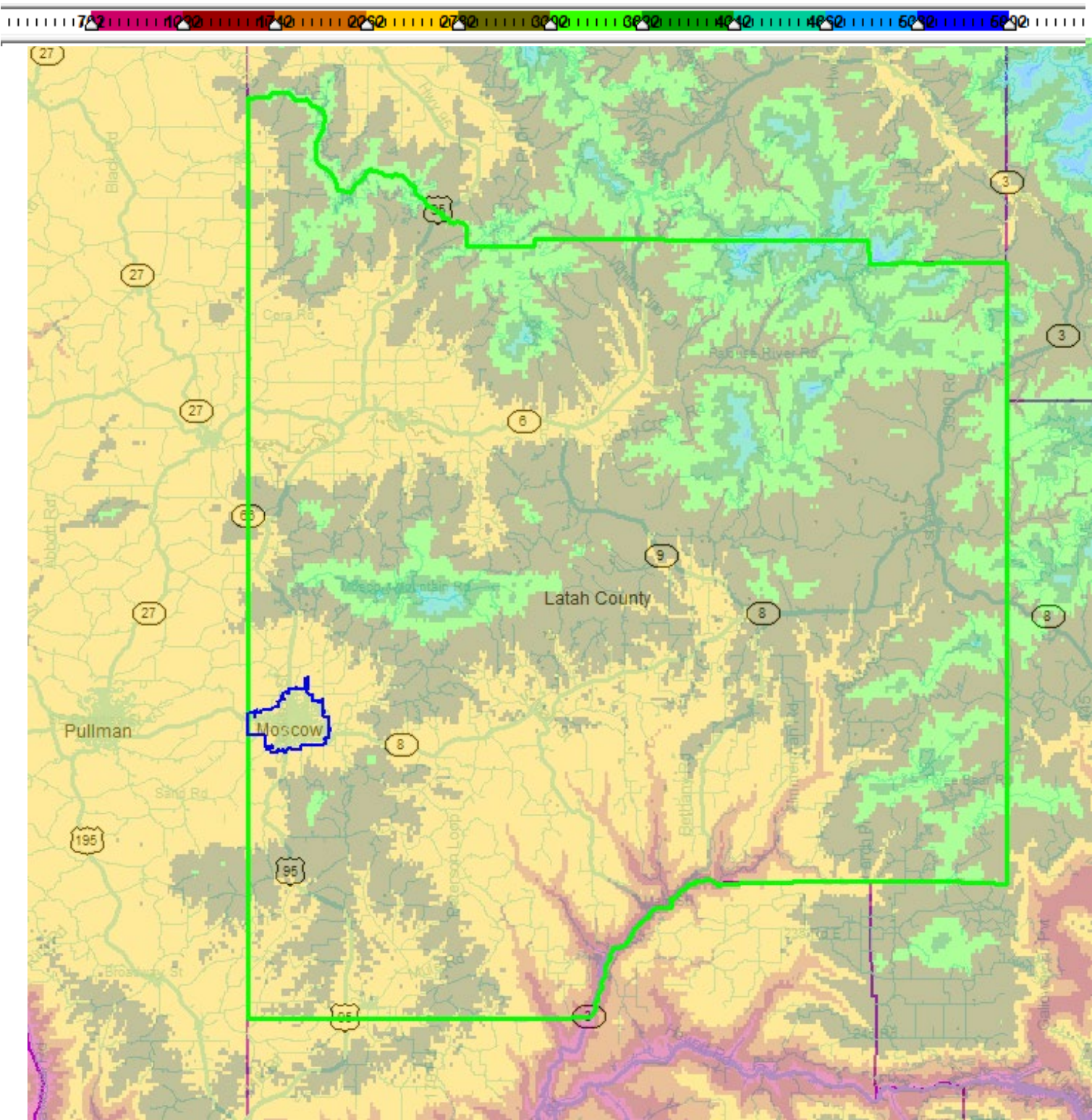
Batteries

RACOM has included for all the sites getting a new power system a battery tray and batteries for 100Ah based on the current loading outlined above. RACOM typically prefers NorthStar, Power Safe, or DEKA and will work with City on which solution will work best for you and your needs.



Larger Drawings, Images and Maps

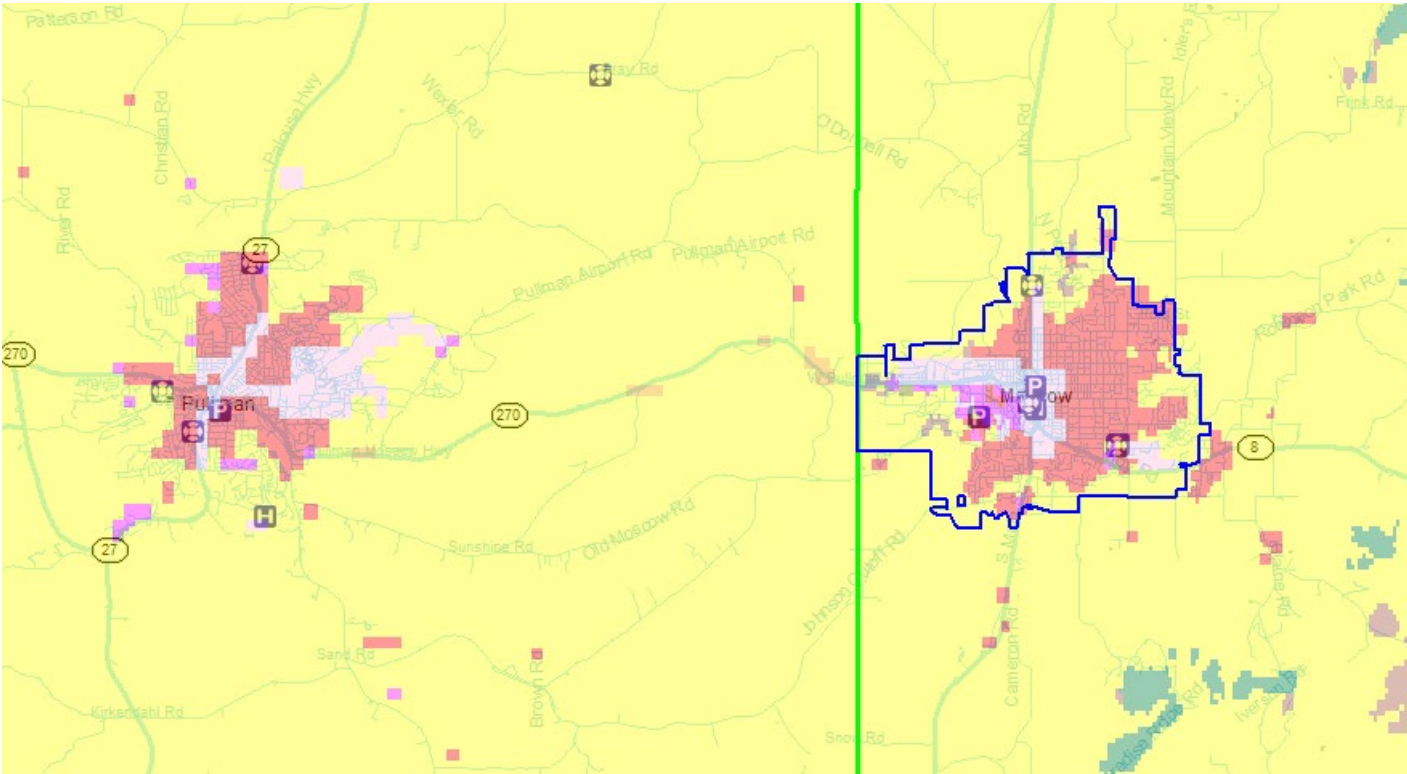
Land Use and Loss Clutter (LULC) Maps and Coverage Prediction Assumptions



LULC Color Customization	
Color	Description
 	Water
 	Snow Ice
 	Wetland
 	Open Land
 	Rangeland
 	Transportation
 	Agricultural
 	Residential
 	Forest
 	Mix Urban Buildings
 	Commercial/Industrial
 	High Density Urban

City of Moscow Environment Date Used for Maps (dB)				
	Clutter Loss	Street	Additional Loss Added for Inbuilding by Type	
			Default	Category
Water	0	0	0	Lakes
Snow & Ice	0	0	0	Snow Pack
Wetland	3	0	3	Non-forested
Open Land	5	0	3	Bare Land
Rangeland	9	0	3	Herbaceous
Transportation	3	0	3	Roadways
Agricultural	3	0	3	Grassland
Residential	14	0	6	Suburban
Forest	8	0	3	Pine (>30')
Mixed Urban/Buildings	15	0	10	Apartment (<4 stories)
Commercial/Industrial	14	0	15	Commercial Services
High Density Urban	15	0	20	Skyscrapers

Land Use and Loss Clutter (LULC) Maps and Coverage Prediction Assumptions



Land Use Land Clutter Map
City of Moscow & Pullman

LULC Color Customization	
Color	Description
	Water
	Snow Ice
	Wetland
	Open Land
	Rangeland
	Transportation
	Agricultural
	Residential
	Forest
	Mix Urban Buildings
	Commercial/Industrial
	High Density Urban

Coverage Prediction Assumptions For City of Moscow					
1	General Project Parameters				
	A	Project/Site Datum	NAD83-CONUS		
	B	Frequency	150-174 Mhz		
	C	Project Sensitivity	a. Mobile -107dBm		b. Portable -107dBm
	D	Terminal Antenna Height	a. Mobile 5.0 feet		b. Portable 3.5 feet
	E	Prediction Model	Harris Okumura		
	F	Body Loss/ Harris Portables	Hip: 15dB Head: 8dB		
	G	Service Area/Design Target	Portable 95%/95% Mobile 95%/95%		
2	Mobile Radios				
	A	Transmit Power	50.0 watts		
	B	Receiver	Noise Figure 10 /-107dBm Faded/1.0uV, 50ohms		
	C	Mobile Antenna Gain	-1.0 dB	Net Gain (0dB antenna and -1 line/connector)	
	D	Vehicle Distortion Margin	(-)1.2dB		
	E	Antenna Mounting Position	Center of Roof with a light bar		
3	Portable Radios				
	A	Transmit Power	6.0 Watts		
	B	Receiver	Noise Figure 10 /-107dBm Faded/1.0uV, 50ohms		
	C	Portable Antenna Gain	1/2 wave Unity Gain 0 dB gain		
4	Environment				
		Clutter Loss (dB)		Building Loss - TSB 88 (dB)	
	A	Water	0	0	Lakes
	B	Snow & Ice	0	0	Snow Pack
	C	Wetland	3	3	Non-Forested
	D	Open Land	3	3	Bare Land
	E	Rangeland	9	3	Herbaceous
	F	Transportation	3	3	Roadways
	G	Agricultural	3	3	Row Crops
	H	Residential	14	6	Suburban
	I	Forest	8	3	Pine (>30')
	J	Mixed Urban/Buildings	15	10	Apartments (<4 stories)
	K	Commercial/Industrial	14	15	Commercial Services
	L	High Density Urban	15	20	Skyscrapers

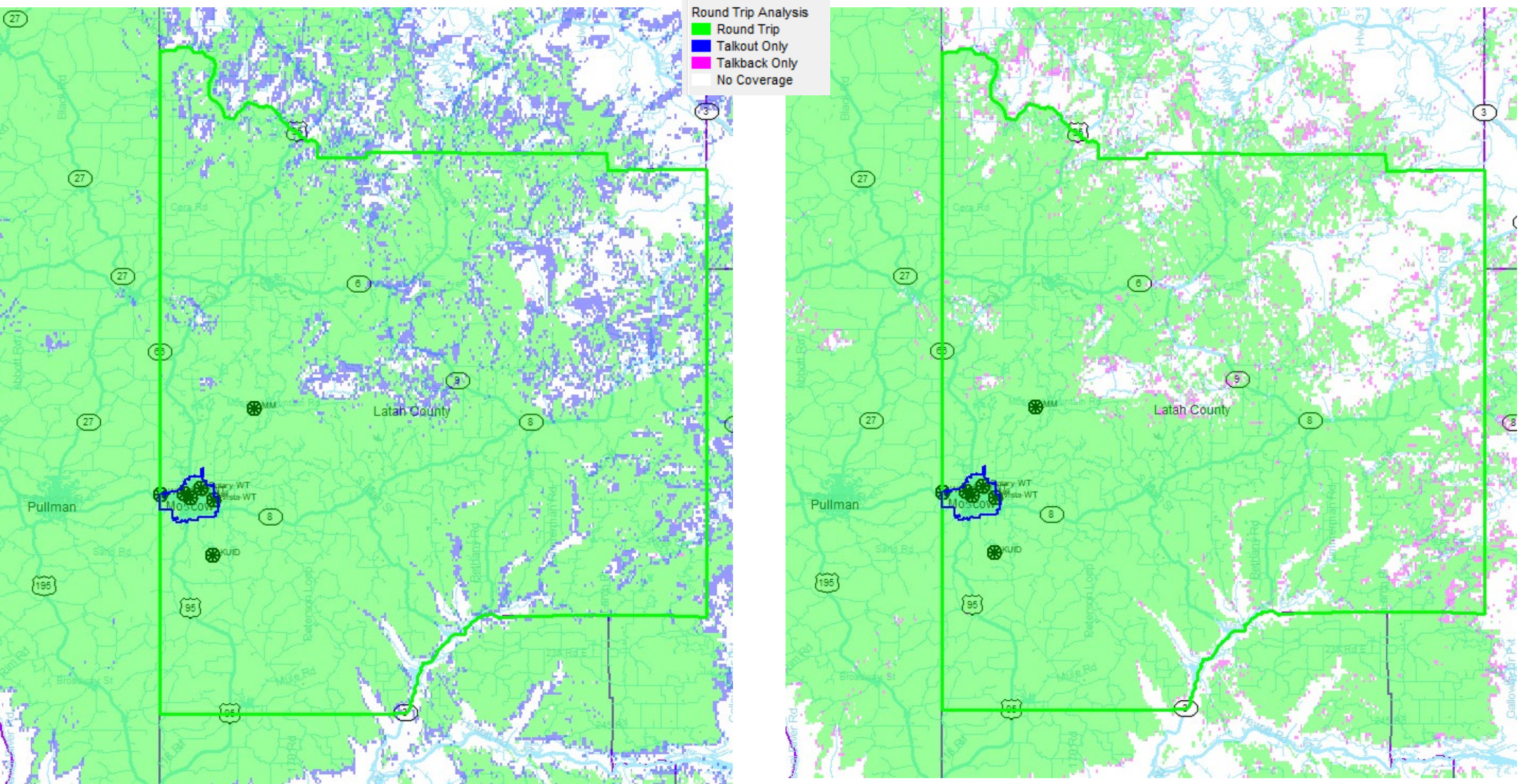
VHF Site Details for Coverage Predictions

Site Name		City Hall	KUID - TV Paradise Ridge	Moscow Mountain	Well10
Site ID		CityHall	KUID	MM	Well10
Latitude		46° 43' 57.790" N	46° 40' 54.000" N	46° 48' 40.950" N	46° 44' 06.700" N
Longitude		116° 59' 59.020" W	116° 58' 17.000" W	116° 55' 02.940" W	117° 02' 21.700" W
Datum		NAD83	NAD83	NAD83	NAD83
Site Elevation		2589 ft	3547 ft	4442 ft	2589 ft
Base Station		TB9400-Analog	TB9400-Analog	TB9400-Analog	TB9400-Analog
Frequency Range		150 - 174 MHz	150 - 174 MHz	150 - 174 MHz	150 - 174 MHz
Site Transmit	Station Output Power	100.0 W	100.0 W	100.0 W	61.7 W
	Combiner Model	DB4345 (2 ch.)	DB4345 (5 ch.)	DB4345 (3 ch.)	DB4345 (5 ch.)
	Tx to Tx Spacing	200	200	200	200
	Combiner Loss	4.0 dB	5.1 dB	4.5 dB	5.1 dB
	Filter/Duplexer Model				
	Filter/Duplexer Loss	0.0 dB	0.0 dB	0.0 dB	0.0 dB
	Coax Type	7/8" Foam	7/8" Foam	7/8" Foam	7/8" Foam
	Coax Length	105 ft	92 ft	110 ft	110 ft
	Coax Loss	0.5 dB	0.4 dB	0.5 dB	0.5 dB
	Antenna Model	ANT150F2	ANT150F2	ANT150F2	ANT150F2
	Antenna Height (C.L)	55 ft	42 ft	60 ft	60 ft
	Antenna Azimuth	0°	0°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°	0°
	Antenna Gain (Hzn)	2.5 dBd	2.5 dBd	2.5 dBd	2.5 dBd
	Maximum ERP (Hzn)	81.8 W	50.5 W	56.6 W	30.4 W
Site Receive	HAAT	-140.0 ft	840.0 ft	1552.0 ft	-89.0 ft
	Total System Gain	1.6 dB	1.0 dB	1.3 dB	1.5 dB
	Multicoupler Model	DB7300 (8 ch.)	DB7300 (8 ch.)	DB7300 (8 ch.)	DB7300 (8 ch.)
	Coax Type	7/8" Foam	7/8" Foam	7/8" Foam	7/8" Foam
	Coax Length	105 ft	242 ft	175 ft	135 ft
	Tower Top Amp Model	(None)	(None)	(None)	(None)
	TTA Pad	0.0 dB	0.0 dB	0.0 dB	0.0 dB
	Distribution Pad	0.0 dB	0.0 dB	0.0 dB	0.0 dB
	Duplexer Loss	0.0 dB	0.0 dB	0.0 dB	0.0 dB
	Antenna Model	ANT150F2	ANT150F6	ANT150F6	ANT150F6
	Antenna Height (C.L)	55 ft	192 ft	125 ft	85 ft
	Antenna Azimuth	0°	0°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°	0°
	Antenna Gain (Hzn)	2.5 dBd	6.0 dBd	6.0 dBd	6.0 dBd
	HAAT	-140.0 ft	990.0 ft	1617.0 ft	-64.0 ft

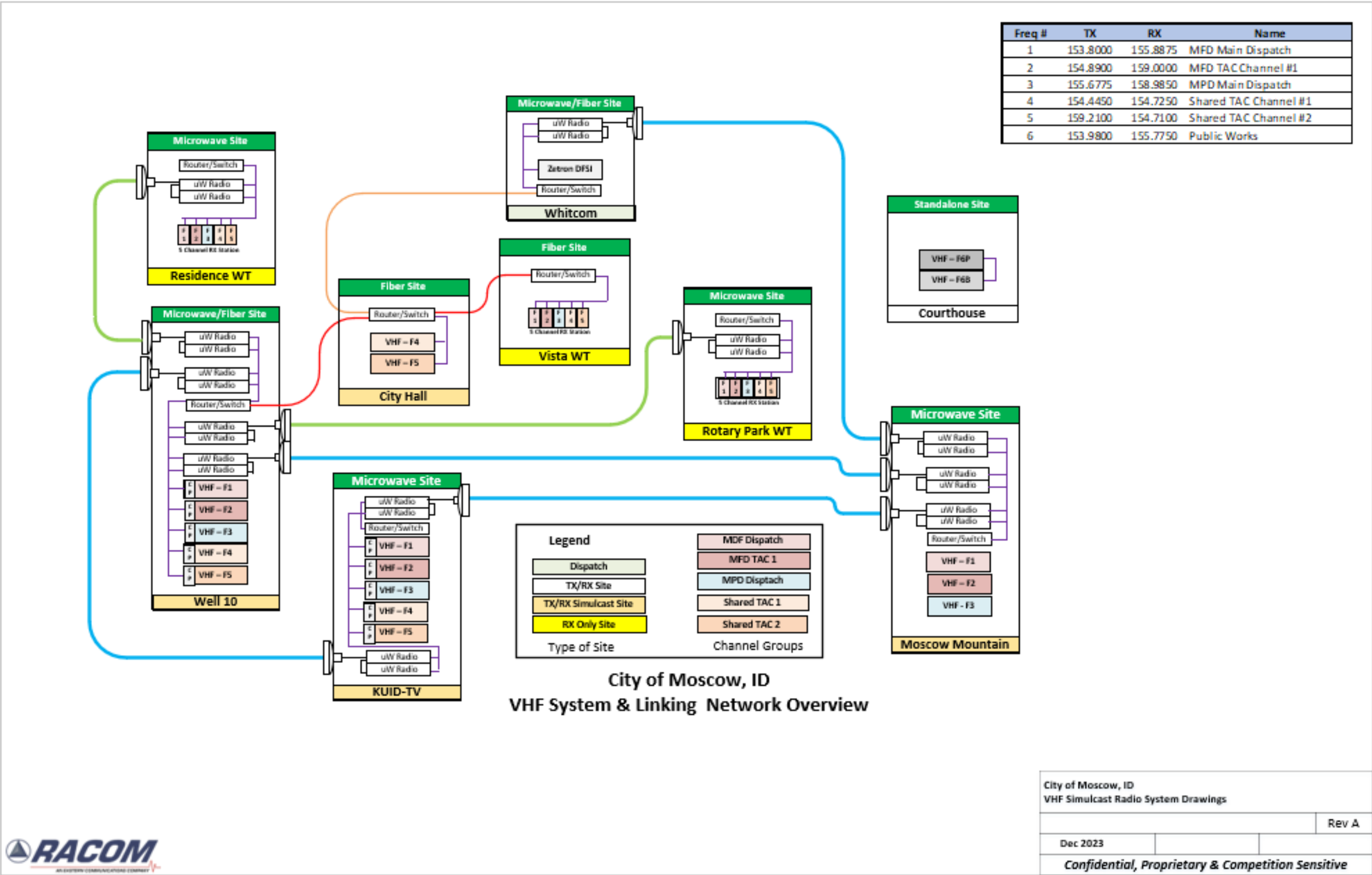
Site Details for Coverage Predictions - Continued

Site Name		Water Tank - Residence	Water Tank - Rotary	Water Tank - Vista
Site ID		RES-WT	Rotary-WT	Vista-WT
Latitude		46° 44' 12.710" N	46° 44' 27.550" N	46° 43' 50.320" N
Longitude		117° 00' 30.700" W	116° 59' 12.020" W	116° 58' 10.470" W
Datum		NAD83	NAD83	NAD83
Site Elevation		2654 ft	2674 ft	2700 ft
Base Station		TB9400-Analog RX Only	TB9400-Analog RX Only	TB9400-Analog RX Only
Frequency Range		150 - 174 MHz	150 - 174 MHz	150 - 174 MHz
Site Transmit	Station Output Power			
	Combiner Model			
	Tx to Tx Spacing			
	Combiner Loss			
	Filter/Duplexer Model			
	Filter/Duplexer Loss			
	Coax Type			
	Coax Length			
	Coax Loss			
	Antenna Model			
	Antenna Height (C.L.)			
	Antenna Azimuth			
	Antenna Mechanical Tilt			
	Antenna Gain (Hzn)			
	Maximum ERP (Hzn)			
	HAAT			
Site Receive	Total System Gain	1.6 dB	1.6 dB	1.6 dB
	Multicoupler Model	DB7300 (8 ch.)	DB7300 (8 ch.)	DB7300 (8 ch.)
	Coax Type	7/8" Foam	7/8" Foam	7/8" Foam
	Coax Length	110 ft	110 ft	100 ft
	Tower Top Amp Model	(None)	(None)	(None)
	TTA Pad	0.0 dB	0.0 dB	0.0 dB
	Distribution Pad	0.0 dB	0.0 dB	0.0 dB
	Duplexer Loss	0.0 dB	0.0 dB	0.0 dB
	Antenna Model	ANT150F2	ANT150F2	ANT150F2
	Antenna Height (C.L.)	60 ft	60 ft	50 ft
	Antenna Azimuth	0°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°
	Antenna Gain (Hzn)	2.5 dBd	2.5 dBd	2.5 dBd
	HAAT	-56.0 ft	-91.0 ft	-100.0 ft

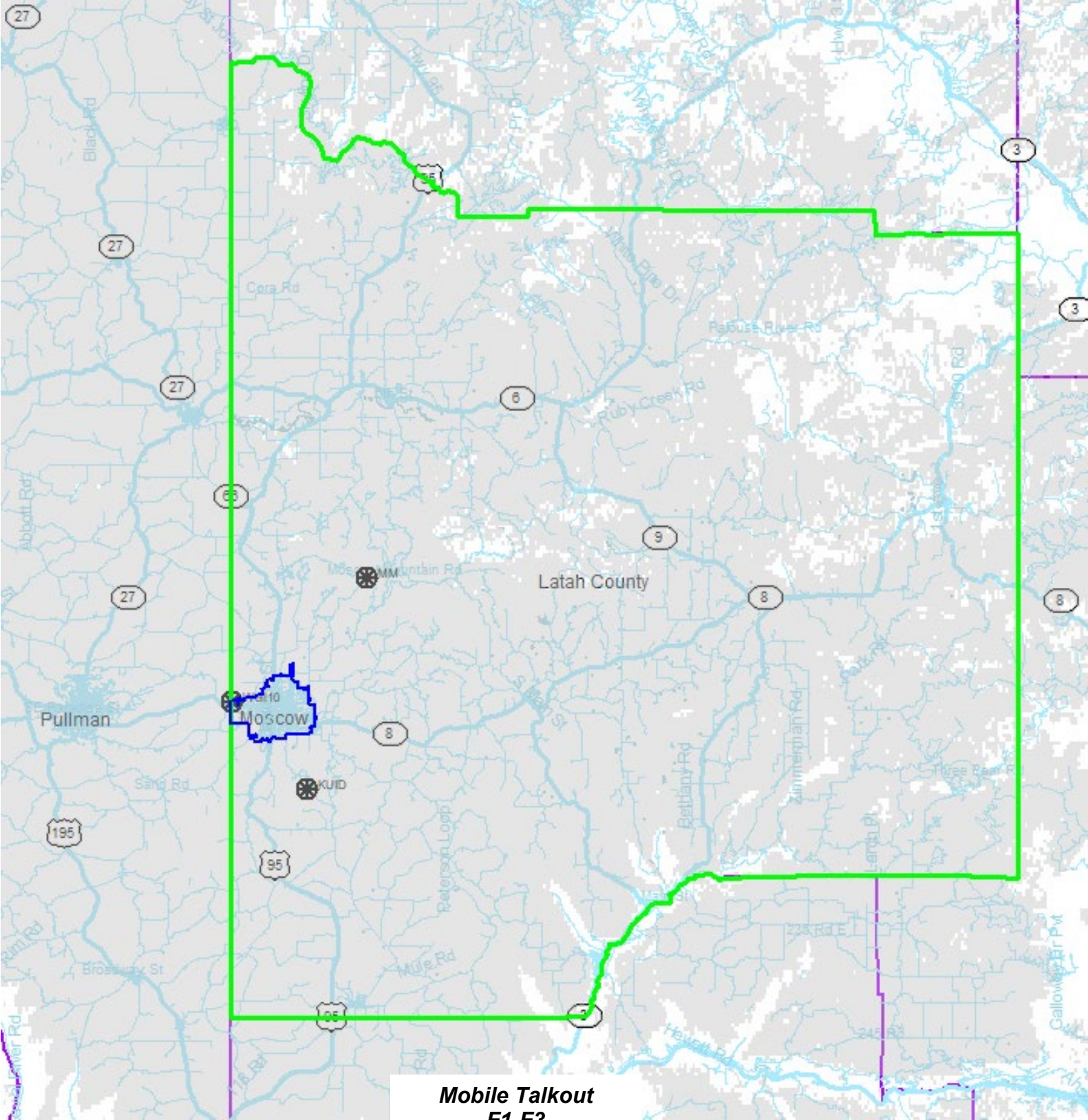
Site Balanced Report Mobile and Portable Round Trip Analysis Map



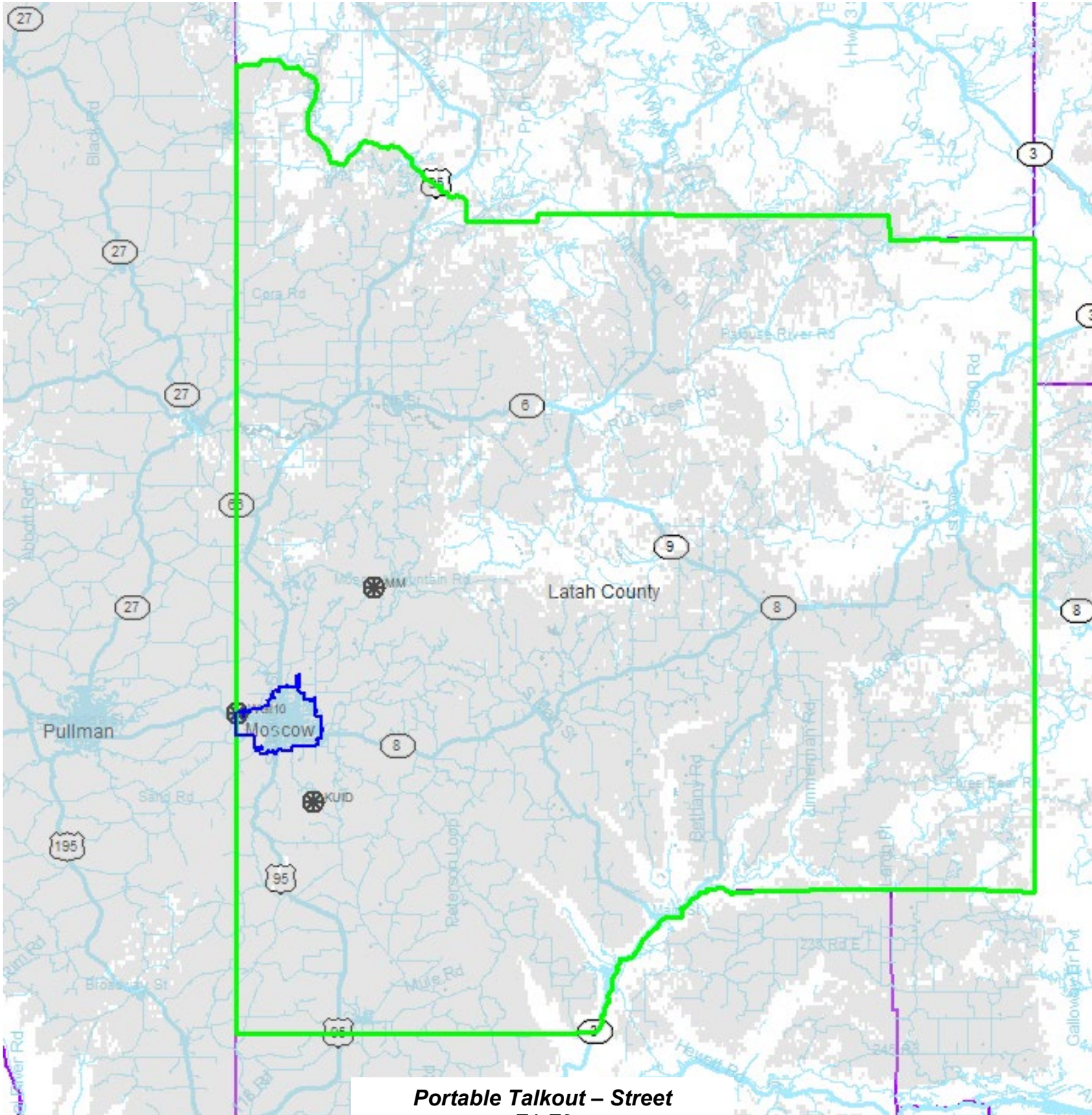
Highlevel System Drawing



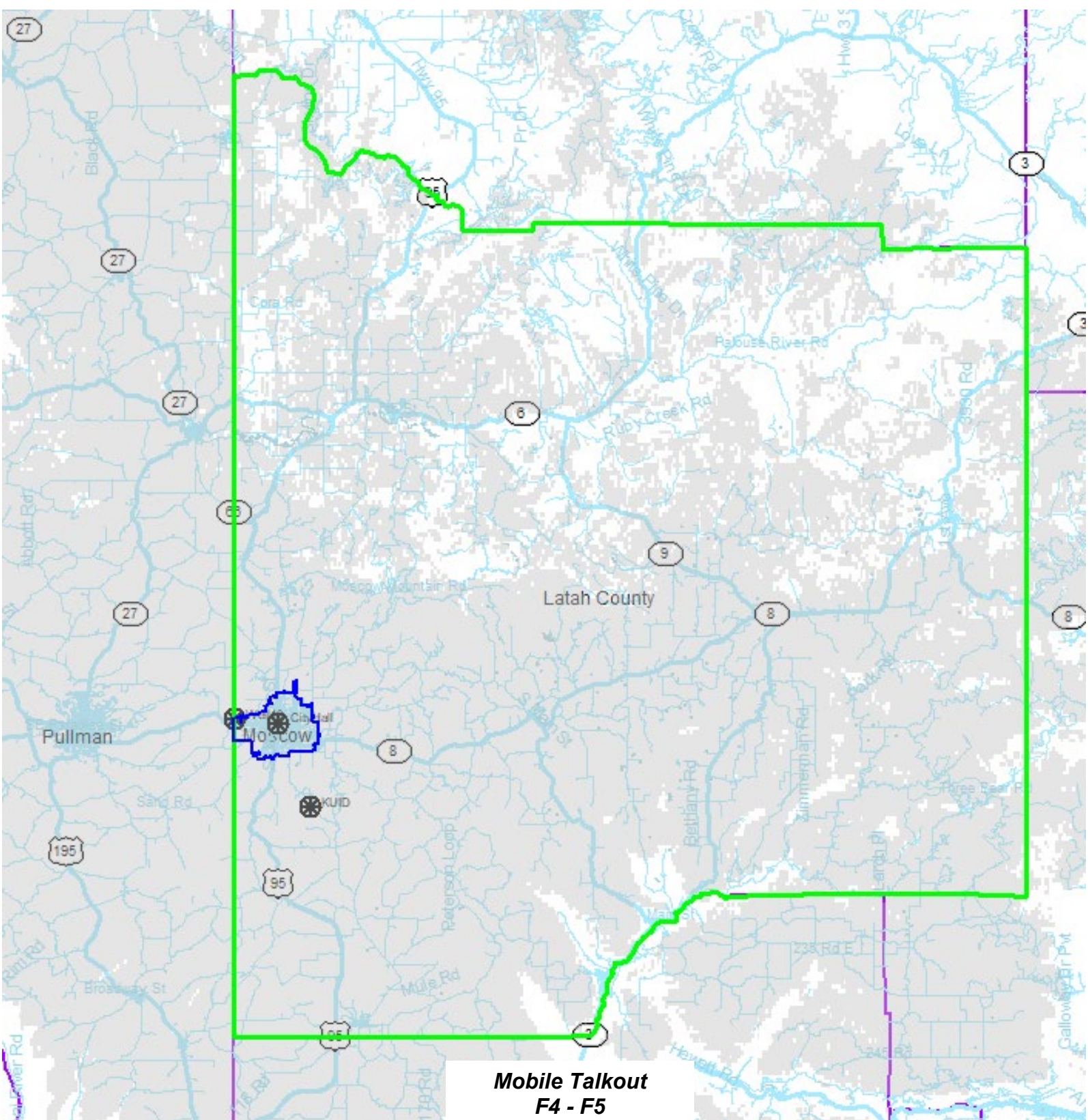
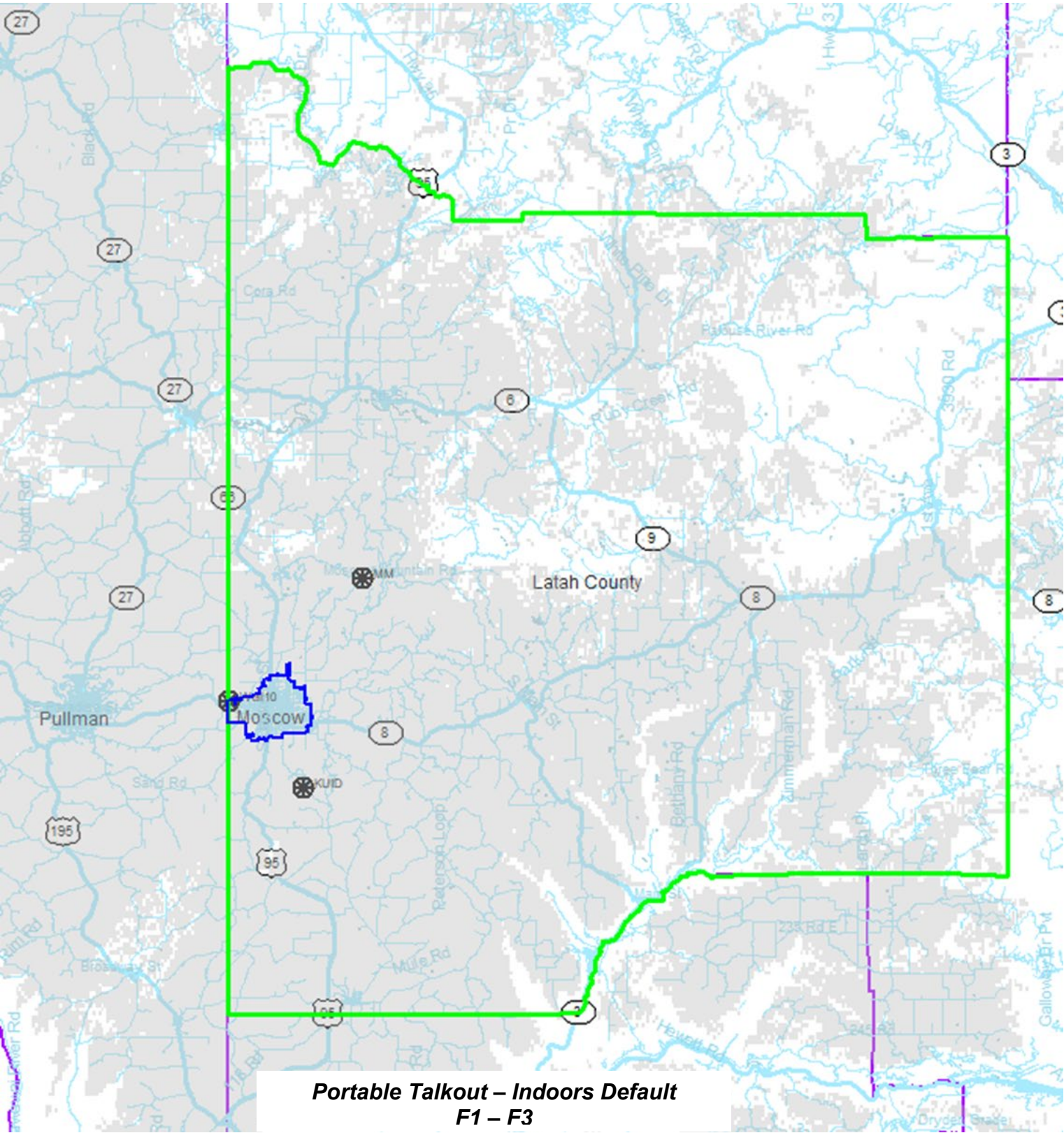
Analog Coverage Maps

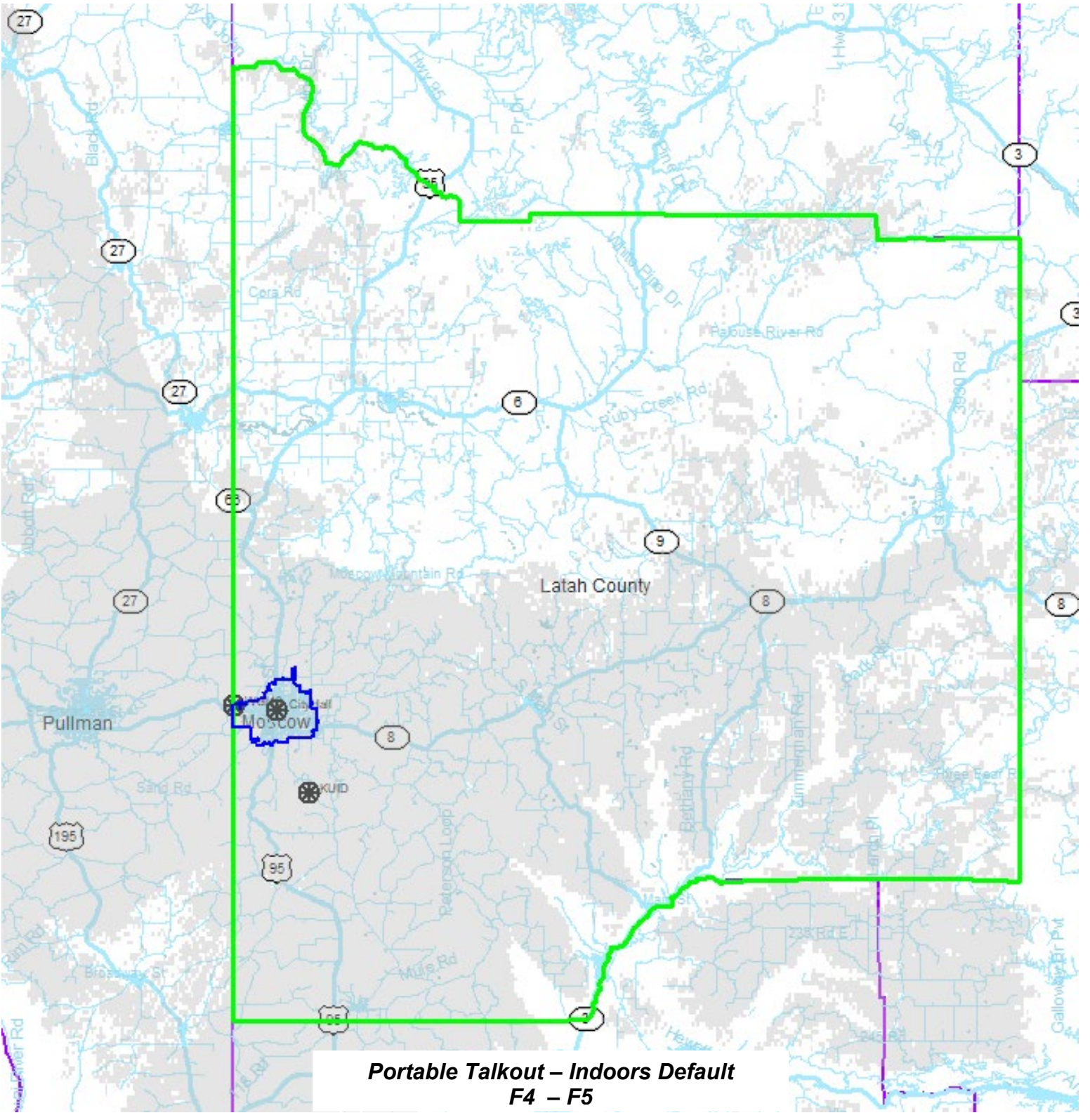
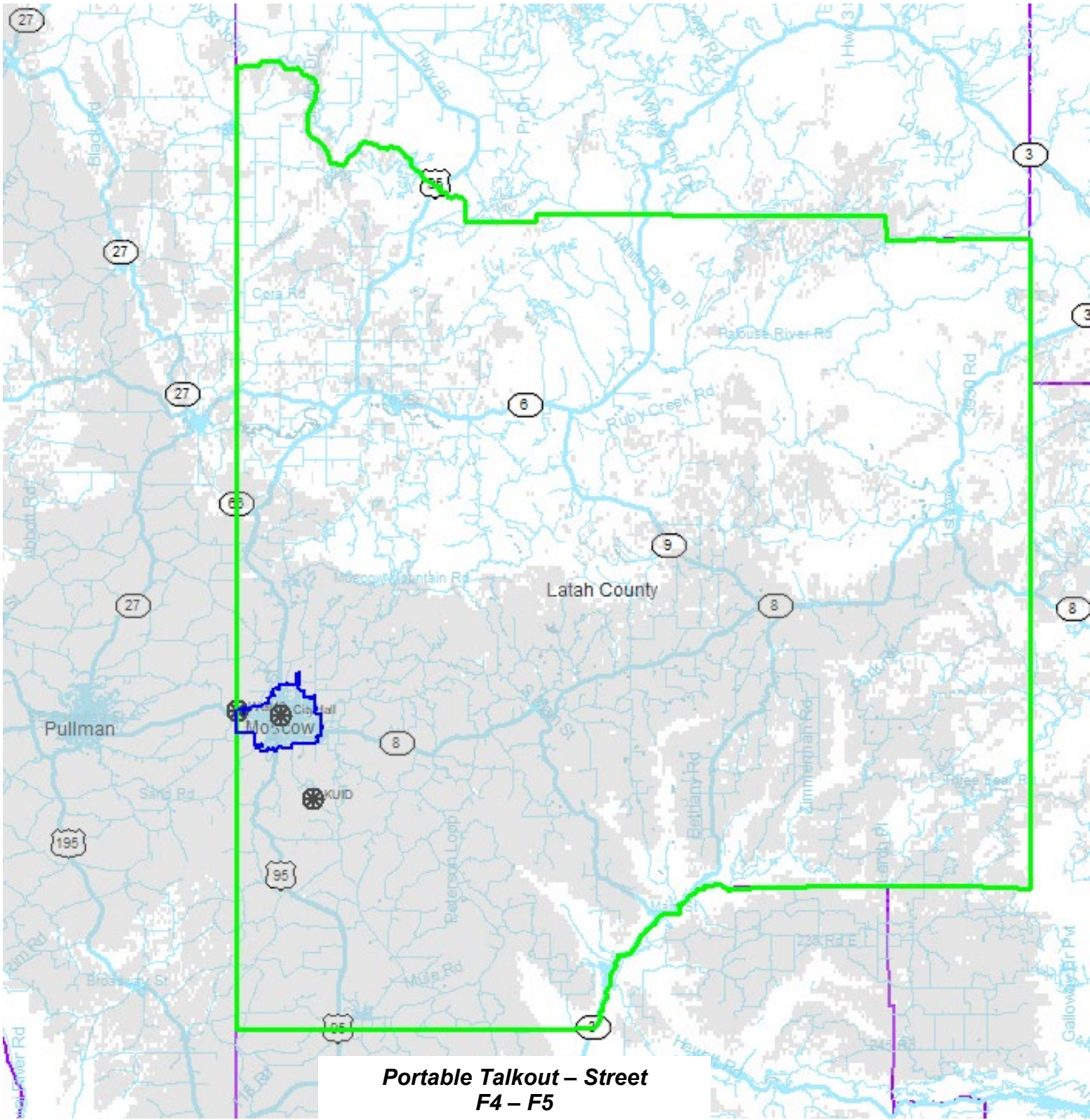


Mobile Talkout
F1-F3



Portable Talkout – Street
F1-F3





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CITY OF MOSCOW VHF SIMULCAST RADIO SYSTEM

HIGH LEVEL SCOPE OF WORK BY LOCATION

1. Moscow Mountain Site

Provide and install base station repeater equipment for a VHF simulcast subsystem system with 3 repeaters, including transmitter combining and receiver multicoupler systems, simulcast and receiver voting systems, ethernet switch, backup DC power systems, antennas, transmission lines and surge arrestors. Equipment is to be installed in new equipment racks inside the exiting shelter at the Moscow Mountain site and connected to an existing electrical panel at the site. Antennas are to be installed on the existing tower at Moscow Mountain.

Provide and install three microwave radios and associated antennas to provide links to the Well 10, KUID-TV and Whitcom sites. Microwave antennas are to be installed on the roof of the existing shelter at the Moscow Mountain site. Interface the microwave radios with the simulcast radio system. Provide frequency coordination and FCC licensing for the microwave links.

RACOM Response: Comply

RACOM has included the items outlined above for the site based on the requirements outlined in the RFP. The final design and equipment to be provided will be mutually agreed on during the detailed design process.

2. KUID-TV Site

Provide and install base station repeater equipment for two VHF simulcast subsystems with 3 repeaters on one subsystem and 2 repeaters on the other subsystem, including transmitter combining and receiver multicoupler systems, simulcast and receiver voting systems, ethernet switch, backup DC power systems, antennas, transmission lines and surge arrestors. Equipment is to be installed in new equipment racks inside the exiting shelter at the KUID-TV site and connected to an existing electrical panel at the site. Antennas are to be installed on the existing tower at the KUID-TV site.

Provide and install two microwave radios and associated antennas to provide links to the Well 10 and Moscow Mountain and sites. Microwave antennas are to be installed on the existing tower at the Moscow Mountain site. Interface the microwave radios with the simulcast radio system. Provide frequency coordination and FCC licensing for the microwave links.

RACOM Response: Comply

RACOM has included the items outlined above for the site based on the requirements outlined in the RFP. The final design and equipment to be provided will be mutually agreed on during the detailed design process..

3. Well 10 Site

Provide and install base station repeater equipment for two VHF simulcast subsystems with 3 repeaters on one subsystem and 2 repeaters on the other subsystem, including transmitter combining and receiver multicoupler systems, simulcast and receiver voting systems, ethernet switch backup DC power systems, antennas, transmission lines and surge arrestors. Equipment is to be installed in new equipment racks inside the equipment building at the Well 10 site and connected to an existing electrical panel at the site. Antennas are to be installed on a new monopole (to be provided as a design-build component) at the Well 10 site.

Provide and install four microwave radios and associated antennas to provide links to the KUID-TV, Moscow Mountain, Residence WT and Rotary Park WT sites. Microwave antennas are to be installed on the new monopole (to be provided as a design-build component) at the Well 10 site. Interface the microwave radios with the simulcast radio system. Provide frequency coordination and FCC licensing for the microwave links.

NOTE: The new monopole at the Well 10 site is to be designed, provided and installed by the contractor under the provisions of the design-build subsection of the specifications. Provide and install a new 85' monopole capable of supporting the antenna and transmission line systems shown in the drawings and compliant with the current revision of ANSI/TIA 222 and all applicable City of Moscow codes and standards.

RACOM Response: Comply

RACOM has included the items outlined above for the site based on the requirements outlined in the RFP. The final design and equipment to be provided will be mutually agreed on during the detailed design process.

4. City Hall Site

Provide and install base station repeater equipment for a single VHF simulcast subsystem with 2 repeaters on one subsystem and 2 repeaters on the other subsystem, including transmitter combining and receiver multicoupler systems, simulcast and receiver voting systems, ethernet switch, backup DC power systems, antennas, transmission lines and surge arrestors. Equipment is to be installed in new equipment racks inside the basement communications room at City Hall and connected to an existing electrical panel at the site. Antennas are to be installed on the roof of City Hall (replacing the existing antennas now installed at that site).

Provide an interface between the simulcast radio system and existing City of Moscow fiber links to Whitcom, the Well 10 site and the Vista Water Tank site (the Well 10 site provides microwave links to the other sites in the system, including to Whitcom (via the Moscow Mountain Site)).

RACOM Response: Comply

RACOM has included the items outlined above for the site based on the requirements outlined in the RFP. The final design and equipment to be provided will be mutually agreed on during the detailed design process.

5. Latah County Courthouse Site

Provide 2 new VHF stand-alone base station repeaters configured for main/backup redundant operation to replace the existing City of Moscow Public Works repeater at this site. Equipment to include backup DC power system and main/backup switching system. Re-use the existing duplexer and existing antenna system at the Courthouse site. Equipment to be installed in the existing data/communications room at the Courthouse site and connected to an existing electrical panel at the site.

RACOM Response: [Comply](#)

[RACOM has included the items outlined above for the site based on the requirements outlined in the RFP. The final design and equipment to be provided will be mutually agreed on during the detailed design process.](#)

6. Residence Water Tower Site

Provide and install a 5-channel VHF voting receiver system, including an ethernet switch, a receiver multicoupler system, a voting receiver controller, a backup DC power system, a receive antenna and transmission line and surge arrestor. Equipment will be installed in a new air-conditioned outdoor cabinet and will be connected to an existing electrical panel at the site. The RX antenna is to be installed on the water tank at this site.

Provide and install one microwave radio and associated antennas to provide a link to the Well 10 site. Microwave antennas are to be installed on the existing water tank at this site. Interface the microwave radios with the voting receiver system. Provide frequency coordination and FCC licensing for the microwave link.

RACOM Response: [Comply](#)

[RACOM has included the items outlined above for the site based on the requirements outlined in the RFP. The final design and equipment to be provided will be mutually agreed on during the detailed design process.](#)

7. Rotary Park Water Tower Site

Provide and install a 5-channel VHF voting receiver system, including an ethernet switch, a receiver multicoupler system, a voting receiver controller, a backup DC power system, a receive antenna and transmission line and surge arrestor. Equipment will be installed in a new air-conditioned outdoor cabinet and will be connected to an existing electrical panel at the site. The RX antenna is to be installed on the water tank at this site.

Provide and install one microwave radio and associated antennas to provide a link to the Well 10 site. Microwave antennas are to be installed on the existing water tank at this site. Interface the microwave radio with the voting receiver system. Provide frequency coordination and FCC licensing for the microwave link.

RACOM Response: [Comply](#)

[RACOM has included the items outlined above for the site based on the requirements outlined in the RFP. The final design and equipment to be provided will be mutually agreed on during the detailed design process.](#)

8. Vista Water Tank Site

Provide and install a 5-channel VHF voting receiver system, including an ethernet switch, a receiver multicoupler system, a voting receiver controller, a backup DC power system, a receive antenna and transmission line and surge arrestor. Equipment will be installed in the existing pump building and will be connected to an existing electrical panel at the site. The RX antenna is to be installed on the existing wood pole at this site.

Provide an interface between the voting receiver system and the existing City of Moscow fiber link to City Hall, and connect this link to the rest of the interconnect system at that site

RACOM Response: Comply

RACOM has included the items outlined above for the site based on the requirements outlined in the RFP. The final design and equipment to be provided will be mutually agreed on during the detailed design process.

9. Whitcom Site

Provide and install equipment to provide an interface between the City of Moscow simulcast systems and the Whitcom dispatch console, including an ethernet switch and other equipment required to provide a console interface. Coordinate with Whitcom and Whitman County Department of Emergency Management to properly configure the new radio channels at the console dispatch positions.

Provide and install one microwave radio and associated antenna to provide a link to the Moscow Mountain site. Microwave antennas are to be installed on the existing tower at this site. Interface the microwave radios with the console interface system. Provide frequency coordination and FCC licensing for the microwave link.

RACOM Response: Comply

RACOM has included the items outlined above for the site based on the requirements outlined in the RFP. The final design and equipment to be provided will be mutually agreed on during the detailed design process..

10. System-Wide Tasks

Provide complete alignment and optimization of the simulcast sub-systems and receiver voting systems. Complete all tests required by the specifications, including transmission line and antenna sweeps. Configure the microwave/fiber interconnect system to provide redundant connections among the main radio sites (not including the voting receiver sites) and to the Whitcom dispatch center. Re-program City of Moscow mobile and portable radios for new system configuration/frequencies. Complete coverage testing as described in the specifications and drawings. Provide all testing and as-build documentation described in the specifications. Provide warranty service for the radio system as described in the specifications.

RACOM Response: Comply

RACOM has included the servers and support outlined above for the system based on the requirements outlined in the RFP.

SECTION 26 20 00 - DC POWER SYSTEMS

RACOM Response: RACOM has included new DC Power Systems as outlined below in Section 26 20 00 for those sites that require it and as outlined in our response. For those areas that have specified specific equipment, RACOM has either proposed the same or equipment that meets the specification intent as outlined based on our experience of the products, it manufactures support and long-term supportability of the product proposed. The final equipment to be used will be mutually agreed to during the detailed design process.

For each individual areas outlined RACOM has indicated if we Comply, Read & Understood (RACOM understands what is being asked for if it is something being provided by RACOM's scope of work) , Take Exception or Non-Comply as outlined.

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. DC power systems, including all component parts reasonably incidental to providing a complete system.
2. DC power systems are defined to include, but are not limited to the following components (common to each --48 VDC and 12 VDC power system):

Meter & alarm panel/controller
Shunt switch panel
Fuse panels
Power return bar
Wiring and hardware
Battery termination bus assembly
Batteries and battery racks
Rectifiers/chargers
DC-DC Converters
DC-AC Inverters

RACOM Response: Read & Understood RACOM is only included -48VDC plants in our offer to support the equipment being proposed.

B. Related Sections

1. Division 01 Sections.
2. Section 33 83 00 – Land Mobile and Microwave Radio Systems
3. Section 26 07 00 - Basic Electrical Materials and Methods

RACOM Response: Read & Understood

1.2 REFERENCES

A. ANSI/NFPA

1. ANSI/NFPA 70 - National Electrical Code

RACOM Response: Read & Understood

B. ANSI/ATIS

1. ANSI/ ATIS T1.311 DC Power Systems – Telecommunications Environment Protection
2. ANSI/ATIS-0600017 DC Power Wire and Cable for Telecommunications Power Systems
3. ANSI/ATIS -0600315 Voltage Levels for DC-Powered Equipment Used in the Telecommunications Environment
4. ANSI/ATIS-0600330 Valve-Regulated Lead-Acid Batteries Used in the Telecommunications Environment
5. ANSI/ATIS-0600333 Grounding and Bonding of Telecommunication Equipment

RACOM Response: Read & Understood

1.3 SYSTEM DESCRIPTION

- A. Both the existing City of Moscow radio system and the proposed new City of Moscow VHF simulcast radio system are described in detail in Section 33 83 00.
- B. Because the VHF analog base stations that make are part of the new City of Moscow VHF simulcast system are available from various vendors, and because some radios require --48 VDC power and some radios require 12 VDC (nominal 13.6 VDC) power, these specifications and the attached Contract Drawings show typical equipment configurations and equipment rack layouts for both --48 VDC equipment and for 12 VDC equipment. Vendors may specify a system configuration with either power supply alternative, provided that all of the radio equipment (excluding the transmitter combiner and receiver multicoupler equipment), microwave or fiber interconnect equipment and backup DC power equipment fits into a single EIA 19" equipment rack (because of equipment space limitations at some of the repeater sites). The configuration of equipment shown in the Contract Drawings is typical, and Vendors may provide a different configuration of equipment as long as it meets the space requirement described above.
- C. Provide and install DC power systems at the City of Moscow VHF Simulcast System and Voting Receiver Sites as described herein and as shown in the drawings.
- D. These systems provide all the necessary components to provide primary distribution of --48 V DC and 12 VDC at the VHF simulcast sites and the voting receiver sites that make up the proposed City of Moscow VHF radio system.
- E. The 12 VDC system provides distribution breakers, metering, and power plant alarm functions, and cable termination for input and distribution loads. The -48 VDC system also provides distribution breakers, metering, and power plant alarm functions, and cable termination for input and distribution loads. The systems specified herein have charging capacity to cover the full design and future load at the City of Moscow radio sites.

RACOM Response: Read & Understood

1.4 DESIGN REQUIREMENTS

- A. Manufacturer's Standard of Design and Quality: Specification of product by model name/manufacturer is intended to represent a standard of quality and is not intended to restrict competition. Proposed product must meet or exceed all functions and features of specifications. Specified product is manufactured by manufacturer as indicated. Drawings and specifications are based on information furnished by the manufacturer. Other products with equal or better characteristics are acceptable, subject to approval by the Officer-in-Charge. Should other manufacturers require different drawings and details than shown, provide shop drawings and field adjustment at no cost to City.

RACOM Response: Read & Understood

- B. The required configurations for the -48 VDC systems and the 12 VDC systems are shown in the drawings.

RACOM Response: Read & Understood

- C. At the following sites, for a proposed radio system requiring -48 VDC provide and install a new -48 VDC rectifier system (La Marche LMP-100A or approved equivalent, as shown in the drawings. A single -48 VDC battery string will be installed at these sites, as described herein and as shown in the drawings.

1. Moscow Mountain
2. KUID-TVWell 10

Detailed specifications for the LaMarche LMP100A rectifier system are shown in Section 2.2.B below.

RACOM Response: Comply

- D. At the following sites, for a proposed radio system requiring -48 VDC provide and install a new -48 VDC rectifier/power supply system (Newmar PFM-500 Power Function Manager + Newmar PM48-20 or PM48-10 Power Modules or approved equivalents), as shown in the drawings. A single -48 VDC battery string will be installed at these sites, as described herein and as shown in the drawings.

1. City Hall – 1 PFM-500 + 1 PM48-20
2. Residence Water Tower – 1 PFM-500 + 2 PM48-20
3. Rotary Park Water Tower – 1 PFM-500 + 2 PM48-20
4. Vista Water Tank – 1 PFM-500 + 1 PM48-20
5. Whitcom Site - 1 PFM-500 + 1 PM48-10

Detailed specifications for the Newmar PFM-500 Power Function Manager and the Newmar PM48-50 and PM48-10 power modules are shown in Section 2.2.C and 2.2.D below.

RACOM Response: Comply

- E. At the following sites, for a proposed radio system requiring -48 VDC provide and install a new -48 VDC integrated power system [Newmar IPS 48-11 Integrated Power System (or approved equivalent)], as shown in the drawings. A single -48 VDC battery string will be installed at this site, as described herein and as shown in the drawings.

1. Courthouse – 1 IPS 48-11

Detailed specifications for the Newmar IPS 48-11 Integrated Power System are shown in Section 2.2.E below.

RACOM Response: Comply

- F. At the following sites, for a proposed radio system requiring 12 VDC provide and install a new 12 VDC rectifier/power supply system (Newmar PFM-500 Power Function Manager + Newmar PM12-80 or PM12-40A Power Modules or approved equivalents), as shown in the drawings. A single 12 VDC battery string will be installed at these sites, as described herein and as shown in the drawings.

1. Moscow Mountain – 1 PFM-500 + 1 PM12-80
2. KUID-TV – 1 PFM-500 + 2 PM12-80
3. Well 10 – 1 PFM-500 + 2 PM12-80
4. City Hall – 1 PFM-500 + 1 PM12-80
5. Residence Water Tower - 1 PFM-500 + 1 PM12-80
6. Rotary Park Water Tower - 1 PFM-500 + 1 PM12-80
7. Vista Water Tank - 1 PFM-500 + 1 PM12-80
8. Whitcom - 1 PFM-500 + 1 PM12-40A

Detailed specifications for the Newmar PFM-500 Power Function Manager and the Newman PM48-50 and PM48-10 power modules are shown in Section 2.2.C and 2.2.D below.

RACOM Response: Take Exception RACOM has not included any 12 VDC power as none of the proposed equipment requires it. If there is other existing equipment that needs 12 VDC, RACOM will work with the City on the best solution to provided that but is not part of the current scope.

- G. At the following sites, for a proposed radio system requiring 12 VDC provide and install a new 12 VDC integrated power system [Newmar IPS 12-40 Integrated Power System (or approved equivalent)], as shown in the drawings. A single 12 VDC battery string will be installed at this site, as described herein and as shown in the drawings.

9. Courthouse – 1 IPS 12-40

Detailed specifications for the Newmar IPS 48-11 Integrated Power System are shown in Section 2.2.E below.

RACOM Response: Take Exception RACOM has not included any 12 VDC power as none of the proposed equipment requires it. If there is other existing equipment that needs 12 VDC, RACOM will work with the City on the best solution to provided that but is not part of the current scope.

- H. At the following sites, for a proposed radio system requiring 12 VDC provide and install a new 12 VDC to 48 VDC DC-DC Converter (Wilmore 1760-13-48-7.5 [or Wilmore 1760-48-7.5-M3 for multiple units connected in parallel] or approved equivalent), as shown in the drawings.

1. Moscow Mountain – Quantity 3 - 1760-13-48-7.5-M3
2. KUID-TV – Quantity 3 - 1760-13-48-7.5-M3
3. Well 10 – Quantity 3 - 1760-13-48-7.5-M3
4. City Hall – Quantity 1 - 1760-13-48-7.5
5. Residence Water Tower - Quantity 1 - 1760-13-48-7.5
6. Rotary Park Water Tower - Quantity 1 - 1760-13-48-7.5
7. Vista Water Tank - Quantity 1 - 1760-13-48-7.5

Detailed specifications for the Wilmore 1760-13-48-7.5 converters are shown in Section 2.2.F below.

RACOM Response: Take Exception RACOM has not included any 12 VDC power as none of the proposed equipment requires it. If there is other existing equipment that needs 12 VDC, RACOM will work with the City on the best solution to provided that but is not part of the current scope.

- I. At the following sites, for a proposed radio system requiring 12 VDC or for a proposed radio system requiring -48 VDC provide and install a new 48 VDC to 120 VAC Inverter (Samlex PSR-1200-48 or approved equivalent) to provide 120 VAC power for the Ethernet switch at each site, as shown in the drawings.

1. Moscow Mountain – 1 PSR-1200-48
2. KUID-TV – 1 PSR-1200-48
3. Well 10 – 1 PSR-1200-48
4. City Hall – 1 PSR-1200-48
5. Residence Water Tower - 1 PSR-1200-48
6. Rotary Park Water Tower - 1 PSR-1200-48
7. Vista Water Tank - 1 PSR-1200-48
8. Whitcom - 1 PSR-1200-48

Detailed specifications for the Samlex PSR-1200-48 converters are shown in Section 2.2.G below.

RACOM Response: Take Exception RACOM has not included any 12 VDC power as none of the proposed equipment requires it. If there is other existing equipment that needs 12 VDC, RACOM will work with the City on the best solution to provided that but is not part of the current scope.

- J. Provide 12 VDC systems at the City of Moscow simulcast repeater and voting receiver sites with interconnections between the battery banks and the battery bus feed point at the rectifier/charger system using stranded Extra Flexible power wire with a minimum wire size of AWG 3 (Southwire Telcoflex or approved equivalent). Battery interconnection cables shall comply with ANSI/ATIS-0600017.2014 (DC Power Wire and Cable for Telecommunications Power Systems), and shall be Class 1 cable, highly stranded, as defined in Section 5.3, Table 4 of ANSI/ATIS -0600017.2014. Cables shall use RHW flame retardant insulation, and shall be Type 2 or Type 4 cable, as defined in Section 5.6.3.2 of ANSI/ATIS -0600017.2014. Terminate cables with lug-type terminations (Tyco Electronics TE-20001 series or approved equivalent).

Detailed Specifications for the Telcoflex (or approved equivalent) battery cable are shown in Section 2.2.J below

RACOM Response: Take Exception RACOM has not included any 12 VDC power as none of the proposed equipment requires it. If there is other existing equipment that needs 12 VDC, RACOM will work with the City on the best solution to provided that but is not part of the current scope.

- K. Provide -48 VDC systems at the City of Moscow simulcast repeater and voting receiver sites with interconnections between the battery banks and the battery feed point at the rectifier/charger system using stranded Extra Flexible power wire with a minimum wire size of AWG 5 (Southwire Telcoflex or approved equivalent). Battery interconnection cables shall comply with ANSI/ATIS-0600017.2014 (DC Power Wire and Cable for Telecommunications Power Systems), and shall be Class 1 cable, highly stranded, as defined in Section 5.3, Table 4 of ANSI/ATIS -0600017.2014. Cables shall use RHW flame retardant insulation, and shall be Type 2 or Type 4 cable, as defined in Section 5.6.3.2 of ANSI/ATIS -0600017.2014. Terminate cables with terminations (Tyco Electronics TE-20001 series or approved equivalent).

Detailed Specifications for the Telcoflex (or approved equivalent) battery cable are shown in Section 2.2.J below.

RACOM Response: Comply

- L. Provide AC power connections from the rectifier systems to the local electrical panel at each simulcast repeater site, voting receiver site and at the Whitcom site as shown in the drawings and as follows:
1. Moscow Mountain – 50 Amp 240 VAC breaker at electrical sub-panel
 2. KUID-TV – 1 PSR-1200-48 – 50 Amp 208 VAC breaker at KUID Generator panel
 3. Well 10 – 1 PSR-1200-48-80 – 50 AMP 240 VAC Breaker at main electrical panel
 4. City Hall – 1 PSR-1200-48-80 – 120 VAC power cord from rectifier system to local outlet with generator backup
 5. Residence Water Tower – 20 Amp 120 VAC breaker at electrical panel
 6. Rotary Park Water Tower - 20 Amp 120 VAC breaker at electrical panel
 7. Vista Water Tank - 20 Amp 120 VAC breaker at electrical panel
 8. Whitcom - 1 PSR-1200-48 - 120 VAC power cord from rectifier system to local outlet with generator backup

RACOM Response: Comply

- M. Provide and install a new 12 VDC distribution breaker panel equipped with a minimum of 18 distribution circuit breakers mounted in a Unipower Telecom DPP2U-A1-B1-S (or approved equivalent) circuit breaker panel, with Option R Grounded Return Bus Bars and Option D "Breaker Tripped" alarm contacts (SPDT Form C), as shown in the Contract Drawings. Use available bolt-in breakers from 5 to 100A for circuit breaker panels. Connect each circuit breaker panel to the distribution output of the Newmar PFM-500 Power Function Module or the Newmar Integrated Power System at each site depending upon the rectifier/power supply system for each site shown in the Contract Drawings). Provide and install suitable breakers cabling and connections to the equipment connected to the breaker panel, as shown in the block diagrams included in the rack elevation drawings for each site.

Detailed specifications for these distribution breaker panels are shown in Section 2.2.H below

RACOM Response: Take Exception RACOM has not included any 12 VDC power as none of the proposed equipment requires it. If there is other existing equipment that needs 12 VDC, RACOM will work with the City on the best solution to provided that but is not part of the current scope.

- N. Provide and install a new --48 distribution breaker panel equipped with a minimum of 18 distribution circuit breakers mounted in a Unipower Telecom DPP2U-A1-B1-S (or approved equivalent) circuit breaker panel, with Option R Grounded Return Bus Bars and Option D "Breaker Tripped" alarm contacts (SPDT Form C), as shown in the Contract Drawings. Use available bolt-in breakers from 5 to 100A for circuit breaker panels. Connect each circuit breaker panel to the distribution output of the LaMarche LMP-100A rectifier system, the Newmar PFM-500 Power Function Module or the Newmar integrated Power System at each site (depending upon the rectifier/power supply system for each site shown in the Contract Drawings). Provide and install suitable breakers, cabling and connections to the equipment connected to the breaker panel, as shown in the block diagrams included in the rack elevation drawings for each site.

Detailed specifications for these distribution breaker panels are shown in Section 2.2.H below

RACOM Response: Comply

- O. Provide and install new 12 VDC and -48 VDC battery strings made up of 12 VDC batteries (Energys PowerSafe 12V125F VRLA batteries or approved equivalent) at the simulcast repeater sites, the voting receiver sites, and the Courthouse and Whitcom sites, as shown in the Contract Drawings.

Detailed specifications for these batteries are shown in Section 2.2.I below

RACOM Response: Comply (-48 VDC only)

- P. The drawings, which constitute a part of these specifications, indicate the general installation locations for the battery banks, rectifiers, distribution panels, and other components of the DC power systems. Data presented on these drawings are as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification, of all dimensions, routing, etc., is directed.

RACOM Response: Read & Understood

- Q. Specifications and drawings are for assistance and guidance, but exact routing, locations, distances and levels will be governed by actual field conditions. Make detailed field surveys as part of work prior to submitting system layout shop drawings.

RACOM Response: Read & Understood

1.5 PERFORMANCE REQUIREMENTS

- A. Conform to all applicable code for manufacture and installation of DC power systems and associated equipment and materials.

RACOM Response: Comply

- B. Install and configure DC power systems in accordance with good engineering practices.

RACOM Response: Comply

1.6 SUBMITTALS

- A. Submittal Drawings: Submit shop drawings showing details and location of DC Power System equipment (battery banks, rectifiers and associated equipment) at each site. Provide schematic line drawing showing configuration of DC power distribution for each DC power system provided under this specification.

RACOM Response: Comply

- B. Product Data: Submit manufacturer's data on DC power systems including, but not limited to, batteries and battery racks, rectifiers, controllers and alarm equipment, DC distribution and alarm panels. Manufacturer's Installation Instructions: Submit preparation requirements, and special installation instructions.

RACOM Response: Comply

1.7 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Submit as-built drawings recording actual locations, configuration, and installation details of DC power systems.

RACOM Response: Comply

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five (5) years' experience.
- B. Installer: Company specializing in performing Work of this section and approved and certified by manufacturer.

RACOM Response: Comply

1.9 PRE-INSTALLATION MEETINGS

- A. Convene pre-installation meeting minimum one week prior to commencing work of this section.
- B. Attendance is to include all parties directly affecting, or affected by work of this section, including electrical sub-contractor, and contractor responsible for installation of new racks, microwave radio and mobile radio systems at the City of Moscow radio sites.

RACOM Response: Read & Understood

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products with adequate protection against damage. Avoid breakage, denting and scoring finishes. Do not install damaged equipment.

RACOM Response: Comply

- B. Deliver material to work site in original factory packaging.

RACOM Response: Comply – Expect for those items pre racked and tested before being installed at the site.

- C. Store batteries, rectifiers, and other DC power system components and accessories in original cartons or shipping containers and in a clean dry space; protect from weather and construction traffic. Wet materials should be unpacked and dried before storage.

RACOM Response: Comply

1.11 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

RACOM Response: Comply

1.12 SEQUENCING

- A. Sequence work to allow for installation of electrical systems, land mobile and microwave radio equipment, security equipment, and other work required before installation of DC power systems.

RACOM Response: Comply

- B. COORDINATION Coordinate work with sub-contractors installing electrical systems, cable tray systems, equipment racks, and radio & microwave radio systems.

RACOM Response: Comply

1.13 WARRANTY

- A. Provide standard manufacturer's warranty for all equipment listed in these Specifications.

RACOM Response: Comply

1.14 MAINTENANCE SERVICE

- A. Furnish service and maintenance of DC power systems for one year from Date of Substantial Completion.

RACOM Response: Comply

PART 2 PRODUCTS

2.1 GENERAL

- A. Manufacturer: Subject to compliance with these specifications, or approved equal.

RACOM Response: Read & Understood

2.2 DC POWER SYSTEM COMPONENTS

- A. DC Power Equipment Configuration:

All DC supply equipment shall be installed in 19-inch wide, EIA universal mounting spacing, welded steel, zinc plated and gold chromate conversion, seismic rated floor supported equipment racks (Cooper B-Line SB506084XUYZ) or approved equivalent, as shown in the Contract Drawings. Detailed specifications for these racks are shown in Section 33 83 00 Land Mobile Radio Systems.

RACOM Response: Read & Understood

- B. -48 VDC Rectifier Systems

The detailed specifications for the -48 VDC rectifier systems (LaMarche LMP-100A or approved equivalent) are shown below:

Specifications		100A (1RU)
AC Input	Input Mode	176-300VAC (1Ph) Linearly Derated (85-173VAC)
	Max Input Current	36A
	Input Frequency	50Hz/60Hz (45 to 66Hz)
	SPD (Surge Protection)	
DC Distribution*	Output Voltage	-42 to -58VDC, Nominal: -53.5VDC
	Rated Output	6000W
	Battery Breakers	1 x 40A (Fuse)
	Load Breakers (1P)	1 x 80A (Fuse) 1 x 40A (Fuse)
	Low Voltage Disconnect (1P)	BLVD
Rectifier	Input Voltage	85 to 300VAC, rated 220VAC
	Rated Power	3000W (176 to 300VAC) Linearly Derated (85 to 173VAC)
	Efficiency	>95% Peak
	Power Factor	>=0.99
	THD	<=8%
	Operating Temperature	-40°C to 65°C (full load @ 55°C)
	Dimension (WxDxH)	4.17 x 11.73 x 1.67in 106 x 298 x 42.5mm
	Weight	3.53 lbs (1.6 kg)
Controller	Cooling	Forced Cooling
	Signal Input	1 Battery Temp, 1 Ambient Temp, 2 Common DI
	Alarm Output	4 Dry Contacts
	Communication Port	RS232/485, Ethernet
System**	Display Mode	LCD
	Dimension (WxDxH)	17.32 x 14 x 1.73in 440 x 354 x 44mm
	Weight (w/out rect.)	14.33lbs (6.5kg)
	Mounting	19/23" Rack Mount
Standards and Compliance	Terminals	Front Access
		IEC 60950 Standards EN 61000-4-5 UL/IEC 62368-1 FCC Part 15 Subpart B RoHS
Environmental	Operating Temperature	-40°F to 149°F (-40°C to 65°C)
	Storage Temperature	-40°F to 158°F (-40°C to 70°C)
	Operating Humidity	5% to 95% (Non-Condensing)
	Altitude	0 to 6562ft (0 to 2000m)

RACOM Response: Read & Understood

C. -48 VDC and 12 VDC Power Function Managers

The detailed specifications for the -48 VDC and 12 VDC power function managers (Newmar PFM-500 Power Function Manager or approved equivalent) are shown below:

1. Low voltage battery disconnect protects batteries in the event of extended AC power loss
2. Simplifies wiring with parallel tie point for power modules 12, 24 or 48 VDC input/output
3. Digital meter displays: system bus voltage, battery voltage, total rectifier amperage, connect/disconnect voltage set points, and system ambient temperature
4. Up to five isolated distribution circuit breaker capacity with alarm contacts; easy front panel plug-in installation
5. Alarm LED (summary) indicates impending LVD disconnection, Power Module output fail or load circuit breaker trip
6. Summary alarm contacts (form C) allow remote monitoring of system status
7. Manual battery disconnect switch allows service/ replacement of batteries without system shutdown
8. Maximum Voltage Range 8 - 65 VDC
9. Continuous Current 500 Amps DC
10. Low Voltage Battery Disconnect 500 Amp, Contactor
11. Size 19/23", 2 RU
12. Weight 20 Lbs.

RACOM Response: Read & Understood (-48 VDC only)

D. 12 VDC & -48 VDC Power Modules

The detailed specifications for the Newmar PM12-80 or PM12-40A 12 VDC Power Modules and the Newmar PM48-20 or PM48-10 -48 VDC Power modules are shown below:

Input:

- 85 - 135/170-270 VAC (selectable),
47 - 63 Hz., 560 watt models
- 90 - 265 VAC, 1000 watt models
- 207 - 253 VAC, 2200 watt model

Power Factor: 0.7, 560W & 2200W models

0.98, 1000W models

Regulation: $\pm 1\%$ at direct output (V2);

$\pm 2\%$ through "oring" diode (V out)

Ripple: 1% (Typical)

Efficiency: 80-85% @ full load

Front panel Output Voltage Adjustment

Pot Range: $\pm 10\%$

Altitude Range: Full output to 5,000 feet. Derate
output current 4% per 1,000 feet to 10,000
feet max.

Temperature Rating

560 watt models: -40° C to +60° C;

Derate linearly from 100% load @ 50° C to
75% @ 60° C

1000 watt models: -20° C to + 70° C;

Derate linearly from 100% load @ 50° C to
50% @ 70° C

2200 watt model: 0 - 50° C

Mechanical/General

- Powder coated aluminum front panel and cover
- Vinyl laminated base and cover
- 19" Rackmount brackets provided
- Wallmount via optional brackets
- AC Input wiring:
 - 560 watt units: IEC AC entry, 6' IEC cord with
NEMA 5-15 plug provided
 - 1000 watt units: IEC entry, 6' IEC power cord
with NEMA 20 plug provided
 - 2200 watt unit: Hardwire junction box, no
power cord provided
- 1/4" -20 Output stud (560 watt models)
- Output bus bar (1,000 & 2200 watt models) with
1/4" - 20 bolts
- Output "OK" L.E.D.
- Multi color LED: Green = Ok, Red = Fail (1000W
models only)
- Loss-of-output alarm contacts- Form C, plus loss
of AC alarm contacts Form C (1000 & 2200
watt units only)
- Front panel voltage test points

Options

- Three stage charger function with gel/
lead-acid selector Model: CFB (560 & 1000
watts only)
- Temperature compensation (for battery
charging). All models.
- DC Quick Connect Wiring Kit:
560 watt models: QCK-3 (for 2-3 unit PM
system) & QCK-6 (for 4-6 unit PM system)
1000 watt models: QCK-3A (for 2-3 unit PM
system) & QCK-6A (for 4-6 unit PM system)
2200 watt model: CCK-4
- "Universal" mounting bracket; Model:
UMB-PM (500 & 1KW models only)
- Metering, alarms, LVD and distribution
breakers (PFM-400 or ULM-100
module options)

Protection

- Output fuse for reverse polarity
- Current limit
- Input circuit breaker
- Automatic high temp. output
power reduction (560W & 2200W models)
- Forced air cooling with filter provided (560W
models only)

Design Standards

- UL 1950 / EN 60950 (Safety)
- EN 50082 (Immunity)
- EN 55014 (Conducted)

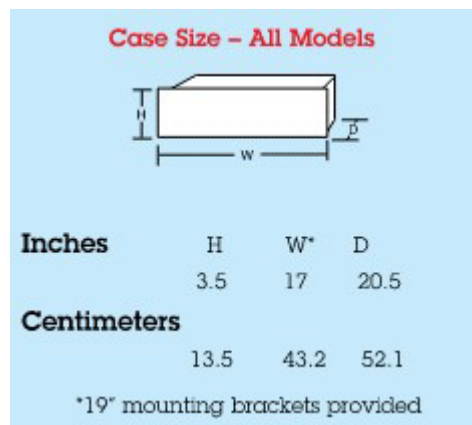
Model	Input Amps @ Full Load	Output		Amps Cont. +	Watts	Weight	
	115/230V	VDC V Out	VDC V2			Lbs	Kg.
PM-12-40A	8.5/4.3	13.6	14.3	40	560	12.2	5.5
PM-12-80	16/8	13.6	—	80	1000	15.2	6.9
PM-24-20	8.5/4.3	27.2	27.9	20	560	12.2	5.5
PM-24-40	16/8	27.2	—	40	1000	15.2	6.9
PM-48-10	8.5/4.3	54.4	55.1	10	560	12.2	5.5
PM-48-20	16/8	54.4	—	20	1000	14.0	6.4
PM-48-50	* /22	54.4	—	50	2200	34	15

VDC (V out) Measured at output terminal with oring diode

* 230 VAC input only

VDC (V2) Measured at direct output terminal

+ For parallel configuration/load sharing derate output 10%.



RACOM Response: Comply

E. -48 and 12 VDC Integrated Power Systems

The detailed specifications for Newmar IPS 12-40 Integrated Power System and the Newmar IPS 48-11 Integrated Power System (or approved equivalents) are shown below:

Specifications

Model	Input Amps @ Full Load 115 / 230	Output			Supplemental Input Port*	Internal Battery Capacity	Ground Reference
		VDC	Adjustment Range	Amps Continuous			
IPS 48-11	11 / 5.5	54.4	40-60 VDC	11	40 Amps	5 A-H	Positive
IPS 24-22	11 / 5.5	27.2	20-30 VDC	22	40 Amps	10 A-H	Negative
IPS 12-40	11 / 5.5	13.6	10-15 VDC	40	N/A	20 A-H	Negative

AC Input

Input Range (switch selectable):
115V = 92-130 VAC
230V = 184-260 VAC
Frequency: 47-63 Hz

DC Output

Voltage/Amperage: See Matrix above
Maximum Load with External Rectifier and Battery Inputs: 40 amps
Regulation: Line: $\pm 1\%$, Load: $\pm 2\%$
Ripple: $\pm 1\%$

Power Scaling via Back Panel Quick Connects

External Rectifier Input: 24V, 48V only;
560 or 1,000 watt (see PM Series page 6)
External Battery Bank: 12V/24V/48V

Environmental

Temperature Rating: -10° to + 60° C;
Derate linearly from 100%
load @ 50° C to 75% @ 60° C

Internal Batteries

Type: 12 Volt, 5 A-H Sealed Lead-Acid
Maintenance-Free
Amp-Hour Capacity: See Matrix below
Weight: 4 Lbs. each; 4 Batteries per Unit
Approvals: UL Recognized, DOT and IATA
approved for shipment by air

Indicators and Alarms

System "Nominal" indicator lights:

- AC OK
- External Rectifier ON/OK*
- *Except IPS-12-40

- Internal Rectifier On/OK
- Battery Contactor Closed

System "Warning" indicator lights:

- Check System
- Battery Disconnected

Form C Alarm Contacts:

- Summary Failure
- AC Input Failure (Optional)

Options

AC Input Fail Contacts - Specify 115 or 230 VAC

Rectifier/Battery Input Cable Assembly
(Model CA-24)

Rear Support Bracket for Flush Mounting
Models: RSB-19 or RSB-23

Distribution Panel Models: DST-10 (UL),
DST-20A (UL)

Unit Supplied Without Batteries

**Internal Battery
Constant Current Performance
(Amps) to 1.75 VPC**

MODEL	5 MIN.	15 MIN.	30 MIN.	1 HR.	2 HRS.
IPS 48-11	15.0	8.0	5.0	3.0	2.0
IPS 24-22	30.0	16.0	10.0	6.0	4.0
IPS 12-40	40.0	32.0	20.0	12.0	8.0

Mechanical

Chassis: Aluminum
Rack Size: 19" or 23", 2 RU (3.5")
Cooling: Forced Air
Dimensions: 3.5"H x 17"W x 18"D
Weight: 33 Lbs. (with batteries)
17 Lbs. (without batteries)

Protection

- Current Limit, Short Circuit
- Over Voltage
- Auto Thermal Shutdown/Recovery
- Input Fuse and Circuit Breaker
- Circuit Breaker For Internal Battery
- Low Voltage Battery Disconnect (Adjustable)

RACOM Response: Read & Understood (-48 VDC only)

F. 12 VDC to -48 VDC DC-DC Converters

Detailed Specifications for the 12 VDC to -48 VDC DC-DC Converters ((Wilmore 1760- 13-48-7.5 [or Wilmore 1760-48-7.5-M3 for multiple units connected in parallel] or approved equivalent) are shown below:

Table 1

Input Voltage Range (VDC)	Input Current ¹ (ADC)	Output Voltage (VDC)	Output Current (ADC)	Model Number ²
10.5 - 16 (13V nominal)	17.8	24	8	17xx-13-24-8
	33.5		15	17xx-13-24-15
	17.5	48	4	17xx-13-48-4
	33.1		7.5	17xx-13-48-7.5

¹Typical current at full load and nominal input voltage

Output Voltage Regulation

Versus line: $\pm 0.5\%$
Versus load: $\pm 2\%$

Output Voltage Ripple

5 millivolts rms (typical)
50 millivolts peak-to-peak (typical)

Isolation and Grounding

Mutual electrical isolation is provided between the input circuit, the output circuit, and chassis ground.

Protection

Protection against overloads, short-circuits and output overvoltages is provided electronically. Recovery to normal operating conditions is automatic upon removal of the overload or short-circuit fault. Following an overvoltage shutdown, input power to the converter must be removed and reapplied to resume converter operation. Protection against accidental reversal of the dc input-voltage polarity during installation is provided by a shunt diode working in conjunction with the front-panel circuit breaker.

Ambient Temperature Range

Operating: -30°C to $+50^{\circ}\text{C}$ (convection cooling)
Storage: -40°C to $+95^{\circ}\text{C}$

Efficiency

The efficiency reaches 80% at approximately 20% of full load and remains above 80% for most of the load range. The no-load input power is typically less than 6 watts. Full-load heat dissipation is approximately 250 BTU/hour for 360-watt models and approximately 135 BTU/hour for 200-watt models.

Dimensions 1.72" H X 19" W X 11.2" D (with rack mounting ears)

RACOM Response: Read & Understood (RACOM has not proposed any 12 VDC solutions)

G. -48 VDC to 120 VAC Inverters

Detailed specifications for the -48 VDC to 120 VAC Inverters (Samlex PSR-1200-48 or approved equivalent) are shown below:

MODEL NO.	PSR-1200-24	PSR-1200-48
AC OUTPUT IN INVERTER MODE	OUTPUT VOLTAGE	100 - 120 VAC (User selectable) ; Default: 120 VAC
	OUTPUT FREQUENCY	45 - 65 Hz (User Selectable) ; Default: 60Hz
	TYPE & OUTPUT WAVE FORM	High Frequency Type ; Pure Sine Wave
	TOTAL HARMONIC DISTORTION OF OUTPUT WAVEFORM	< 2%
	CONTINUOUS OUTPUT POWER	1200W
	SURGE OUTPUT POWER	2000W
AC OUTPUT IN BYPASS MODE	PEAK EFFICIENCY	> 88% > 90%
	NEUTRAL ISOLATION	• Neutral bonded to Chassis Ground when Inverter is supplying the load • Neutral isolated from Chassis Ground when Grid is supplying the load
	OUTPUT VOLTAGE	Same as external AC input source
	TYPE OF OUTPUT WAVEFORM	Same as external AC input source
	THD OF OUTPUT WAVEFORM	Same as external AC input source
	CONTINUOUS OUTPUT POWER	1200W continuous (Protected by 15A AC input breaker)
DC/AC INPUT	RATING OF TRANSFER RELAY	16A
	TRANSFER RELAY SWITCHING TIME	< 8ms
	TRANSFER TYPE	Synchronized or Unsynchronized (User selectable)
	NEUTRAL ISOLATION	Neutral and Chassis Ground are isolated through internal relay
	NOMINAL DC INPUT VOLTAGE	24 VDC 48 VDC
	DC INPUT VOLTAGE RANGE	20 - 34 VDC 40 - 60 VDC
DISPLAY	DC INPUT NO LOAD CURRENT	< 0.6A < 0.5A
	AC INPUT FROM GRID/GENERATOR	100 - 120 VAC, 50/60 Hz
LOCAL CONTROL & MONITORING	LCD	Alphanumeric 2 lines x 16 characters each
	LEDs	4 LEDs: AC GRID ; INVERTER ; BYPASS ; ALARM
REMOTE CONTROL & MONITORING	MODE AND PARAMETER SETUP	Through Menus displayed on the LCD screen
	MONITORING OPERATING STATUS	Through LCD screen and 4 LEDs
	PARAMETER SETUP AND MONITORING USING USB / RS-232	Through computer screen using ASCII coded commands
	MONITORING USING ETHERNET / SNMP	Through computer's Web Browser and Ethernet connection • E-mail notification of faults and alarms Notification of faults and alarms through Ethernet / SNMP Trap Messaging
	WIRED ON/OFF CONTROL THROUGH TERMINALS MARKED ENB (HIGH), ENB(LOW) AND GND	To switch ON: • External + 10 to 40VDC fed to ENB and GND (< 6mA) • Short ENB and GND • Battery Positive fed to ENB To switch OFF: • External + 20 to 60VDC fed to ENB and GND (< 6mA) • Short ENB and GND • Battery Positive fed to ENB
	WIRED SIGNALLING	Signaling of faults and alarms through SPDT relay contact switching (no voltage) • Relay contact rating: 240 VAC, 16A

MODEL NO.	PSR-1200-24	PSR-1200-48
COOLING	3 load / temperature controlled fans: • Switch ON when output load is >300W and switch OFF when the load reduces to < 280W • Switch ON when internal heat sink temperature is ≥ 50°C and switch OFF when temperature reduces to ≤ 45°C	
	DC INPUT UNDER VOLTAGE (UV) ALARM	17.0 to 23.0 VDC ; Default: 21.5 VDC (Auto reset at 0.5V > the set voltage)
	DC INPUT OVER VOLTAGE (OV) ALARM	25.0 to 35.0VDC ; Default: 33.0VDC (Auto reset at 0.5V < the set voltage)
	FAN FAULT ALARM	Fan stops Fan stops
	DC INPUT UNDER VOLTAGE PROTECTION (UVP)	17.0 to 23.0 VDC ; Default: 20.0 VDC
	DC INPUT UNDER VOLTAGE PROTECTION (UVP) RECOVERY	17.5 to 23.5 VDC ; Default: 23.0 VDC
PROTECTIONS	DC INPUT OVER VOLTAGE PROTECTION (OVP)	25.0 to 35.0 VDC ; Default: 34.0 VDC
	DC INPUT OVER VOLTAGE PROTECTION (OVP) RECOVERY	24.5 to 34.5 VDC ; Default: 33.0 VDC
	OUTPUT OVERLOAD (OL) PROTECTION	• Programmable from 100% to 110% • Default: 110% • Shut down when load is > programmed value for > 2 sec
	SHORT CIRCUIT PROTECTION	Shut down in case of the following: • Output voltage is < 80V RMS for 1.2 sec • Output current is > 24A for 1.2 sec
	OVER TEMPERATURE PROTECTION	Shut down when internal heat sink temperature is >105°C. Auto reset at 85°C.
	DC INPUT OVER CURRENT PROTECTION	4 pieces of 20A fuses in parallel = 80A Each fuse: Mini Blade Fuse, 20A: Littell Fuse 0297020.WXN or equivalent
INPUT /OUTPUT CONNECTIONS	AC INPUT OVER CURRENT PROTECTION	Breaker, 250 VAC, 12A.
	DC INPUT	Terminals with cylindrical hole and set screw • Hole diameter: 7/16" • Set screw: 5/16" x 24 TPI; 1/2" length; Slotted head
	DC CHASSIS GROUND	Terminal with cylindrical hole and set screw • Hole diameter: 5/16" • Set screw: 5/16" x 24 TPI; 3/8" length; Slotted head
	AC INPUT CONNECTION	• Male AC Power Inlet Connector IEC 60320, C14 • Detachable AC Power Cord with mating Connector IEC 60320, C13 on one end and NEMAS-1SP Plug on the other end (Supplied with the unit)
	AC OUTPUT CONNECTION	NEMAS-20R Duplex Outlet
	SAFETY AND EMI / EMC COMPLIANCE	ETL listed to UL Standard 62368-1 and CSA Standard C22.2 No. 62368-1 EMVEMC Certified to comply with FCC Part 15(B), Class B
ENVIRONMENT	OPERATING TEMPERATURE RANGE	-20 to +50°C
	RELATIVE HUMIDITY	Up to 90%, non condensing
DIMENSIONS	STORAGE TEMPERATURE	-30 to +70°C
	(W X D X H) MM	482 X 386.8 X 44
WEIGHT	(W X D X H) INCHES	19 X 15.24 X 1.73
	KG	5.8
	LBS	12.8

NOTES:
1. All AC power ratings in the Inverter Section are specified at Power Factor = 0.95
2. All specifications given above are at ambient temperature of 25°C / 77°F unless specified otherwise
3. Specifications are subject to change without notice

RACOM Response: Read & Understood (All proposed equipment is -48 VDC supplied so RACOM has not included any 120 VAC inverters in our proposed solution)

H. -48 VDC and 12 VDC Distribution Breaker Panels

Detailed specifications for the -48 VDC and 12 VDC Distribution Breaker Panels (Unipower Telecom DPP2U-A1-B1-S or approved equivalent) are shown below:

SPECIFICATIONS

Typical at 25°C Unless Otherwise Noted.

INPUT/OUTPUT

Panel Capacity	
@35°C	450A per Bus
@40°C	400A per Bus
@50°C	320A per Bus
@70°C	200A per Bus
Configuration	450A Single Bus with 1 to 20 Breakers 900A Dual Bus 1 to 10 Breakers Each Bus
Breaker Capacity ¹	2.5A to 200A
Voltage	21-60VDC
Polarity	Neutral, Positive or Negative Ground

ALARMS

Alarm Indicator	Dual Color LED Per Bus
LED Status Indication	Green = Normal Red = CB Trip Alarm Off = No Power
Alarm Relays	Form C Contacts for each Bus

SAFETY

Safety	UL60950-1 2 nd Ed., CSA22.2 No. 60950-1 2 nd Ed., EN60950-1 2 nd Ed.
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ENVIRONMENTAL

Operating Temp. Range	-10°C to +70°C
Storage Temp. Range	-40°C to + 85°C
Humidity	0% to 95%, Non-Condensing

PHYSICAL SPECIFICATIONS

Case Material	Steel
Finish	Powder Coat Black
Overall Dimensions, Inches (mm) ²	
without Plastic Safety Cover	3.45 H x 17.16 W x 9.48 D (87.6 x 435.9 x 240.8)
with Plastic Safety Cover	3.45 H x 17.16 W x 14.08 D (87.6 x 435.9 x 357.6)
Weight (excluding breakers)	25 lbs. (11.4 kg.)
Rack Mounting (universal brackets included)	19 or 23 inch

CONNECTIONS

Input Connections	Bus Bar
Output Connections	1/4-20 Stud, 2-hole lugs
Chassis Ground Connection	1/4-20 Stud, 2-hole lugs
Alarm Relay Connections	Spring Clamp Terminals, 16-26AWG

Notes:

- See ordering guide to specify.
- Excluding mounting brackets. Depth from front face, see details on page 3.

RACOM Response: Read & Understood (-48 VDC only)

I. Batteries

Provide and install the following Valve Regulated Lead Acid (VRLA) batteries (Energys PowerSafe 12V125F or approved equivalent). Configure individual strings of 4 batteries as 12 VDC battery systems (wired in series) or as -48 VDC battery systems (wired in parallel), as shown in the drawings. Specifications for these batteries are shown below:

General Specifications

Battery Type	Number of Cells	Nominal Voltage (V)	Nominal Capacity (Ah)		Nominal Dimensions						Typical Weight		Short Circuit Current	Internal Resistance**	Terminals	Electrolyte (1.300 S.G.)				Pure Acid (H ₂ SO ₄ Acid)				Lead Weight	
			8hr. Rate 1.75Vpc @77°F	10hr. Rate 1.80Vpc @68°F	Length		Width		Height							Volume	Weight		Volume		Weight		Weight		
			in	mm	in	mm	in	mm	lb	kg	gal	L				lb	kg	gal	L	lb	kg	lb	kg		
12v26F-FT	6	12	31	31	11.0	280	3.8	97	6.3	159	23.8	10.8	1327	9.87	M8 F	0.37	1.41	3.96	1.80	0.16	0.60	1.68	0.76	16.8	7.61
12v38F-FT	6	12	38	38	11.0	280	3.8	97	7.2	184	27.6	12.5	1500	8.53	M8 F	0.48	1.81	5.10	2.31	0.20	0.77	2.17	0.98	19.8	8.99
12v42F-FT	6	12	62	62	11.0	280	3.8	97	10.4	264	42.3	19.2	2080	5.98	M8 F	0.77	2.91	8.20	3.72	0.33	1.23	3.48	1.58	29.6	13.4
12v92F-FT	6	12	92	92	15.6	395	4.1	105	10.4	264	60.8	27.6	2410	5.19	M8 F	1.12	4.25	12.0	5.44	0.48	1.81	5.09	2.31	43.3	19.7
12v100FC-FT	6	12	100	100	15.6	395	4.3	108	11.3	287	68.3	31.0	1930	6.46	M8 F	1.34	5.06	14.3	6.48	0.57	2.15	6.07	2.75	46.6	21.1
12v101F-FT	6	12	101	100	20.1	510	4.3	110	9.3	235	73.9	33.5	2108	5.92	M8 F	1.19	4.52	12.8	5.79	0.47	1.76	4.98	2.26	50.0	22.7
12v125F	6	12	126	125	22.1	561	4.1	105	12.4	316	98.1	44.5	2355	5.30	M6 M	1.98	7.48	21.1	9.57	0.89	3.37	9.50	4.31	62.7	28.5
12v155F	6	12	155	150	22.1	561	4.9	125	11.1	283	106.9	48.5	3325	3.80	M6 M	2.16	8.16	23.0	10.4	0.92	3.47	9.79	4.44	70.4	31.9
12v170F	6	12	170	170	22.1	561	4.9	125	11.1	283	112.0	50.8	3360	3.75	M6 M	2.12	8.01	22.6	10.3	0.90	3.40	9.61	4.36	77.3	35.1
12v190F	6	12	190	190	22.1	561	4.9	125	12.4	316	126.3	57.3	3625	3.50	M6 M	2.42	9.17	25.9	11.7	1.03	3.90	11.0	4.99	89.4	40.6

Notes:

** Resistance values are for reference only and not intended to represent an Ohmic Value or Baseline measurement

RACOM Response: Read & Understood (-48 VDC only)

- J. Detailed Specifications for cables used to connect the batteries to the rectifier systems (Southwire Telcoflex or approved equivalent) are shown below:

SPECIFICATIONS:

- ASTM B-33 and B-172 Class I tinned copper
- UL 44 Type RHH, FT4-ST1, VW-1, 600 Volts DC or AC
- KS-24194™ List 2
- UL 2731 Telecommunications Central Office Power Cable
- ATIS-0600017.2014 Non-Halogenated DC Power Wire and Cable for Telecommunications Power Systems
- Telecordia GR-347-CORE
- CSA AWM IB 105°C 600V. FT4-ST1
- Lead-Free, Silicone-Free, RoHS Complaint
- IEC including 60674 and 60332
- REACH - European Community Regulation

RACOM Response: Read & Understood

- K. Safety and Hazards

1. The design of the plant shall not expose personnel to any safety hazards, and product damage shall not occur during normal installation, operation, and maintenance.
2. The safe replacement of components such as fuse holders shall not require that the plant be de-energized.

RACOM Response: Read & Understood

PART 3 EXECUTION

3.1 EXAMINATION

- A. Check work with related trade's shop drawings and make corrections when required.
- B. Verify that field conditions are acceptable and are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.

RACOM Response: Read & Understood

3.2 INSTALLATION

- A. Install battery banks and 12 VDC and -48 VDC rectifier/charger systems as shown in the drawings. Provide and install all required interconnecting cable in compliance with all applicable electrical codes.

RACOM Response: Comply (-48 VDC only)

- B. Coordinate installation of battery and DC power system equipment with other electrical work as necessary to properly integrate installation of DC power system work with other work.

RACOM Response: Read & Understood

- C. FIELD QUALITY CONTROL AND TESTING Section 01 40 00 - Quality Requirements: Field sample requirements, and testing and inspection services, and 01 70 00 - Execution Requirements: Testing, adjusting, and balancing.

RACOM Response: Read & Understood

- D. The tests described in the following sections apply to the DC power systems in the new Communications Room only.

RACOM Response: Read & Understood

- E. Test each tray of batteries for ground faults prior to installation as soon as the batteries are received from the manufacturer, after the battery trays have been installed in the racks at each site, and one week after installation of the battery system. Perform the tests as follows:

RACOM Response: Read & Understood

- F. Connect a megohm meter (Extech 380360 or equivalent) between the tray and one of the terminals of the battery (or one terminal of a series of cells if the cells are strapped together). Set the test set for 2000 megohms with 1000 Volt test voltage. If the value is above 2000 megohms the batteries are acceptable for installation. If a lower value is obtained, isolate the problem cell by disconnecting the connectors between the batteries, and replace the bad battery or batteries with a new cell.

RACOM Response: Comply

- G. Using a battery impedance tester, perform a battery impedance (or internal battery resistance, depending upon the test equipment used) measurement of each battery in the battery bank and record the results to establish a baseline for each battery. Compare the values with the manufacturer's specifications for the battery cell. Values should be within approximately $\pm 20\%$ of the manufacturer's nominal specification. Perform these tests one week after battery plant has been put into service.

RACOM Response: Comply

3.1 CLEANING

- A. Upon completion of this section of work, remove protective wraps and debris. Repair damages due to installation of this section of work.

RACOM Response: Read & Understood

3.2 PROTECTION OF FINISHED WORK

- A. Protect DC power systems work from damage after installation.

RACOM Response: Read & Understood

END OF SECTION

SECTION 33 83 40 - MICROWAVE RADIO AND ANTENNA SYSTEMS

PART 1 GENERAL

RACOM Response: RACOM has included new Microwave Radio and Antenna Systems as outlined below in Section 33 83 40 for those sites that require it and as outlined in our response. For those areas that have specified specific equipment, RACOM has either proposed the same or equipment that meets the specification intent as outlined based on our experience of the products, it manufactures support and long-term supportability of the product proposed. The final equipment to be used will be mutually agreed to during the detailed design process.

For each individual areas outlined RACOM has indicated if we Comply, Read & Understood (RACOM understands what is being asked for if it is something being provided by RACOM's scope of work) , Take Exception or Non-Comply as outlined.
For each individual areas outlined RACOM has indicated if we Comply, Read & Understood, Take Exception or Non-Comply as outlined.

1.1 SUMMARY

- A. Section Includes:
 - 1. Product requirements and specifications for microwave radios, antennas and associated hardware, waveguides, connectors, grounding kits, and weatherproofing, for the City of Moscow simulcast repeater and voting receiver sites.
 - 2. Requirements and specifications for installation of microwave antennas and associated equipment at the City of Moscow simulcast repeater and voting receiver sites.
- B. Related Sections:
 - 1. Division 01 Sections.
 - 2. Section 33 83 00 Land Mobile Radio and Antenna Systems

RACOM Response: Read & Understood

1.2 REFERENCES

- A. The equipment and accessories shall be designed, manufactured, and tested in accordance with the applicable standards from the following organizations, including all amendments in effect at the time of purchase order placement.

RACOM Response: Read & Understood

- B. These codes and standards set forth minimum requirements necessary to assure satisfactory performance of the Vendor's equipment. Other internationally recognized codes and standards will be acceptable provided they meet or exceed the requirements of the listed codes and standards.

If different from the project list, the Vendor shall submit for City's approval, details of the codes and standards, which Vendor proposes to use. Vendor shall demonstrate to the satisfaction of City that these codes and standards meet or exceed the requirements of the codes and standards listed.

RACOM Response: Read & Understood

- C. In the event of any conflict between codes, standards, and specification, the Vendor shall refer the conflict to City for written resolution before start of design.

RACOM Response: Comply

- D. Vendor shall provide a list of codes and standards used for the manufacture of Vendor's product in effect at the time of purchase order.

RACOM Response: Read & Understood

- E. All materials and equipment supplied under this specification shall comply with all applicable regulations and standard listed below, and all Federal, State and Local Statutes. All electrical material and equipment shall be listed and/or labeled by OSHA through a National Recognized Testing Laboratory (NRTL) and approved by the authority having jurisdiction.

RACOM Response: Read & Understood – As they apply.

- F. ANSI – American National Standards Institute
1. ANSI T1.101 – Synchronization Interface Standard
 2. ANSI T1.102 - Digital Hierarchy – Electrical Interfaces
 3. ANSI T1.105 - Synchronous Optical Network (SONET) - Basic Description including Multiplex Structure, Rates and Formats
 4. ANSI T1.106 - Digital Hierarchy - Optical Interface Specifications (Single Mode)
 5. ANSI T1.107 - Digital Hierarchy - Format Specifications
 6. ANSI/ATIS- 0600315.2007- Voltage Levels for DC-Powered Equipment Used in the Telecommunications Environment

RACOM Response: Read & Understood

- G. TIA – Telecommunications Industry Association
1. ANSI / TIA Standard - 232
 2. ANSI / TIA Standard - 422

RACOM Response: Read & Understood

- H. Federal Communications Commission:
1. FCC Rules - 47 CFR Part 1.1310
 2. FCC Rules – 47 CFR Part 101
 3. FCC Rules – 47 CFR Part 15
 4. FCC Rules – 47 CFR Part 2

RACOM Response: Read & Understood

- I. IEEE – Institute of Electrical and Electronics Engineers:
1. IEEE 802.3 - 10/100/1000bT Ethernet interfaces

RACOM Response: Read & Understood

- J. ITU – International Telecommunication Union:
1. IEEE 802.3 - 10/100/1000bT Ethernet interfaces

RACOM Response: Read & Understood

- K. ITU – International Telecommunication Union:
1. ITU G. 8032 Ethernet Ring Protection

RACOM Response: Read & Understood

- L. Telcordia Technologies (formerly Bellcore):
1. GR-499-CORE Transport Systems Generic Requirements (TSGR) Common Requirements, Issue 4
 2. TR-TSY-000752 Microwave Digital Radio Systems Criteria, Issue 1, October 1989
 3. GR-474-CORE Network Maintenance: Alarm and Control for Network Elements, Issue 2, May 2011
 4. GR-63 –Core Network Equipment-Building System (NEBS) Requirements: Physical Protection, Issue 4, April 2012
 5. SR-332 Special Report, Reliability Prediction Procedure for Electronic Equipment, Issue 3, February 2011
 6. GR-1089-CORE, Electromagnetic Compatibility and Electrical Safety Generic Criteria for Network Telecommunication Equipment, Issue 6, May 2011

RACOM Response: Read & Understood

- M. Codes and Standards of good practice issued by the following organizations:
1. National Electric Manufacturers Association (NEMA)
 2. National Fire Protection Association (NFPA)
 3. Occupational Safety Health Administration (OSHA)
 4. Underwriters Laboratories (UL)

RACOM Response: Read & Understood

1.3 SYSTEM DESCRIPTION

- A. A network map of the proposed City of Moscow Ethernet interconnection network is shown in Figure 1 below. The network is made up of both microwave radio connections and fiber connections over the City of Moscow fiber network. The microwave radios operate in the 11 GHz and 23 GHz under Part 101 of the FCC's Rules.

The frequency band to be employed for each path is shown Figure 1 below. The geographical coordinates and other sites details are shown in Table 2 of Section 33 83 00 – Land Mobile Radio and Antenna Systems.

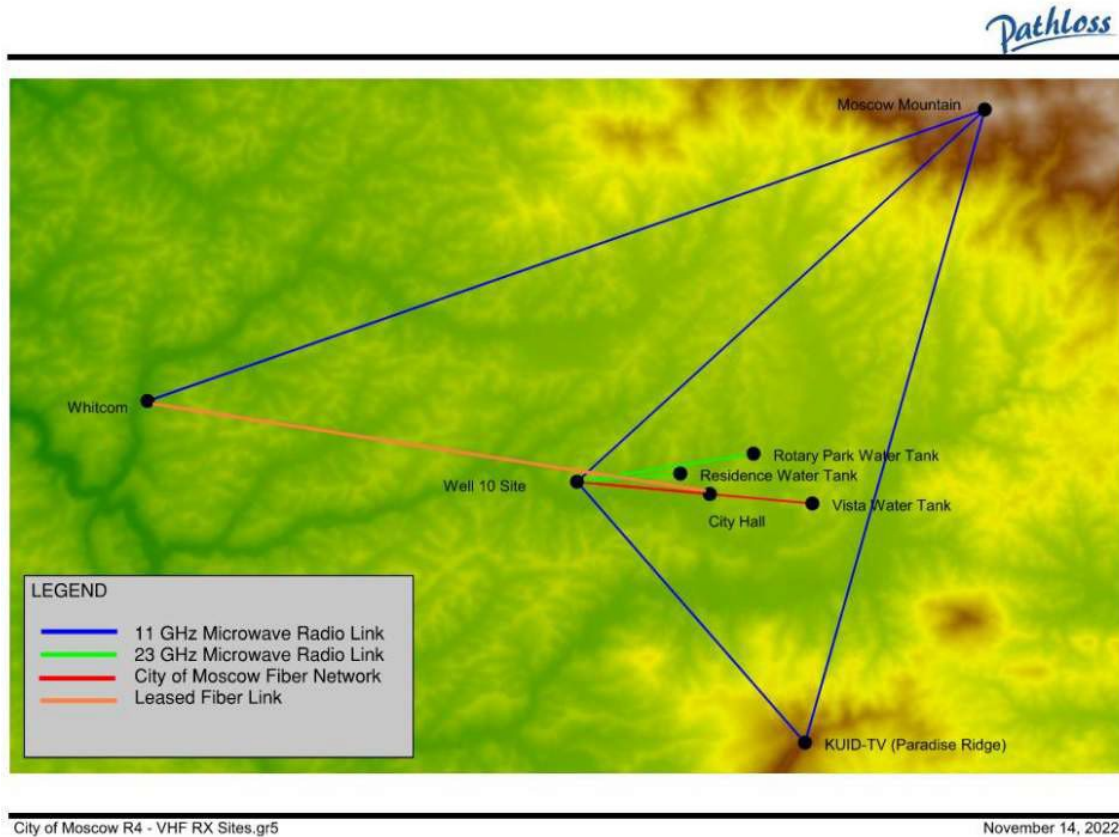


Figure 1 – Proposed City of Moscow Interconnect Network

RACOM Response: Comply RACOM has proposed the system as outlined using Aviat's Eclipse radio line. During Detailed Design, RACOM is recommending looking at using 11GHz also for the current 23 GHz link to minimize the number of spares if the City elects to hold them.

- B. The microwave radio antennas to be provided and installed under this Section are listed in Table 1 below.

RACOM Response: Read & Understood

- C. Configuration of the microwave radios, including antenna mounting locations and equipment installation in equipment rack at each site is shown in the Contract Drawings.

RACOM Response: Read & Understood

- D. Antenna mounts compatible with the tower provided under this specification are to be provided and installed for all antennas provided under this contract, as listed in the drawings. The antenna schedule shown in the drawings includes a separate column for the antenna mounts, which shall be used to indicate the manufacturer and model/part numbers for all antenna mounts.

RACOM Response: Read & Understood The proposed mounts are based on the information outlined and final mounts and locations will be determined during the Detailed Design after site visits and path studies have been completed.

- E. Provide proposed system documentation and pricing for two system alternatives, as shown below.
1. System Alternative #1 – Split system with indoor network interface and power supply unit and outdoor RF unit mounted on the antenna. Interconnections between indoor units and outdoor units provided with ½” coaxial cable, as specified herein. Configure radios for 1+1 MHSB operation.
 2. System Alternative #2 – Outdoor only system, with network interface at the RF unit mounted on the antenna. Power to radio supplied via POE interface. Configure radios for 2+0 operation with dual-polarized antennas.

RACOM Response: Comply, RACOM has proposed a split system solution only as it requires less tower work after installation to replace equipment than an outdoor only system.

1.4 PERFORMANCE REQUIREMENTS

- A. It is not the City’s intent to specify all technical requirements or to set forth those requirements adequately covered by applicable codes and standards. The Vendor's product shall meet the requirements of this specification and the applicable industry codes and standards.

RACOM Response: Read & Understood as they apply to the proposed solution.

- B. Upon acceptance of a purchase order based on this specification, the Vendor accepts full responsibility for engineering, design, material, and workmanship of the product and warrants that the product will satisfy the performance requirements of this specification.

RACOM Response: Comply, Site and Path Surveys are required before a final design can be confirmed. Current design and the proposed pricing is based on the information provided in the specification and the RFP.

- C. The work includes all items necessary for the safe, efficient and continuous operation of the equipment within the scope of this specification.

RACOM Response: Read & Understood

- F. The City requires that the selected vendor/integrator provide digital Microwave equipment that operates in the FCC Part 101 licensed bands in the 11 GHz and 23 GHz frequency bands. Bandwidth utilization shall be 100% packet based using Ethernet as the interface to each radio. The microwave equipment shall meet the minimum requirements outlined in this specifications document.

RACOM Response: Read & Understood

- G. The selected vendor/integrator shall provide all required frequency coordination and FCC licensing necessary to implement the City of Moscow interconnect system described in these Specifications.

RACOM Response: Read & Understood

E. General Requirements

1. All licensed microwave radios shall operate in spectrum allocated by the FCC under Part 101 as follows:
11 GHz
23 GHz

RACOM Response: Read & Understood

2. Radio terminals are required to be an outdoor only or split (indoor/outdoor) product for use at 6 GHz and 11 GHz. Provide technical details and cost proposals for two alternative system configurations shown above in Section 1.3.D:

RACOM Response: Read & Understood, RACOM is only proposing a split system as outlined before in our response.

3. Regardless of method of deployment of radios, the system shall be end-to-end compatible using a common packet switching, and service management platform.

RACOM Response: Read & Understood

4. The radio shall be capable of “nodal” operation supporting at least six (6) directions of transmission in a non-protected configuration or 3 directions in fully protected configuration.

RACOM Response: Read & Understood

5. Electrical interface shall be Ethernet. Ethernet layer shall be auto-negotiable at 10/100/1000 Mb/s. The Ethernet bandwidth shall be 155 Mb/s in 30 MHz channels.

RACOM Response: Read & Understood

6. The microwave radio equipment shall have remote access capability for diagnostics, monitoring of performance metrics and configuration data and remote configuration. The microwave radio equipment diagnostics, monitoring of configuration data and configuration shall be locally accessible via a laptop computer using a web browser.

RACOM Response: Comply

7. Management System Support

- a. Radio terminals shall have an Element Management System (EMS) or Microwave Craft Terminal (MCT) software for both local and remote operations, administration, maintenance and provisioning (OAM&P) of the complete radio system as a single Network Element (NE) – whether comprised of a simple terminal, and repeater, or a N-way hub.
- b. The EMS shall be capable of end-to-end, point and click circuit provisioning of all traffic interfaces (radio and Ethernet) as well as service cross-connections.

- c. The radio shall be capable of reporting alarm, status conditions as well as performance monitoring and diagnostic information to external Network Management System(s) via SNMPv3.

RACOM Response: Comply, RACOM has proposed the Aviat Provision tool.

8. Indoor radio components shall be mountable in ANSI/ EIA 310 standard racks.

RACOM Response: Read & Understood

9. Radios shall support optional redundancy of system control and switching fabric.

RACOM Response: Read & Understood

11. The City will use standard Windows-based PCs for field configuration and diagnostics. Vendor shall provide a description of operating system, hardware requirements, and any additional required software.

RACOM Response: Read & Understood, the system management accesses through a standard web browser so has no specific hardware or OS requirements.

F. General Equipment Specifications

1. Environmental and Physical Parameters

- a. The microwave transceivers for all radio configurations shall be fully operational within the temperature range of 0° C to +50°

RACOM Response: Read & Understood

- b. The baseband unit including layer 2 switch and chassis for tributary cards shall be fully operational within the temperature range of 0° C to +50° C.

RACOM Response: Read & Understood

- c. The indoor microwave radio equipment and all its systems and components quoted shall be fully self-contained and mount in standard ANSI/EIA 310 equipment racks.

RACOM Response: Read & Understood

- d. The waveguide interface for the outdoor RF units shall be the CPR type of the appropriate size for the selected frequency band. Vendor shall note if this is not the case, and shall include the required transition pieces in their proposal.

RACOM Response: Read & Understood

- e. The radios shall be NEBS Level 3 compliant.

RACOM Response: Read & Understood

- f. Vendor shall provide a certificate from a recognized laboratory of NEBS Certification. Vendor shall provide a copy of the NEBS tests and results at the request of the City.

RACOM Response: Comply, the ODU is not tested because the NEBS suite of tests is designed for indoor equipment only. Reports are available for the INUe. The INU and INUe comply in terms of NEBS performance.

2. Vibration

- a. The radio equipment, when mounted in an optional seismic style relay rack, shall meet the requirements of GR-63, for seismic and site vibrations. Also, the radio shall be resistant to the effects of mechanical shock (microphonic induced transmission impairments) caused by normal maintenance actions such as unit replacements.

RACOM Response: Read & Understood

3. Cooling

- a. The radio system shall have self-contained cooling systems to maintain continuous operation and specified performance under environmental temperatures ranging from 0° to 50° C.

RACOM Response: Read & Understood

- b. Fan units shall have redundant fan assemblies such that failure of an individual fan motor/blade assembly does not cause an interruption of traffic or degraded performance of the radio system. Such fan assembly failures shall also generate an alarm – both locally via contact closure as well as through the network management channel.

RACOM Response: Read & Understood

4. Electromagnetic Compatibility

- a. The radio equipment shall be designed to operate in a communications equipment environment installed in or near the vicinity of other types of equipment which may include other digital radio equipment, fiber optic terminal equipment, VHF/UHF base stations, and telephone signaling equipment.

RACOM Response: Read & Understood

5. Power Requirements

- a. The microwave radio equipment shall operate from a nominal -48 VDC power source per ANSI/T1 315.

RACOM Response: Read & Understood

- b. The microwave radio equipment shall allow the “hot” insertion and removal of radio transceiver, modem and tributary cards without service interruptions or damage to themselves or other modules. The radio shall also be capable of “hot” insertion and removal of an out-of-service common equipment module.

RACOM Response: Read & Understood

- c. The microwave radio equipment shall restart with no loss of provisioning for interfaces upon the loss and regaining of power.

RACOM Response: Read & Understood

6. Alarms and Status Indications

- a. Each microwave radio equipment module shall have a visual alarm/status indication noting either “normal” or “alarm” condition. A summary remote alarm shall be available via dry contacts (Form C) indicating, as a minimum, microwave radio equipment alarm conditions for the following:
 - 1. Critical Alarm
 - 2. Major Alarm
 - 3. Minor Alarm

RACOM Response: Read & Understood

G. Link and Network Topologies & Protection

- 1. The following supported configurations shall be supplied:
 - a. 1+0 (non-protected, single channel)
 - b. 1+1 Monitored Hot Standby
 - c. 2+0 (with dual-polarized antennas, for outdoor only systems)

RACOM Response: Read & Understood, as proposed for each of the links.

H. RF Specifications and Features

- 1. All radios shall provide the following:
 - a. Transmitter output power (typical at 128 QAM, or 256 QAM in a 30 MHz channel and with reference to the antenna port)

Frequency Band	Minimum TX Power
11 GHz	+27.5 dBm
23 GHz	+27.5 dBm
 - b. RF Switch for hot standby TX configuration
 - c. Auto-tuning when spare unit is installed
 - d. Standard transmitter-receiver filtering and combining using an integrated diplexer or separate TX and RX filters integrated into the radio’s antenna coupling unit.

RACOM Response: Read & Understood

2. Frequency Stability shall be +/- 10 ppm

RACOM Response: Read & Understood

3. Automatic Transmitter Power Control

- a. The radio shall support Automatic Transmitter Power Control with independently variable maximum, minimum, and operational threshold settings, all adjustable in 1dB steps. Range may be variable based on modulation setting, but in any case, shall be no less than 10 dB.

RACOM Response: Read & Understood

4. Compatibility with Antenna/Waveguide systems

- a. Transmitter shall operate at full power with an Antenna/Waveguide Return Loss as high as 16 dB.

RACOM Response: Read & Understood

I. Packet Features & Specifications

1. Layer 2 Packet Switching

- a. The radio shall employ a Layer 2 packet switch with a capacity of at least 2 Gb/s for a N-way nodal radio. The packet switch fabric shall have the option of being made redundant.

RACOM Response: Read & Understood

2. MEF 9 & 14 Compliance

- a. The radio shall be MEF 9 and 14 compliant.

RACOM Response: Read & Understood

3. Packet Features and Options

- a. Packet features and options shall include, but not limited to:

1. VLAN

Port-based VLAN

802.1Q Tag-based VLAN

VLAN steering

2. QoS

Strict Priority, D-WRR with Bandwidth Management (Minimum rate guarantee, maximum rate limitation)

Classification: VLAN CoS/Diffserve

3. Ethernet Protection Protocols

Ethernet Line Protection (G.8031), or

Ethernet Ring Protection (G.8032)

4. Ethernet Synchronization:

SyncE 1588v2

RACOM Response: Read & Understood as applicable.

4. Ethernet ports

- a. For split systems with an indoor network interface unit, the core Ethernet switch shall provide a minimum of 3 Ethernet ports:
 - 1. Minimum of 3 ports with RJ45 (10/100/1000Base-T) interfaces.
 - 2. Minimum of 2 ports supporting Small Form Pluggable (SFP) SX, LX, ZX interfaces.
 - 3. The SFP and RJ45 operation may be on an exclusion basis provisioned via the EMS or craft interface terminal.

RACOM Response: Read & Understood

- a. For split systems with an indoor network interface unit, additional Ethernet ports may be enabled by insertion of optional Ethernet tributary cards:
 - 1. The Ethernet tributary card shall provide a minimum of 8 Ethernet ports:
 - 2. Minimum of 3 ports with RJ45 (10/100/1000Base-T) interfaces.
 - 3. Minimum of 2 ports supporting Small Form Pluggable (SFP) SX, LX, ZX interfaces.
 - 4. Ethernet tributary cards shall have their own Layer 2 switch capability with capacity of at least 2 Gb/s
 - 5. The radio shall be able of supporting at least 2 Ethernet tributary cards.
 - 6. Ethernet tributary cards shall have the option of being made 1+1 redundant, and offering full 1+1 redundancy on the Ethernet backplane and 1+1 redundancy on the SFP ports

RACOM Response: Read & Understood not included in the proposed solution

J. Network Management

1. Network Management Interfaces

- a. The radio shall have an SNMPV3 interface for network management.
 - 1. SNMP Interface - The radio shall provide an SNMP network management interface capable of providing alarm data for the radio. The interface shall be compliant with version 2.0 and 3.0 of the SNMP standard. The Vendor shall state the specific alarm points supported.

RACOM Response: Read & Understood

2. Maintenance

- a. Normal maintenance actions that include replacements of failed or faulty redundant traffic processing units on the off-line portion of the radio shall not cause hits or impairments on the online portion of the radio.

RACOM Response: Read & Understood

- b. Test Points/Voltage Displays - Means shall be provided to measure or read-out critical voltage parameters within the radio. This may be satisfied through test points suitable for simple voltmeter connection or voltage reading displays using built-in devices in conjunction with a hand-held terminal or laptop PC. The following parameters, as a minimum, shall be able to be monitored in such a fashion:

1. Station DC Voltage

RACOM Response: Read & Understood

2. Direct measurement of transmitter power output and transmitter frequency via an integrated calibrated RF test port (SMA connector). An external waveguide directional coupler is not acceptable.

These shall be capable of being monitored at the far-end of the path using the remote display capability. The voltages shall be capable of being monitored at the network management center through use of the network management interface.

RACOM Response: Read & Understood

- c. Offline Diagnostics - Radio system shall provide diagnostic alarms and status on both online and off-line devices in redundant systems (hot-standby 1+1, frequency diversity 1:1 and space diversity receivers). As a minimum, the following parameters that shall be provided:

1. Transmitter – RF Transmit Power alarm
2. Transmitter – ATPC High Power alarm
3. Receiver – Radio Framing Loss alarm
4. Receiver – Total Bit Errors (counter, with local and remote reset capability)
5. Receiver – Total Errored Seconds
6. Receiver – Total Severely Errored Seconds
7. Receiver – Bit Error Rate

RACOM Response: Read & Understood as applicable for the proposed equipment.

4. Manufacturing Process Quality

- a. In order to ensure the highest quality telecommunications equipment, the Vendor's manufacturing facility shall be TL 9000 certified.

RACOM Response: Read & Understood

5. Service Life

- a. The radio equipment shall be designed for a service life of at least 10 years.

RACOM Response: Read & Understood

6. Modulation Requirements

- a. Minimum modulation formats and channel bandwidths of 128 QAM, and 256 QAM with channel widths of 10 MHz 30 MHz are required.

RACOM Response: Read & Understood, the current path design and throughput is based on 128 QAM.

- b. Optional modulation formats and channel bandwidths of QPSK, 16 QAM, 64 QAM, and 128 QAM and Bandwidths of 5 MHz are desired.

RACOM Response: Read & Understood

K. 6 GHz Radio System Requirements

RACOM Response: RACOM has proposed no 6 GHz links but has read and understands the information outlined if one should be needed in the final designed solution.

1. Frequency Band

- a. Part 101: The radio system shall be capable of operation in the FCC Part 101 frequency bands of 5.925 – 6.425 GHz and 6.525 – 6.875 GHz.

2. Quantities & Ethernet Capacity Requirements

- a. The 11 GHz and 23 GHz radios shall be designed to provide the following minimum capacities relative to the radio channel size and modulation

Modulation	Channel Size	
	10 MHz	30 MHz
128 QAM	50 Mb/s	155 Mb/s
256 QAM	60 Mb/s	185 Mb/s

- b. Specific capacity requirements are stated in the Network Diagram shown in Figure 1 above.

3. Modulation Requirements

- a. Minimum modulation formats and channel bandwidths of 128 QAM and 256 QAM with channel widths of 10 MHz and 30 MHz are required.

4. RF Interfaces

- a. Any user-accessible physical RF connections within the radio equipment shall not employ semi-rigid coaxial cables due to problems with breaking of connectors with periodic maintenance. Only flexible RF cables may be used.
- b. External RF interface feeding to the antenna shall be CMR-137 waveguide flange interface. If a type CPR-137 flange is utilized, a CMR-137 to CPR-137 adaptor shall be provided.

5. Ethernet Provisioning Configuration

- a. The Ethernet interface shall be capable of being provisioned in the following configuration(s):
 - Non-protected
 - A & B Switched – Hot Standby
 - A & B Summed – Load balancing

6. Protection Configuration

- a. The radios shall be capable of being provisioned with the following protection configuration, which shall be self-contained including all protection switching equipment
 - 1+0 (non-protected, single channel)
 - 2+0 (with dual-polarized antennas, for outdoor only radios)
 - 1+1 Hot Standby

L. 11 GHz Radio System Requirements

1. Frequency Band

- a. Part 101: The radio system shall be capable of operation in the FCC Part 101 frequency bands of 10.700 - 11.7 GHz

RACOM Response: Read & Understood

2. Quantities & Ethernet Capacity Requirements

- a. The 11 GHz radios shall be designed to provide the following minimum capacities relative to the radio channel size and modulation

Modulation	Channel Size		
	10 MHz	30 MHz	40 MHz
128 QAM	50 Mb/s	155 Mb/s	213 Mb/s
256 QAM	N/A	183 Mb/s	230 Mb/s

RACOM Response: Read & Understood

- b. Specific LINK capacity requirements are stated in the Network Design Specification.

RACOM Response: Read & Understood

3. Modulation Requirements

- a. Minimum modulation formats and channel bandwidths of 128 QAM and 256 QAM with channel widths of 10 MHz and 30 MHz are required.

RACOM Response: Read & Understood, the current path design and throughput is based on 128 QAM.

- b. Optional modulation formats and channel bandwidths of 64 QAM, 128 QAM, 256 QAM and Bandwidths of 40 MHz are desired.

RACOM Response: Read & Understood

4. RF Interfaces

- a. Any user-accessible physical RF connections within the radio equipment shall not employ semi-rigid coaxial cables due to problems with breaking of connectors with periodic maintenance. Only flexible RF cables shall be used.

RACOM Response: Read & Understood

- b. External RF interface feeding to the antenna shall be a CPR- 90G waveguide flange interfaces for 11 GHz radios and. PBR-220 waveguide flange for 23 GHz radios.

RACOM Response: Read & Understood CPR-90G or equivalent will be used where applicable.

5. Ethernet Provisioning Configuration

- a. The Ethernet interface shall be capable of being provisioned in the following configuration(s):

Non-protected

A & B Switched – Hot Standby

A & B Summed – Load balancing

RACOM Response: Read & Understood

6. Configuration

- a. The radios shall be provisioned with the following protection configuration, which shall be self-contained including all protection switching equipment
1+0 (non-protected, single channel)
1+1 Hot Standby
2+0 (with dual polarized antenna for outdoor only radios)

RACOM Response: Read & Understood as proposed for each link.

M. Transmission lines for Split (Indoor/Outdoor) systems.

- 1. All exposed antenna hardware must be S31600 stainless steel, brass, or C65100 low silicon bronze. Hot dip zinc galvanized steel meeting ASTM A-123, A-153, A-385 and B-695 may be used for mounting brackets.

RACOM Response: Read & Understood

- 2. Microwave Antenna Transmission Lines - for transmission lines from microwave radio indoor units to outdoor RF units, use Commscope LDF4-50A ½” (or approved equivalent) foam dielectric coaxial cable with Type N male connectors (or appropriate connector for microwave radio indoor units, outdoor RF units and surge arrestor).

RACOM Response: Read & Understood as per the final Detailed Design based on coax runs lengths.

- 3. All connections between transmission lines and outdoor microwave radio RF units shall be weatherproofed using the weatherproofing kit recommended by the manufacturer, Commscope 221213 (or approved equivalent).

RACOM Response: Read & Understood

4. Hangers used to support transmission line on transmission line bridge, transmission line ladder, and other locations where support members with mounting holes are used shall attach to support members with a bolt installed through the mounting hole and a lock washer and nut on the back side of the support member. "Snap-in" hangers are not permitted.

RACOM Response: Read & Understood

5. Provide Valmont Structures® waveguide entries (or approved equivalent) for the waveguides, as described in Section 33 83 00.

RACOM Response: Read & Understood

6. To ensure that antennas and waveguides meet specifications after installation, test transmission lines as described in Section 3.3 below. Submit a detailed test plan to City for approval in advance of these tests. Record and sign tests and present tests to City in printed format.

RACOM Response: Read & Understood, will be delayed and approved as part of the Detailed Design.

7. Antenna mounting structures and devices shall be mechanically compatible with the antenna support structures at each of the City of Moscow simulcast repeater sites and voting receiver sites and shall be adequate to support each antenna on the tower or other support structure.

RACOM Response: Read & Understood

8. Transmission lines shall have their outer conductors bonded to the tower at the antenna end, as close to the antenna as possible, to the ground bars at the base of the tower, at the building entry port, and inside the building as close to the entry port as possible, using the manufacturer's recommended grounding kit. Grounding kit wires used to connect transmission line and waveguide ground kits to tower ground lugs or ground bars shall be continuous lengths of wire supplied by the manufacturer as part of the ground kit. Splices in ground kit wires are not permitted.

RACOM Response: Read & Understood

N. Ethernet Cables for Outdoor Only Systems.

1. Ethernet cables for connections between outdoor-only microwave radios and Ethernet switches inside the equipment shelters shall be outdoor rated, flooded CAT6 ethernet cable (Superior Essex EnduraGain OSP Shielded 04-110-64, or approved equivalent).

RACOM Response: RACOM has not proposed any Outdoor only equipment.

Specifications for this cable are shown below:

SPECIFICATIONS	
Pair Count	4
Conductor	Solid annealed copper
AWG (mm)	23 (0.57)
Insulation	Polyolefin
Separator	Polyolefin cross-web
Shield/Armor	BBDN6A: Electrically continuous 0.008 in (0.20 mm) polymer coated smooth aluminum tape shield, applied with an overlap BBDG6A: Electrically continuous 0.005 in (0.13 mm) corrugated copper-clad steel armor, applied with an overlap
Dry Water Block	BBDN6A: SAP powder BBDG6A: SAP yarn
Jacket	Black, sunlight and weather resistant polyethylene
Characteristic Impedance Ohms	100 ± 15
Nominal Velocity of Propagation %	68
Performance Compliance	ANSI/TIA-568-C.2 ANSI/ICEA S-107-704-2006 RoHS-compliant REACH-compliant

RACOM Response: Read & Understood

1.5 SUBMITTALS

- A. Shop Drawings: Indicate proposed locations and details of installation for each antenna and transmission line to be installed under this Section. Indicate proposed configuration of specific transmission line at the transmission line entry port and at the interior (radio) side of the waveguide entry. Specifically identify the antenna, tower leg, and elevation proposed to be associated with each transmission line.

RACOM Response: Read & Understood

- B. Product Data: Submit manufacturers cut sheets for antennas, transmission lines and associated equipment. Submit manufacturer's cut sheets for all antenna mounts, and add manufacturer and model number for antenna mounts to the antenna schedule shown in the drawings. Submit revised antenna schedule with antenna mount information included.

RACOM Response: Read & Understood

- C. Test Reports: Submit test reports provided by the manufacturer for each antenna and transmission line.

RACOM Response: Read & Understood

- D. Manufacturer's Installation Instructions: Submit manufacturer's installation instructions for all antennas, antenna support structures, transmission lines, transmission line connectors, transmission line ground kits transmission line entry ports, grounding bars and surge suppressors provided under this Section.

RACOM Response: Read & Understood

1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record as-built tower locations and details of installation for each antenna and waveguide installed under this Section. Record and document configuration of specific waveguides at the waveguide entry port and at the interior (radio) side of the entry port. Specifically identify the antenna, tower leg, and elevation associated with waveguide.

RACOM Response: Read & Understood

1.7 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with a minimum of five (5) years demonstrated experience in the installation of land mobile and microwave radio equipment, antennas and waveguides/transmission lines with a documented history of neat and workmanlike installation practices. Provide photo documentation of previous installation work comparable to the work called for in these specifications. Provide project references (including customer contact information) for at least three (3) previous projects with work comparable to the work called for in these specifications.

RACOM Response: Read & Understood

1.8 PRE-INSTALLATION MEETINGS

- A. Convene a pre-installation meeting a minimum of one week prior to commencing work of this section.

RACOM Response: Read & Understood, Meeting may be on site or remote.

- B. Attendance is to include all parties directly affecting the work of this section.

RACOM Response: Read & Understood

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products with adequate protection against damage.

RACOM Response: Read & Understood

- B. Accept antennas, waveguides, and associated equipment on site or at Contractor's local storage facility in the Honolulu area. Inspect for damage.

RACOM Response: Read & Understood – RACOM will be storing equipment at our facilities in the Spokane area before any installation work.

- C. Arrange for transportation of all equipment from local storage facility to Puu Manawahua site. Take care to assure that waveguides are protected from damage and from rain and moisture as they are transported, and once they are delivered to the job site. Keep the ends of waveguide runs capped to avoid migration of water into the waveguides during transport, storage or installation. Waveguides are especially delicate and subject to damage if they are uncoiled from their spool prior to transport or prior to actual installation on the tower. Take steps to assure that waveguides are not twisted, dented or otherwise distorted during transport and installation.

RACOM Response: Read & Understood as it relates to the project and the proposed sites. RACOM will not be delivering equipment at the site outlined for this project.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Do not install transmission line connectors or transmission line weatherproofing during inclement weather.

RACOM Response: Read & Understood

1.11 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

RACOM Response: Read & Understood

1.12 SEQUENCING

- A. Sequence work to coordinate with installation and alignment of microwave system antennas.

RACOM Response: Read & Understood

1.13 COORDINATION

- B. Coordinate work with work of others affected by work of this section, including those performing microwave antenna and transmission line installation and alignment and those performing land mobile radio antenna and transmission line equipment.

RACOM Response: Read & Understood

1.14 WARRANTY

- A. Provide manufacturer's standard warranty.

RACOM Response: Read & Understood

PART 2 PRODUCTS

2.1 PRODUCT

- A. Product Description: the products described in this section include antennas, waveguides, grounding kits, weatherproofing materials, transmission line entry ports, other equipment required to implement the microwave systems in the Puu Manawahua new Communications Room, and microwave antenna systems on the new Puu Manawahua tower.

RACOM Response: Read & Understood, While RACOM would love to work on at the Puu Manawahua site, we will provide the same work and services as the sites being proposed for the City of Moscow.

2.2 COMPONENTS

- A. Antennas - The antenna manufacturers and model numbers for the antennas to be mounted on the towers and other antenna support structures at the City of Moscow are show above in Table 1. No substitutions may be made for these antennas without the written consent of the City. Substitution requests are required prior to bid and must be described n the general terms and conditions (GTC).

RACOM Response: Read & Understood, RACOM has outlined the proposed antennas for each of the proposed links and will be finalized in the Detailed Design after site visits and path studies have been completed.

- B. Microwave Radios – Provide and install new 155 Mbps microwave radios at the at the City of Moscow Sites, as shown in Figure 1 above. Configure radios for 1+1 MHSB (monitored hot-standby) operation (for split systems provided under Alternative 1) or 2+0 operation with dual-polarized antennas (for outdoor only systems provided under Alternative 2). Mount indoor units for split systems in the radio equipment rack at each site, as shown in the Contract Drawings. DC power for the radios is to be provided from the -48 VDC systems at each site, as shown in the drawings.

RACOM Response: Read & Understood, To confirm RACOM has proposed split systems for all the proposed links and the configuration is based on the type of link, Looped or Spur for each of the proposed links as outlined in our response.

- C. For outdoor only radios, provide and install suitable POE injectors (MSTronic MIT-65G-4856 112W DC/DC Gigabit PoE Injector or approved equivalent) to provide power to the radios if they are powered over the Ethernet cable connecting them to the network Provide all interconnecting cables required to interconnect the Ethernet interface on each radio to the Ethernet switch at each City of Moscow simulcast repeater site or voting receiver site.

RACOM Response: Read & Understood, RACOM has proposed no outdoor only radios.

Specifications for the POE injectors are shown below:

1. INPUT :

Input Voltage:	40Vdc to 72Vdc Normal = 56V
Input Current:	3.6A at 40Vdc @ Full Load
	2.6 A at 56Vdc @ Full Load

2.0 A at 72Vdc @ Full Load

2. OUTPUT :

Output Voltage & Current:

OUTPUT	56V
Max. load	2.0A
Power	112W
Min. Load	0.01A
Load reg.	% 5%
Line reg.	% 1%
Ripple %	1%
Noise %	1%
TOTAL POWER :	112W

Note 1: Noise bandwidth is from DC to 20Mhz. Ripple & Noise is measured by Paralleling a 0.1uF metalize capacitor on the test point.

EFFICIENCY : 80% min at Full Load , 40Vdc ~ 72Vdc Input Voltage

PROTECTION

Short Circuit Protection	Output Short GND Terminal will not damage the Power Supply and will Auto-Reset.
Input	Fuse Protection.
Safety Standard :	meet UL1950, CSA 22.2 &TUV EN60950-1.
EMC :	meet FCC Class A , EN55022 Class A
Over Current :	110% ~ 130% @All DC Input F.L

RACOM Response: Read & Understood

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions at the City of Moscow sites before starting work.

RACOM Response: Read & Understood

- B. Beginning of work means installer accepts existing surface and substrate conditions.

RACOM Response: Read & Understood

3.2 INSTALLATION

- A. Install antennas, transmission lines, connectors, entry ports, grounding kits, and weatherproofing in accordance with manufacturer's instructions.
- B. Install transmission line hangers at 3-foot intervals on the horizontal runs across the transmission line bridge and at 3-foot intervals on vertical runs up the tower.
- C. Weatherproof grounding kits using the materials and following the procedures contained in grounding kits specified above.

D. Microwave Antenna and Transmission Line Installation Requirements

1. These requirements apply to the installer mounting the microwave antennas and installing the microwave transmission lines.
 - a. Confirm correct antenna polarization and rough alignment.
 - b. Align antenna using existing signal from far end of path, using a spectrum analyzer to observe signal level.
 - c. Sweep waveguides for return loss and provide sweep results to City. Sweeps for each waveguide to include waveguides terminated with an appropriate load and connected to the antenna.
 - d. Make final connections to equipment and confirm correct signal levels; Contractor to make final antenna adjustments at direction of City personnel.

RACOM Response: Read & Understood

3.3 FIELD QUALITY CONTROL AND TESTING

A. Performance Verification & Acceptance Testing

1. Path Design & Performance
 - a. Vendors shall perform their own calculations and studies, including field verification as required to achieve path reliability and system performance objectives.

RACOM Response: Read & Understood

- b. The annual one-way path propagation reliability for each path shall be a minimum of 99.999% based on a maximum BER of 10^{-6} .

RACOM Response: Read & Understood

- c. Propagation outage and reliability shall be based on the Vigants model (Ref. "Space Diversity Engineering", Bell System Technical Journal, January, 1975):

$$P = 2.5 \times 10^{-6} \times C \times f \times d^3 \times 10^{-A/10}$$

Where:

P = Fade Probability

C = Climate/Terrain factor

f = frequency in GHz

d = path length in miles

A = effective (composite) fade margin

RACOM Response: Read & Understood, Draft Path Studies and the levels assumed have been provided in our response.

- d. A climate factor of $C = 2$ shall be assumed.

RACOM Response: Read & Understood, Draft Path Studies and the levels assumed have been provided in our response.

- e. The effective or composite fade margin shall be calculated using:
$$A = -10 \times \log (10^{-DFM/10} + 10^{-TFM/10})$$

Where:
DFM = Dispersive Fade Margin
TFM = Thermal Fade Margin

RACOM Response: Read & Understood, Draft Path Studies and the levels assumed have been provided in our response.

- f. If space diversity is required to meet the specified outage objectives, the following shall be used to calculate the diversity improvement factor (Vigants):
$$Isd = 7 \times 10^{-5} \times f \times v^2 \times s^2 \times 10^{A/10/d}$$

Where:
v = difference in main and diversity signals
s = vertical spacing of antennas in feet

RACOM Response: Read & Understood, Draft Path Studies and the levels assumed have been provided in our response.

- g. Rainfall outage calculations shall assume Crane 96, Zone C2.

RACOM Response: Read & Understood, Draft Path Studies and the levels assumed have been provided in our response.

2. Latency Criteria

- a. Vendor shall indicate worst-case latencies for proposed MW Radio equipment; back-to-back means with effective zero transmission propagation delays between the two sets of connected equipment for the following scenarios:
1 Hop
5 Hops
And the following payloads
Ethernet: from the originating Ethernet port on the Core Switch Module to the end Ethernet port on the Core Switch Module at the far-end site.

RACOM Response: Read & Understood, Draft Path Studies and the levels assumed have been provided in our response.

3. The following tests shall be conducted to verify that the digital microwave 155 mbps performance meets the requirements of the specification

- a. BER (Bit Error Rate)
A 2-hour one-way (loopback) test shall be conducted and the resulting BER shall be equal to no more than 15 errored seconds during a 2-hour, one-way (loopback) test.

RACOM Response: Read & Understood

b. Jitter/Wander

Jitter/Wander measurements shall indicate 150 ns for an observation time of 1000 seconds.

RACOM Response: Read & Understood

4. Test transmission lines with an appropriate termination after they are installed on the tower and before they are connected to the associated microwave radio to confirm that insertion loss and VSWR (Return Loss) conform to the manufacturer's specifications. Provide written results to City for each test.

RACOM Response: Read & Understood

5. Perform distance-to-fault measurements with the transmission line shorted at the radio end to confirm that there are no significant impedance "bumps" in each waveguide run.

Provide written results to City for each test.

RACOM Response: Read & Understood

6. Test antennas before they have been connected to their associated radio by sweeping each antenna VSWR (Return Loss) over the specified bandwidth of the antenna. Provide written results for each test.

RACOM Response: Read & Understood

7. All test and measurement equipment utilized for installation, and testing of the system shall have been recently calibrated to the test equipment manufacturer's specifications by a recognized calibration laboratory. Contractor shall provide proof of calibration certification prior to commencing ant testing of the system to the City.

RACOM Response: Read & Understood

3.4 SCHEDULES

- A. Antenna schedule, See Table 1 above.

RACOM Response: Read & Understood – RACOM has included a schedule of the antenna as proposed in our response.

3.5 CLEANUP

- A. Upon completion of this section of work, remove debris. Repair damages due to installation of this section of work.

RACOM Response: Read & Understood

END OF SECTION 33 83 40

SECTION 33 83 00 LAND MOBILE RADIO SYSTEMS

PART 1 GENERAL

RACOM Response: RACOM has included the Land Mobile Radio Systems as outlined below in Section 33 83 00 for those sites that require it and as outlined in our response. For those areas that have specified specific equipment, RACOM has either proposed the same or equipment that meets the specification intent as outlined based on our experience of the products, it manufactures support and long-term supportability of the product proposed. The final equipment to be used will be mutually agreed to during the detailed design process.

For each individual areas outlined RACOM has indicated if we Comply, Read & Understood (RACOM understands what is being asked for if it is something being provided by RACOM's scope of work) , Take Exception or Non-Comply as outlined.

1.1 SUMMARY

A. Section Includes

1. Contractor to provide and install voice radio systems, including all component parts reasonably incidental to providing a complete system.

RACOM Response: Read & Understood

2. Land mobile radio systems are defined to include, but are not limited to the following components at the City of Moscow radio sites described in this Specification:

VHF Narrowband Analog radio base stations
VHF Narrowband Analog radio voting receivers
Receiver Voting Equipment
Site Controllers Required for Simulcast Operation and for Receiver Voting
Transmitter Combiners
Receiver Multicouplers
Monitoring and Alarm Systems
Ethernet switches
Equipment Racks
GPS Oscillators
Transmission Lines and Antennas
Surge Arrestors

RACOM Response: Read & Understood

B. Related Sections

1. Division 01 Sections.
2. Section 26 20 00 – DC Power and Alarm Systems
3. Section 33 83 40 Microwave Radio System
4. Section 16050 - Basic Electrical Materials and Methods
5. Section 16075 – Electrical Identification

1.2 REFERENCES

A. ANSI/NFPA

1. ANSI/NFPA 70 - National Electrical Code

B. Federal Communications Commission:

1. 47 CFR 1.1310 – Radiofrequency Radiation Exposure Limits

RACOM Response: Read & Understood

1.3 SYSTEM DESCRIPTION

A. SYSTEM OVERVIEW

This Specification contains the requirements for the procurement, installation, configuration, and testing of new VHF base station radio equipment that will make up a new VHF simulcast radio system with three base station repeater sites, and three voting receiver sites. The system will have two simulcast subsystems, as described below, and a voting receiver system incorporating all of the receivers in both simulcast sub-systems.

The Contractor's responsibility shall be to provide and install, configure, test and document the radio systems at the new and existing sites described in this specification.

Radio system equipment including VHF base station radios, site controllers, transmitter combiners and receiver multicouplers, monitoring and alarm units for the VHF and microwave radios, Ethernet switches, GPS oscillators, transmission lines and antennas, surge arrestors and other equipment required to provide a complete and functional simulcast system with receiver voting will be provided and installed by the contractor, as described below.

All cabling and other ancillary equipment required to interconnect these items of equipment into fully functional systems shall be provided and installed by the contractor.

Microwave radio equipment and backup DC Power systems will also be installed under this contract, as described in Section 33 83 40 and Section 26 20 00.

Because VHF analog base stations are available from various vendors, and because some radios require -48 VDC power and some radios require 12 VDC (nominal 13.6 VDC) power, these specifications and the attached Contract Drawings show typical equipment configurations and equipment rack layouts for both -48 VDC equipment and for 12 VDC equipment. Proposers may specify a system configuration with either power supply alternative, provided that all of the radio equipment (excluding the transmitter combiner and receiver multicoupler equipment), microwave or fiber interconnect equipment and backup DC power equipment fits into a single EIA 19" equipment rack (because of equipment space limitations at some of the repeater sites). The configuration of equipment shown in the Contract Drawings is typical, and Proposers may provide a different configuration of equipment as long as it meets the space requirement described above.

RACOM Response: Read & Understood, RACOM's proposed solution is -48 VDC. RACOM has not included any 12 VDC equipment in our response.

Existing City of Moscow Radio System

The existing City of Moscow Radio System consists of a primary dispatch channel and a tactical channel for the Moscow Fire Department (MFD), a primary dispatch channel for the Moscow Police

Department (MPD), and a primary dispatch channel for the City of Moscow Public Works Department.

Both the Fire dispatch and the Fire TAC channel have stand-alone base station repeaters at the Moscow Mountain site. The Moscow Police Department primary dispatch channel now operates from three stand-alone repeater sites within the City of Moscow: the Latah County Courthouse, the Rotary Park Water Tank, and a site at the golf course on the University of Idaho campus. The MPD users select the appropriate repeater site based on their location, using CTCSS tones in their mobile and portable radios. The Public Works channel operates from a stand-alone repeater site at the Latah County Courthouse. The MFD and MPD channels are connected to the Whitcom dispatch center, while the Public Works channel is not connected to dispatch; it is dispatched by Public Works personnel using a fixed control station operating on the Public Works channel.

RACOM Response: Read & Understood

Proposed New City of Moscow Radio System

The frequencies and channel names that will be used in the new system are shown below in Table 1.

City of Moscow VHF Simulcast TX Channels	
153.8000	MFD Main Dispatch Channel - TX (Moscow Mountain, KUID-TV & Well 10 Sites)
154.8900	MFD TAC Channel #1 - TX (Moscow Mountain, KUID-TV & Well 10 Sites)
155.6775	MPD Main Dispatch Channel - TX (Moscow Mountain, KUID-TV & Well 10 Sites)
154.4450	Shared TAC Channel #1 - TX (Well 10, KUID-TV and City Hall Sites)
159.2100	Shared TAC Channel #1 - TX (Well 10, KUID-TV and City Hall Sites)
City of Moscow Public Works TX Channel	
153.9800	Public Works Channelk - TX
City of Moscow VHF Simulcast RX Channels	
155.8875	MFD Main Dispatch Channel - RX (Moscow Mountain, KUID-TV & Well 10 Sites)
159.0000	MFD TAC Channel #1 - RX (Moscow Mountain, KUID-TV & Well 10 Sites)
158.9850	MPD Main Dispatch Channel - RX (Moscow Mountain, KUID-TV & Well 10 Sites)
154.7250	Shared TAC Channel #1 - TX (Well 10, KUID-TV and City Hall Sites)
154.7100	Shared TAC Channel #2 - TX (Well 10, KUID-TV and City Hall Sites)
City of Moscow Public Works RX Channel	
155.7750	Public Works Channel - RX

Table 1 – New System Frequencies and Channel Names

The configuration and locations of the sites that make up the new City of Moscow VHF simulcast radio system are shown below in Table 2. The overall system consists of two simulcast subsystems: one simulcast subsystem made up of the Moscow Mountain, KUID-TV and Well 10 repeater sites and the other simulcast subsystem make up of the City Hall, KUID-TV and Well 10. The system also includes three receive-only voting receiver sites located at the Residence Water Tower, the Rotary Park Water Tower and the Vista Water Tank, all within the City of Moscow.

The Moscow Mountain, KUID-TV and Well 10 simulcast subsystem has three channels: the MFD main dispatch channel, the MFD TAC channel and the MPD main dispatch channel.

The City Hall, KUID-TV and Well 10 simulcast subsystem has two channels: the two shared TAC channels.

The voting receivers at all of the simulcast repeater sites and at all of the voting receiver sites are to be configured as a single voting receiver subsystem, with all sites included in the receiver voting.

The Public Works repeater in the Courthouse will remain a stand-alone repeater with no connection to dispatch or to the other subsystems.

Site	Geographical Coordinates		Elevation (Feet AMSL)	Shelter Type	Antenna Support Structure
Simulcast Sub-System #1 (TX Frequencies: 153.8000 MHz, 153.8900 MHz & 155.6775 MHz)					
Moscow Mountain	46-44-14.6 N	116-59-44.6 W	4485	Existing Shelter	Existing Lattice Tower
KUID-TV	46-40-54.0 N	116-58-17.0 W	3567	Existing Shelter	Existing Lattice Tower
Well 10	46-44-06.7 N	117-02-22.9 W	2625	Existing Well House Building	New Monopole
Simulcast Sub-System #2 (TX Frequencies: 154.4450 MHz & 159.2100 MHz)					
Well 10	46-44-06.7 N	117-02-22.9 W	2625	Existing Well House Building	New Monopole
City Hall			2645	City Hall Equipment Room	TX and RX Tripod Antenna Supports on Roof
KUID-TV	46-40-54.0 N	116-58-17.0 W	3567	Existing Shelter	Existing Lattice Tower
Public Works Repeater (TX Frequency: 153.9800 MHz) Stand-Alone Repeater					
Latah County Courthouse	46-43-50.3 N	116-59-48.6	2648	Courthouse Building	Existing Guyed Tower
Voting Receiver Sites (RX Frequencies: 155.8875 MHz, 159.0000 MHz, 158.9850 MHz, 154.7250 MHz & 154.7100 MHz)					
Residence Water Tower	46 44 12.7 N	117 00 30.7 W	2678	New Outdoor Cabinet	Water Tower
Rotary Park Water Tower	46 44 26.9 N	116 59 12.1 W	2680	New Outdoor Cabinet	Water Tower
Vista Water Tank	46 43 50.5 N	116 58 8.7 W	2750	Existing Equipment Shelter	Existing Pole
NOTE: The RX frequencies shown for the Voting Receiver Sites are also voted at the simulcast sub-system sites (except 154.7250 MHz & 154.7100 MHz at the Moscow Mountain site; these channels are not present at that site.)					

Table 2 – Configuration and Location of City of Moscow Repeater and Voting Receiver Sites

The frequencies and antennas used at each site, along with antenna elevations above ground, nominal transmitter output power and Effective Radiated Power for each frequency at each repeater site are shown below in Table 3. The frequencies and antennas use at each voting receiver site are shown below in Table 4. Cut sheets for the antennas shown in Table 3 and Table 4 are shown in Appendix 2.

Figure 3 – Frequencies, Antennas, Nominal TPO and Effective Radiated Power by Site – Repeater Sites

Repeater Site Location/Frequency	TX or RX Antenna Elevation AGL	TX or RX Antenna Elevation AGL	TX Combiner Output	RX Multicoupler Input	Antenna Type	Antenna Manufacturer	Antenna Model	Gain (dBd)	Orientation (° True)	Nominal Transmitter Output Power (Watts)	Effective Radiated Power (Watts)	Effective Radiated Power (dBm)	Simulcast Delay Offset (µSec)
Moscow Mountain													
TX Frequency #1 - 153.8000 MHz	55	16.8	TX Ant #1		OMNI	Sinclar	D222-SF8PASNM (6 dBd GAIN OFFSET	6.0	N/A	100.0	100.0	50.0	0
RX Frequency #1 - 155.8875 MHz	120	36.6		RX Ant #1	OMNI	Telewave	PATTERN)	6.0	N/A	N/A	N/A	N/A	N/A
TX Frequency #2 - 154.8900 MHz	55	16.8	TX Ant #1		OMNI	Sinclar	D222-SF8PASNM (6 dBd GAIN OFFSET	6.0	N/A	25.0	7.20	38.6	0
RX Frequency #2 - 159.0000 MHz	120	36.6		RX Ant #1	OMNI	Telewave	ANT150F6	6.0	N/A	N/A	N/A	N/A	N/A
TX Frequency #3 - 155.6775 MHz	55	16.8	TX Ant #1		OMNI	Sinclar	D222-SF8PASNM (6 dBd GAIN OFFSET	6.0	N/A	25.0	11.0	40.4	0
RX Frequency #3 - 158.9850 MHz	120	36.6		RX Ant #1	OMNI	Telewave	ANT150F6	6.0	N/A	N/A	N/A	N/A	N/A
KUID-TV													
TX Frequency #1 - 153.8000 MHz	37	11.3	TX Antenna 3		OMNI	Telewave	ANT150F2	2.5	N/A	50.0	23.0	43.6	7
RX Frequency #1 - 155.8875 MHz	187	57.0		RX Antenna 2	OMNI	Telewave	ANT150F2	2.5	N/A	N/A	N/A	N/A	N/A
TX Frequency #2 - 154.8900 MHz	37	11.3	TX Antenna 3		OMNI	Telewave	ANT150F2	2.5	N/A	50.0	23.0	43.6	7
RX Frequency #2 - 159.0000 MHz	187	57.0		RX Antenna 2	OMNI	Telewave	ANT150F2	2.5	N/A	N/A	N/A	N/A	N/A
TX Frequency #3 - 155.6775 MHz	37	11.3	TX Antenna 3		OMNI	Telewave	ANT150F2	2.5	N/A	50.0	23.0	43.6	7
RX Frequency #3 - 158.9850 MHz	187	57.0		RX Antenna 2	OMNI	Telewave	ANT150F2	2.5	N/A	N/A	N/A	N/A	N/A
TX Frequency #4 - 154.4450 MHz	37	11.3	TX Antenna 1		Log Periodic	Kathrein-Scala	CL7-150	7.3	320	25.0	15.0	41.8	
RX Frequency #4 - 154.7250 MHz	197	60.0		RX Antenna 1	Log Periodic	Kathrein-Scala	CL7-150	7.3	335	N/A	N/A	N/A	N/A
TX Frequency #5 - 159.2100 MHz	37	11.3	TX Antenna 2		Log Periodic	Kathrein-Scala	CL7-150	7.3	5	15.0	7.0	38.5	
RX Frequency #5 - 154.7100 MHz	187	57.0		RX Antenna 2	OMNI	Telewave	ANT150F2	2.5	N/A	N/A	N/A	N/A	N/A
Well 10													
TX Frequency #1 - 153.8000 MHz	55	16.8	TX Ant #1		External Dipole Array	Sinclair	SD222-SF8PASNM (6 dBd	6.0	105		100	50.0	0
RX Frequency #1 - 155.8875 MHz	80	24.4		RX Ant #1	OMNI	Telewave	ANT150F6	6.0	N/A	N/A	N/A	N/A	N/A
TX Frequency #2 - 154.8900 MHz	55	16.8	TX Ant #1		Single TX Antenna - See 153.8000 MHz Above			6.0	105	75	75.0	48.8	0
RX Frequency #2 - 159.0000 MHz	80	24.4		RX Ant #1	Single RX Antenna - See 155.8875 MHz Above			6.0	N/A	N/A	N/A	N/A	N/A
TX Frequency #3 - 155.6775 MHz	55	16.8	TX Ant #1		Single TX Antenna - See 153.8000 MHz Above			6.0	105	100	100.0	50.0	0
RX Frequency #3 - 158.9850 MHz	80	24.4		RX Ant #1	Single RX Antenna - See 155.8875 MHz Above			6.0	N/A	N/A	N/A	N/A	N/A
TX Frequency #4 - 154.4450 MHz	55	16.8	TX Ant #1		Single TX Antenna - See 153.8000 MHz Above			6.0	105	50	40.0	46.0	0
RX Frequency #4 - 154.7250 MHz	80	24.4		RX Ant #1	Single RX Antenna - See 155.8875 MHz Above			6.0	N/A	N/A	N/A	N/A	N/A
TX Frequency #5 - 159.2100 MHz	55	16.8	TX Ant #1		Single TX Antenna - See 153.8000 MHz Above			6.0	105	75	70.0	48.5	0
RX Frequency #5 - 154.7100 MHz	80	24.4		RX Ant #1	Single RX Antenna - See 155.8875 MHz Above			6.0	N/A	N/A	N/A	N/A	N/A
City Hall													
TX Frequency #1 - 154.4450 MHz	50	15.2	TX Ant #1		OMNI Co-linear	Telewave	ANT150F2	2.5	xxx	100	56.0	47.5	0
RX Frequency #1 - 154.7250 MHz	50	15.2		RX Ant #1	OMNI Co-linear	Telewave	ANT150F2	2.5	N/A	N/A	N/A	N/A	N/A
TX Frequency #2 - 159.2100 MHz	50	15.2	TX Ant #1		Single TX Antenna - See 154.4450 MHz Above			6.0	xxx	100	70.0	48.5	0
RX Frequency #42- 154.7100 MHz	50	15.2		RX Ant #1	Single RX Antenna - See 154.7250 MHz Above			6.0	N/A	N/A	N/A	N/A	N/A
Courthouse	Public Works Channel Only (Stand-Alone Repeater)												
X Frequency #1 - 153.9800 MHz	55	16.8	Duplexer TX In		OMNI Co-linear	Telewave	ANT150F6	6.0	N/A	100	100	50.0	N/A
RX Frequency #1 - 155.7750 MHz	55	16.8		Duplexer RX	Duplex TX/RX Antenna See 153.9800 MHz			6.0	N/A	N/A	N/A	N/A	N/A

Figure 4 – Frequencies and Antennas by Site – Voting Receiver Sites

Repeater Site Location/Frequency	TX or RX Antenna Elevation AGL (Feet)	TX or RX Antenna Elevation AGL (Meters)	TX Combiner Output	RX Multicoupler Input	Antenna Type	Antenna Manufacturer	Antenna Model	Gain (dBd)	Orientati on (° True)
Voting Receiver Sites (NW Water Tower, Orchard Avenue Water Tower, Vista Water Tank)									
RX Frequency #1 - 155.8875 MHz									
Residence Water Tower	55	16.8	N/A		OMNI	Telewave	ANT150F6	6.0	N/A
Rotary Park Water Tower	55	16.8	N/A		OMNI	Telewave	ANT150F6	6.0	N/A
Vista Water Tank	45	13.7	N/A		OMNI	Telewave	ANT150F6	6.0	N/A
RX Frequency #2 - 159.0000 MHz									
Residence Water Tower	55	16.8	N/A		OMNI	Telewave	ANT150F6	6.0	N/A
Rotary Park Water Tower	55	16.8	N/A		OMNI	Telewave	ANT150F6	6.0	N/A
Vista Water Tank	45	13.7	N/A		OMNI	Telewave	ANT150F6	6.0	N/A
RX Frequency #3 - 158.9850 MHz									
Residence Water Tower	55	16.8	N/A		OMNI	Telewave	ANT150F6	6.0	N/A
Rotary Park Water Tower	55	16.8	N/A		OMNI	Telewave	ANT150F6	6.0	N/A
Vista Water Tank	45	13.7	N/A		OMNI	Telewave	ANT150F6	6.0	N/A
RX Frequency #4 - 154.7250 MHz									
Residence Water Tower	55	16.8	N/A		OMNI	Telewave	ANT150F6	6.0	N/A
Rotary Park Water Tower	55	16.8	N/A		OMNI	Telewave	ANT150F6	6.0	N/A
Vista Water Tank	45	13.7	N/A		OMNI	Telewave	ANT150F6	6.0	N/A
RX Frequency #4 - 154.7100 MHz									
Residence Water Tower	55	16.8	N/A		OMNI	Telewave	ANT150F6	6.0	N/A
Rotary Park Water Tower	55	16.8	N/A		OMNI	Telewave	ANT150F6	6.0	N/A
Vista Water Tank	45	13.7	N/A		OMNI	Telewave	ANT150F6	6.0	N/A

The geographical coordinates of each of the simulcast repeaters sites, the voting receiver sites and the Whitcom site are shown below in Table 5.

Site name	Latitude	Longitude
Courthouse	46 43 50.23 N	116 59 48.37 W
KUID-TV (Paradise Ridge)	46 40 54.00 N	116 58 17.00 W
Moscow Mountain	46 48 40.95 N	116 55 02.94 W
NW Water Tank	46 44 12.71 N	117 00 30.70 W
Orchard Avenue Water Tank	46 44 27.55 N	116 59 12.02 W
Vista Water Tank	46 43 50.32 N	116 58 10.47 W
Well10	46 44 06.70 N	117 02 21.70 W
Whitcom	46 45 05.96 N	117 10 03.00 W

Table 5 – Site Geographical Coordinates

RACOM Response: Read & Understood

- B. The subsystems and system components to be provided installed, configured and tested as described in this Specification include:
1. VHF Analog Narrowband radios, consisting of the following equipment:
 - a.) VHF analog narrowband base station radios, configured as repeaters and programmed for operation on the frequencies and with the nominal transmit power output levels listed in Table 2 above, as follows:
 - b.) Moscow Mountain Site – 3 base station repeaters
 - c.) KUID-TV Site – 5 base station repeaters
 - d.) Well 10 Site – 5 base station repeaters
 - e.) City Hall Site – 2 base station repeaters
 - f.) Courthouse Site – 1 base station repeater
 - g.) General product specifications for the base station repeaters are shown below in Section 2.1.B
 - h.) Install the base station repeaters in the radio equipment rack at each site, as shown in the Contract Drawings.

RACOM Response: Read & Understood, an overview of the system proposed by RACOM is provided in our response that matches what is outlined above.

2. VHF RF power amplifiers consisting of the following equipment:

- a.) If external (i.e., amplifiers external to the base station radio chassis) RF power amplifiers are required to produce the nominal Transmitter Output Power shown for each frequency at each site in Table 2 above, provide and install external RF power amplifiers (Crescent Technologies P10-XEA-C7-001[100 Watts] or P5-XDE1-C7-001 [50 Watts], where the X in the part number indicates the required input power) as follows.

RACOM Response: Read & Understood, the proposed Power Amplifiers are part of the TP9400 Base Station being proposed for the project and are not external devices.

- b.) Moscow Mountain Site – 1 100-Watt External RF Power Amplifier
- c.) KUID-TV Site – 3 50-Watt External RF Power Amplifiers
- d.) Well 10 Site - 5 100-Watt External Power Amplifiers
- e.) City Hall Site – 2 100-Watt External Power Amplifiers

RACOM Response: Read & Understood, RACOM has proposed all 100W TB9400 to minimize the needed spares if the City elects to include them. If decided during Detail Design, the TB9400 is also available in 50W configurations.

- f.) Detailed product specifications for these external RF power amplifiers are shown below in Section 2.1.C.

RACOM Response: Read & Understood – RACOM did not propose an external power amplifier.

- g.) Install the external RF power amplifiers in the radio equipment rack at each site, as shown in the Contract Drawings.

RACOM Response: Read & Understood – RACOM did not propose an external power amplifier.

3. Provide and install transmitter combining and receiver multicoupling equipment at the simulcast repeater sites, the voting receiver sites and the Courthouse site, consisting of the following equipment:

- a.) TX-RX Systems Transmitter Combiner/Receiver Multicoupler Systems
- b.) Moscow Mountain Site – TXRX Systems 74-37-22185-A-MM VHF Transmitter Combiner/Receiver Multicoupler System (or approved equivalent)
- c.) KUID-TV Site – TXRX Systems 74-37-22185-A-KTV VHF Transmitter Combiner/Receiver Multicoupler System (or approved equivalent)
- d.) Well 10 Site - TXRX Systems 74-37-22185-A-W10 VHF Transmitter Combiner/Receiver Multicoupler System (or approved equivalent)

- e.) City Hall Site - TXRX Systems 74-37-22217-A-CTH VHF Transmitter Combiner/Receiver Multicoupler System (or approved equivalent)
- f.) Residence Water Tower Site - TXRX Systems 42-37-22204-A-CM VHF Receiver Multicoupler System (or approved equivalent)
- g.) Rotary Park Water Tower Site - TXRX Systems 42-37-22204-A-CM VHF Receiver Multicoupler System (or approved equivalent)
- h.) Vista Water Tank Site - TXRX Systems 42-37-22204-A-CM VHF Receiver Multicoupler System (or approved equivalent)
- i.) Courthouse Site- Telewave TPRD 1556 VHF Duplexer (or approved equivalent)

RACOM Response: Read & Understood RACOM has proposed equivalent dbSpectra equipment for all the sites as outlined. We can also supply TXRX but our recommended system is dbSpectra based on our experience working with both.

- j.) Detailed specifications for the combining systems are shown in Appendix 1. Detailed Specifications for the duplexer are shown in Section 2.1.D below.

RACOM Response: Read & Understood

- k.) Transmitter combiner/receiver multicoupler systems specified above include 19" rack-mounting for cavities and associated combining equipment.

RACOM Response: Read & Understood

- l.) The contractor shall be responsible for cables from the combining system to the surge arrestors at each site and from the radio equipment to the combiner input ports and the multicoupler output ports.

RACOM Response: Read & Understood

- m.) Install the combining systems and the duplexer in EIA 19" racks (either racks included with combining systems or a new rack for the duplexer), as shown in the Contract Drawings.

RACOM Response: Read & Understood

- n.) Install the receiver multicoupler systems at the voting receiver sites in new outdoor enclosures, as shown in the Contract Drawings. The outdoor enclosures are described elsewhere in this specification and come with rack mounting rails for the cavities and associated receiver multicoupler equipment.

RACOM Response: Read & Understood

4. Provide and install a manual RF Coaxial Switch (Pasternack PE7139 or approved equivalent) and a 2-way power divider (EMR 2412-0/C or approved equivalent to allow switching of the connections between the main and backup Public Works TX and RX ports and the TX and RX ports of the VHF duplexer at the Courthouse site, as shown in the Contract Drawings.

RACOM Response: [Comply](#)

- a.) Install the power divider and switch on a rack shelf in the equipment rack with sufficient space to allow the switch to be easily reached and changed.

RACOM Response: [Read & Understood](#)

- b.) Interconnect the components with 24" Type N to Type N RG-213 jumpers (Pasternack PE3496LF-24 or approved equivalent)

RACOM Response: [Read & Understood](#)

- c.) Detailed specifications for the RF coaxial switch, power divider and RF jumper cables are shown in Section 2.1.E below.

RACOM Response: [Read & Understood](#)

5. Provide and install GPS master oscillator equipment consisting of the following items at the four simulcast sites (Moscow Mountain, KUID-TV, Well 10 and City Hall).

RACOM Response: [Comply](#)

1. GPS Master Oscillator

RACOM Response: [Read & Understood](#)

- a.) Orolia SecureSync 1200-433 Master Oscillator (or approved equivalent) – Quantity – 1 per site

RACOM Response: [Read & Understood](#)

- b.) Orilia Spectacom8230AJ GPS Antenna (or approved equivalent) – 1 per site

RACOM Response: [Read & Understood](#)

- c.) Orilia Spectacom8226 Antenna Line Surge Suppressor (or approved equivalent) – 1 per site

RACOM Response: [Read & Understood](#)

- d.) Orilia Spectacom 1204-1C 10 MHz Frequency Output Option Module Card with 3 outputs per card (or approved equivalent). Quantities: 1 at City Hall and Moscow Mountain sites; 2 at Well 10 and KUID-TV sites

RACOM Response: [Read & Understood](#)

- e.) Install GPS antennas as shown in the Contract Drawings.

RACOM Response: Read & Understood

- f.) Provide and install 1/2" coaxial cables terminated in Type N male connectors (LMR-400 or approved equivalent) between each GPS oscillator and its associated GPS antenna.

RACOM Response: Read & Understood

- g.) Detailed specifications for these GPS oscillators and associated components are shown in Section 2.xx below.

RACOM Response: Read & Understood

6. Provide and install new 16-port Ethernet switches (Cisco CBS250-16P-2P Stackable Managed Switch or approved equivalent) at the simulcast repeater sites, at the voting receiver sites and at the Whitcom site, as shown in the Contract Drawings. (These switches are specified because they are the same switches used in the City of Moscow IP network, so the City has an inventory of spares and City IT personnel are familiar with these units.)

RACOM Response: Read & Understood RACOM can provide these but propose to use the Cisco switches outlined in our system overview as they are available with -48VDC supplies so do not require an inverter.

- a.) Connect the AC power cord for each Ethernet switch to an outlet on the -48 VDC to 120 VAC inverter at each site. (See Section 26 20 00 – DC Power and Alarm Systems for detailed specifications for the DC-AC inverters.)

RACOM Response: Read & Understood

- b.) Detailed specifications for these Ethernet switches are shown in Section 2.1.F below.

RACOM Response: Read & Understood

7. Provide and install new 2-bay outdoor equipment cabinets (DDB Unlimited 20D-78DDXC or approved equivalent) at the following sites, as shown in the drawings. Provide and install HVAC units for the outdoor cabinets (Pentair ACP-6000/8000-N36-110 or approved equivalent). Also provide and install a HVAC unit at the existing equipment shelter at the Vista Water Tank site. Connect the units to AC power via a new 20 Amp circuit from the electrical panel at each site.

RACOM Response: Read & Understood RACOM will include the HVAC unit supplied by DDB. RACOM has included budgetary funds for the HVAC unit for the Vista Water Tank site until the overall BTU needs of the site can be confirmed during the Detailed Design.

- a.) Residence Water Tower Site

- b.) Rotary Park Water Tower Site
- c.) Vista Water Tank (HVAC Unit only; Existing equipment shelter will be used at this site.)
- d.) Provide and install new conduit runs from these cabinets to the tower leg for transmission line runs up the tower and for a ground connection
- e.) Detailed specifications for these outdoor cabinets and HVAC units are shown in Section 2.1.W below.

RACOM Response: Read & Understood

8. Provide and install new 19" EIA equipment racks at the following sites, as shown in the Contract drawings. Racks shall be EIA 19 inch 2-post racks [Cooper B-Line SB506084XUYZ (or approved equivalent)] with zinc chromate finish and universal panel hole pattern, rated for Seismic Design Category B (minimum) with a 900 pound load.

- a.) Moscow Mountain – 1 rack
- b.) KUID-TV – 1 rack
- c.) Well 10 – 1 rack
- d.) City Hall – 1 rack
- e.) Whitcom – 1 rack

RACOM Response: Read & Understood

- f.) XU in the model number shown above indicates a universal hole pattern for the panel mounting holes; YZ in the model number shown above indicates a zinc chromate finish; Confirm with Cooper B-Line that the part number shown above is the correct part number for a 7-foot 19" rack with zinc chromate finish and universal hole pattern.

RACOM Response: Read & Understood

- g.) The outdoor enclosures described elsewhere in this Specification provide rack mounting rails for rack-mounted radio equipment and receiver multicoupler equipment at the voting receiver sites, so no new racks are required at those sites.

RACOM Response: Read & Understood

- h.) Install racks following manufacturer's installation instructions, anchor racks to floor and as shown in the drawings.

RACOM Response: Read & Understood

- i.) Provide a "Framework Ground Conductor System" for the equipment racks consisting of framework ground conductors that connect from the framework ground in each equipment rack directly to the Master Ground Bar ("MGB"). Implement Framework Ground System in a "tree" form. The "trunk" of the framework ground conductor starts at the Master Ground Bar and is run over the racks with a tap conductor connecting to each rack. Tap conductors are connected to the main conductor using irreversible compression "C-clip" taps. Use 1/0 AWG wire for the main conductor. Main conductor may be either bare or green jacketed (THHN) stranded copper wire. Tap conductors from each rack to the framework ground feeder are green jacketed (RHW or THHN) 6 AWG wires terminated with two-hole irreversible compression lugs.

RACOM Response: Read & Understood

- j.) Bond main ground conductor runs to cable tray at 3-foot intervals, as shown in the Contract Drawings.

RACOM Response: Read & Understood

- k.) Details of the locations and mounting details for the racks are shown in the Contract Drawings.

RACOM Response: Read & Understood

- l.) Detailed specifications for these equipment racks are shown in Section 2.1.H below.

RACOM Response: Read & Understood

- 9. Provide and install site/channel controllers to provide simulcast system timing and receiver voting at the following sites. (These controllers are not required if simulcast timing control and receiver voting functionality is incorporated into the base station equipment provided in response to these Specifications.)

RACOM Response: Comply The controllers and votes are built in software features of the proposed TB9400 Base Stations

- a.) Moscow Mountain Simulcast Site
- b.) KUID-TV Simulcast Site
- c.) Well 10 Simulcast Site
- d.) City Hall Simulcast Site
- e.) Residence Water Tower Voting Receiver Site
- f.) Rotary Park Water Tower Voting Receiver Site
- g.) Vista Water Tank Voting Receiver Site

RACOM Response: Read & Understood

- h.) Details specifications for the site controllers are not included in these Specifications, since the specifications for this equipment is specific to the vendor supplying the base station radio equipment.

RACOM Response: Read & Understood

- i.) Install the site controllers (if required) as shown in the Contract Drawings.

RACOM Response: Read & Understood

10. Provide and Install transmission lines, transmission line jumpers, transmission line entry ports, surge arrestor frames and ground bars at the simulcast repeater sites and at the voting receiver sites as shown below.

RACOM Response: Comply Actual cables, connectors and there type and size will be finalized in the Detailed Design but all items proposed will be of those outlined or equivalent.

- a.) All connectors on all fixed station cables and omnidirectional antennas must be Type N or 7/16 DIN, constant impedance type connectors.
- b.) All exposed antenna hardware must be S31600 stainless steel, brass, or C65100 low silicon bronze. Hot dip zinc galvanized steel meeting ASTM A-123, A-153, A-385 and B-695 may be used for mounting brackets.
- c.) Transmission lines shall be Commscope AVA5P-50-C (or approved equivalent) 7/8" foam dielectric solid outer conductor coaxial cable Determine the correct transmission line lengths for each antenna. Transmission lines shall be one continuous length; splices are not allowed. All transmission lines shall be terminated at the antenna end with a Type N female connector, Commscope 78EZNF (or approved equivalent) for 7/8" transmission line, and at the surge arrestor end with a Type N male Connector, Commscope 78EZNM (or approved equivalent) for 7/8" transmission line.
- d.) All connections between antennas and jumpers shall be weatherproofed using the cold-shrink weatherproofing kit recommended by the manufacturer, Commscope 221213 (or approved equivalent) for 1/2" and 7/8" transmission line to antenna or equipment connections].
- e.) GPS Antenna Transmission Lines - for transmission lines to the GPS antennas, use Commscope LDF4-50A 1/2" (or approved equivalent) foam dielectric coaxial cable with Type N male connectors (or appropriate connector for existing GPS antenna and surge arrestor). All connections between antennas and jumpers shall be weatherproofed using the cold-shrink weatherproofing kit recommended by the manufacturer, Commscope 221213 (or approved equivalent) for 1/2" transmission line to antenna connections].
- f.) Connections between the antenna end of each transmission line and the antenna connector shall be made using Commscope F4A-NMNM (or approved equivalent) or F4ANMDM (or approved equivalent) foam dielectric superflexible jumpers terminated with Type N connectors male connectors or 7/16" DIN connectors (as appropriate for each antenna).
- g.) Transmission Line Connectors – Transmission line connectors shall be Commscope or approved equivalent Type N connectors designed specifically to fit the cable on which the connector is installed. Connections between line sections, antennas, and jumpers shall be weatherproofed using the weatherproofing kit recommended by the

manufacturer. All transmission lines shall be terminated at the antenna end with a Type N female connector, Commscope 78EZNF (or approved equivalent) for 7/8" transmission line, and at the surge arrestor end with a Type N male Connector, Commscope 78EZNM (or approved equivalent) for 7/8" transmission line. All connections between line sections and jumpers shall be weatherproofed using the weatherproofing kit recommended by the manufacturer, Commscope 221213 (or approved equivalent) for 7/8" transmission line to 1/2" jumper connections.

- h.) All connectors shall be manufactured by the same manufacturer as the transmission line. All connectors shall be installed utilizing the manufacturer's recommended tooling following manufacturer's instructions.
- i.) The use of any adapters and/or splices is prohibited, with the exception of SMA to Type N adapters or cables required to connect base station radios with SMA connectors to transmitter combiner, receiver multicoupler or duplexer ports with Type N connectors.
- j.) Grounding Kits – Provide and install transmission line grounding kits recommended by the manufacturer to bond each transmission line and waveguide to the tower ground tab at the antenna end, to the ground bar at the base of the tower, and to the ground bar on the outside of the building at the transmission line entry port. Use Commscope CSG78-12B2U (or approved equivalent) universal Grounding Kit (with 45" ground lead and two-hole lugs) for 7/8" transmission line runs. Use Commscope CSG12-06B1A (or approved equivalent) universal Grounding Kit (with 45" ground lead and two-hole lugs) for 1/2" transmission line runs.

Choose ground lead length to be appropriate for the installation situation using the shortest practical route. Ground lead cable bends shall be sweeping and have a bend radius of no less than 8 inches. Bends shall not form an included angle of less than 90 degrees. Install kit following manufacturer's instructions. Weatherproof connections between grounding kit and transmission line using the weatherproofing materials provided with the grounding kit.

Connect ground lead at tower base ground bar and building ground bars with 2 each 5/16"x18 x1" bolt with flat washer between bolt and lug and flat washer, split lock washer and nut behind ground bar or ground plate near antenna. Hardware to be C65100 Low-Silicon Bronze. Use conductive grease between lug and ground bar or ground plate.

- k.) All transmission lines must be secured with the transmission line manufacturer's recommended stainless-steel hardware, with appropriate tower mounting hardware, and supported by transmission line bridges that will be supplied as part of this procurement. Hangers used to support transmission line on transmission line bridge, transmission line ladder, and other locations where support members with mounting holes are used shall attach to support members with a bolt installed through the mounting hole and a lock washer and nut on the back side of the support member. "Snap-in" hangers are not permitted.
- l.) Detailed specifications for the transmission lines and associated equipment shown above are shown in Section 2.1.I through 2.1.P below.

RACOM Response: Read & Understood

- m.) Provide and install Site Pro E1449 transmission 6-port (2 X 3) 4" transmission line entry panels (or approved equivalent) with Site Pro BA121M boot kit (or approved equivalent) for the transmission lines, as described in Section 2.xxx below, and as shown in the Contract Drawings. Install panels at the following sites:

- 1.) Well 10
- 2.) KUID-TV
- 3.) Detailed specifications for these entry ports are shown in Section 2.1.Q below

RACOM Response: Read & Understood

- n.) Provide and install Site Pro E220 transmission 1-port (1 X 1) 4" transmission line entry panels (or approved equivalent) with Site Pro BA121M boot kit (or approved equivalent) for the transmission line at the voting receiver sites, as shown in the Contract Drawings. Install panels at the following sites:

- 1.) Vista Water Tank Voting Receiver Site
- 2.) Detailed specifications for this entry port are shown in Section 2.1.R. below

RACOM Response: Read & Understood

- 3.) Transmission line from the outdoor enclosures to the water tower legs at the Residence Voting Receiver Site and at the Rotary Park Voting Receiver Site run through buried conduit connected to the bottom of each enclosure, as shown in the drawings.

RACOM Response: Read & Understood

- o.) Entry Port Grounding Assembly - Moscow Mountain, KUID-TV and Well 10 simulcast repeater sites + Vista Water Tank Voting Receiver Site,

Provide and install an Commscope AT-K306-U (or approved equivalent) grounding bar trapeze assembly to mount surge suppressors immediately inside building entry port, as shown in the drawings. Mount grounding bar trapeze assembly to both the ceiling and the wall of the building, as shown in the drawings, to assure structural stability. Connect ground bar assembly to Master Ground Bar ("MGB") using 2 AWG tinned solid copper wire with irreversible compression 2-hole lugs, as shown in drawings. Attach lugs to MGB using 2 each 3/8"x 18 x 1" bolt with flat washer between bolt and lug and flat washer, split lock washer and nut behind ground bar. Hardware to be C65100 Low-Silicon Bronze.

Connect exterior ground bar to building buried ground ring using 3" wide 0.032" thick copper strap, as shown in drawings. Attach to-hole lugs from transmission line ground kits to external ground bar, using 2 each 3/8"x 18 x 1" bolt with flat washer between bolt and lug and flat washer, split lock washer and nut behind ground bar. Use conductive grease between ground kit mounting hardware and external ground bar.

Detailed Specifications for the Surge Arrestor Trapeze are shown below in Section 2.1.S below.

RACOM Response: Read & Understood

- p.) Ground Bar - Residence Water Tank Voting Receiver Site & Rotary Park Voting Receiver Site.

Provide and install a new ground bar (Site Pro MG206U-K or approved equivalent) on the wall of the cabinet above the conduit housing the RX antenna transmission line. Connect ground bar to the bottom of the adjacent water tower leg tinned solid copper 2 AWG wire and an irreversible two-hole lug at the ground bar (Burndy YA2CL-2TC38 or approved equivalent) and exothermically weld the wire to bare metal at the base of the tower leg. Route the ground wire through a new 1-1/2" Schedule 80 PVC conduit run, as shown in the Contract Drawings. Provide 2 coats of cold galvanizing paint to the welded joint at the base of the tower.

Detailed specifications for these ground bars are shown below in Section 2.1.T below.

RACOM Response: Read & Understood

- q.) Surge Suppressors –Provide and install surge suppressors (Polyphaser IS-B50HN-C2 or approved equivalent) on incoming transmission lines. Mount surge suppressors directly to AT-K306-U grounding bar assembly at the Moscow Mountain, KUID-TV and Well 10 simulcast repeater sites, and at the Vista voting receiver site using integral surge side Type N Connectors and appropriate lock washers and nuts and integral bulkhead flange plate with #10 stainless steel hardware.

At the Residence Water Tower voting receiver site and the Rotary Park voting receiver site, connect the surge arrestor to the incoming 7.8" transmission line and provide a green jacketed (RHW or THHN) 6 AWG wire to the ground bus bar installed inside the outdoor enclosure.

At the City Hall simulcast repeater site, re-use the existing surge suppressors mounted on the ground bus at the bottom of the transmission line run from the rooftop antennas.

Detailed specifications for these surge suppressors are shown below in Section 2.1.U below.

RACOM Response: Read & Understood

- r.) Cable Ladders –Provide and install cable ladders (B-Line SB17U12BYZ or approved equivalent) at the KUID-TV site, as shown in the drawings.

Detailed specifications for these cable ladders are shown below in Section 2.1.V below.

RACOM Response: Read & Understood

- s.) To ensure that antennas and transmission lines meet specifications after installation, test antennas and transmission lines as described in Section 2.X below. Submit a detailed test plan to City for approval in advance of these tests. Record and sign tests and present tests to City in printed format.

RACOM Response: Read & Understood

- t.) Assure that antennas are mounted to minimize, as much as possible, the pattern distortion effects caused by close proximity to tower members, transmission lines, other antennas, and other metallic objects located near the antenna. Antenna mounting structures and devices shall be mechanically compatible with the antenna support structures at each site, and shall be adequate to support each antenna on the tower or other antenna support structure.

RACOM Response: Read & Understood

- u.) Antennas shall meet or exceed the requirements of ANSI/EIA/TIA-329-C. Antenna bandwidths shall allow an antenna to be used for both receive or transmit for each transmit/receive frequency pair (or frequency pairs in the case of combined antennas) for VHF and UHF antennas. Pattern tilt across this band shall be minimized to the degree that this is possible.

RACOM Response: Read & Understood

- v.) Transmission lines shall have their outer conductors bonded to the tower at the antenna end, as close to the antenna as possible, to the ground bars at the base of the tower and at the building entry port, using the manufacturer's recommended grounding kit. Grounding kit wires used to connect transmission line and waveguide ground kits to tower ground lugs or ground bars shall be continuous lengths of wire supplied by the manufacturer as part of the ground kit. Splices in ground kit wires are not permitted.

RACOM Response: Read & Understood

- 11. Provide and install transmit and receive antennas at all simulcast repeater sites, voting receiver sites and at the Courthouse site as listed in Table 3 above. Any substitutions with antennas equivalent to the model numbers shown in Table 3 must be approved by the City.

- a.) Mount antennas on towers, monopoles, poles or water tanks, as shown in the Contract Drawings.
- b.) At the Courthouse site, replace the existing duplex antenna mounted on the rooftop guyed tower with the new antenna shown in Table 3.

RACOM Response: Read & Understood RACOM has proposed 150F2 antennas for the TX side to better help balance the overall system Talk In verses Talk Out.

C. Network Interconnect Configuration and Documentation

- 1) Coordinate with City IT personnel to assign IP address to the base station repeaters, voting receivers, microwave radios and site controllers (if site controllers are required) at each site. Connect base station repeaters and voting receivers to the IP backbone interconnect system via the Ethernet switches at each site. Coordinate with City IT personnel to connect to the City fiber backbone at the Well 10 simulcast repeater site, the City Hall simulcast repeater site, and the Vista voting receiver site.

RACOM Response: Read & Understood

D. Simulcast System Alignment

- 2) Adjust the launch time for each new simulcast repeater site to minimize audio distortion in the non-capture overlap zones among the new sites making up the two simulcast sub-systems, using the initial delay settings shown in Table 3, which have been determined via modeling of the simulcast delay spread and simulcast system performance in the system coverage area within and around the City of Moscow.
- 3) Provide written results of the simulcast system optimization showing final system simulcast settings to the City.

RACOM Response: Read & Understood

E. Voting Receiver Configuration

- 1) Configure voting receivers to select the best received signal among all the receive sites in the system, as follows:
 - a.) Moscow Mountain Simulcast Repeater Site
 - b.) KUID-TV Simulcast Repeater Site
 - c.) Well 10 Simulcast Repeater Site
 - d.) City Hall Simulcast Repeater Site
 - e.) Residence Water Tower Voting Receiver Site
 - f.) Rotary Park Water Tower Voting Receiver Site
 - g.) Vista Water Tank Voting Receiver Site

RACOM Response: Read & Understood

F. Mobile and Portable Radio Configuration

Program all City of Moscow portable mobile radios to operate on the new VHF simulcast system frequencies. Coordinate with the City to produce a template that includes new frequencies, CTCSS tones and Channel Names for the radio programming. Program radios to allow for a smooth cutover from the existing radio system to the new radio system.

RACOM Response: Read & Understood

G. Coordination with Whitcom Dispatch Center

Coordinate with the City and with the Whitcom Dispatch Center to incorporate the radio channels in the new VHF simulcast system into the dispatch consoles at Whitcom and to provide appropriate interconnections between the new system and the dispatch consoles at Whitcom.

RACOM Response: Read & Understood

H. Network Management System

Provide, install and configure a new network management system to provide status, alarms and monitoring of the radios and associated equipment in the radio system. City will provide a server for the Network Management System software. Coordinate with City to implement the Network Management System.

RACOM Response: Comply RACOM has proposed the Tait EnableMonitor tool for this.

I. Cutover Plan

30 days prior to the beginning of any installation work provide a complete cutover plan, arranged by site, to the City. The cutover plan shall describe how the systems described below will be installed, configured, and tested, and how cutover from the existing configuration of systems at the existing sites to the new system configuration and new sites will be accomplished. Submit the cutover plan for approval by the City.

RACOM Response: Read & Understood

1.4 PERFORMANCE REQUIREMENTS

- A. Conform to all applicable code for manufacture and installation of land mobile radio systems and associated equipment and materials.

RACOM Response: Read & Understood

- B. Install and configure land mobile radio systems in accordance with good engineering practices.

RACOM Response: Read & Understood

- C. All proposed equipment shall be supported by the vendor for a minimum of seven years after product discontinuation. If necessary parts are not available before the end of the seven years, a replacement will be provided at no additional cost to the City of Moscow which meets the contractual requirements and is compatible with the system. All applicable product discontinuations shall be promptly reported to the City of Moscow. This includes the equipment manufactured by the radio vendor as well as any third-party equipment provided by the radio vendor.

RACOM Response: Read & Understood RACOM can offer up to 10 years of extended warranty on the proposed equipment which includes software updates.

1.5 WARRANTY

- A. The Vendor shall include warranty support for the first year, beginning at Final Acceptance or Beneficial Use, whichever comes first.

RACOM Response: Comply

- B. Warranty shall include the following services:

1. Depot Advanced Repair: The replacement part is to be shipped overnight to the field before the broken part is shipped to Depot Repair.

RACOM Response: Read & Understood RACOM would recommend having on-site spares to minimums downtime of the channel.

2. Technical Support: 24 x 7 phone support.

RACOM Response: Comply

- C. At the end of the warranty period, one Preventative Maintenance (PM) shall be performed by the Vendor, and all equipment shall be brought to the latest software revision.

RACOM Response: Comply

1.6 POST-WARRANTY SUPPORT REQUIREMENTS

- A. All technical service bulletins shall be sent to the City of Moscow via email or another approved method.

RACOM Response: Read & Understood, these are only provided to customers under a support agreement and are available on the manufacture's technical web site.

- B. All software revisions shall be provided at no cost to the City of Moscow.

RACOM Response: Read & Understood, these are only provided to customers under a support agreement (Extended Warranty) and are available on the manufacture's technical web site.

- C. Any known major defect with the products supplied by the Vendor shall be corrected at no cost. A major defect is defined as a defect degrading the performance of the product below its published specifications or causing outages.

RACOM Response: Read & Understood, these are only provided to customers under a support agreement (Extended Warranty) and are available on the manufacture's technical web site.

- D. Proposer shall offer post-warranty services matching 1.5.B.

RACOM Response: Comply – RACOM has included the cost for post warranty support in our pricing response.

1.7 TRAINING

- A. The Proposer shall describe the available training related to this system.

RACOM Response: Read & Understood details on the training offered is provided in our response in the implementation section.

1.8 PRICING SHEETS

- A. Pricing sheets shall be formatted as below. Line-item pricing for both the equipment at the line-item level and services pricing broken out into the categories below shall be presented. Proposals with any pricing rolled up into larger categories shall be considered non-compliant and rejected.

RACOM Response: Read & Understood RACOM has included fixed pricing for the services proposed and if required to use hourly billing, the cost to the City will be the actual time spent and there will be an additional administration cost to manage invoice them.

- B. Reference any contractual agreements being used for discounts. Pricing incentives may also be utilized. Pricing shall be valid for one year after system acceptance.

RACOM Response: Read & Understood

- C. Equipment Pricing

RACOM Response: Read & Understood Some items outlined in the RFP if not listed individually are included in the miscellaneous parts line items.

SITE	MODEL NUMBER	DESCRIPTION	QTY	LIST PRICE	DISCOUNT %	CONTRACT PRICE	EXTENDED CONTRACT PRICE
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- D. Services Pricing

RACOM Response: Read & Understood RACOM has included fixed pricing for the services proposed and if required to use hourly billing, the cost to the City will be the actual time spent and there will be an additional administration cost to manage invoice them.

Post Warranty Services Technical Support (24/7 Remote Support) and Depot Repair (Extended Warranty) along with Software Updates is available as one offering called Service Advantage as outlined in our pricing sheet.

CATEGORY	PER HOUR	TOTAL HOURS	LABOR COST	EXPENSES	TOTAL
PROJECT MANAGEMENT					
ENGINEERING					
DOCUMENTATION					
COVERAGE TESTING					
TECHNICIAN OPTIMIZATION					
TRAINING					
WARRANTY SERVICES					
OTHER (DESCRIBE)					

POST WARRANTY SERVICE	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9	YR 10
TECHNICAL SUPPORT									
DEPOT REPAIR									
OTHER (DESCRIBE)									

1.9 SUBMITTALS

- A. Submittal Drawings: Submit shop drawings showing details and location of Radio System equipment (VHF base station repeater radios, transmitter combiners and receiver multicouplers, GPS oscillators, DC power systems and associated equipment) at each site. Provide rack elevation drawings for each site. Provide schematic line drawings showing configuration of radio equipment, network equipment, DC power equipment, microwave radio equipment and related equipment provided under this specification. Submit elevation drawings showing antenna mounting locations for land mobile and microwave antennas (see Section 33 83 40 Microwave Radio System for microwave antenna requirements).

RACOM Response: Read & Understood

- B. Manufacturer's Installation Instructions: Submit preparation requirements, and special installation instructions.

RACOM Response: Read & Understood, as available from the manufacturer.

- C. Provide manuals for each type of equipment. Manuals may be provided electronically in Portable Documentation Format and/or as a hard-copy. For any manual supplied as a hard-copy, provide three copies.

RACOM Response: Read & Understood

1.10 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Submit as-built drawings recording actual locations, configuration, and installation details of all radio system components.

RACOM Response: Read & Understood

- B. Provide a detailed on-site manual with complete documentation of all installed systems for each individual site. Provide an overall system manual that includes complete documentation of all installed systems for all the sites.

RACOM Response: Read & Understood

- C. Provide all documentation in original .docx, .xlsx or .dwg formats, with PDF versions of each document.

RACOM Response: Read & Understood – for those related to the closeout documents only.

1.11 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with a minimum of five (5) years demonstrated experience in the installation of land mobile and microwave radio equipment, antennas and waveguides/transmission lines with a documented history of neat and workmanlike installation practices. Provide photo documentation of previous installation work comparable to the work called for in these specifications. Provide project references (including customer contact information) for at least three (3) previous projects with work comparable to the work called for in these specifications.

RACOM Response: Read & Understood – references included in our response. RACOM has been providing and installing Public Safety Communication system for over 50 years and with us joining Eastern Communication we are now one the three largest system integrators nationwide.

1.12 KICK-OFF MEETING

- A. Vendor shall meet with City of Moscow personnel to verify the design and the Bill of Materials (BOM). The Vendor will visit each site with City personnel to confirm space, power, and other considerations needed for installation. An initial cutover plan will be developed and mutually agreed upon. From this, the Vendor shall provide the County with an installation document including but not limited to:

1. Overall system block diagram
2. Equipment rack elevations
3. Equipment (cabling) interconnections, with references to any cable labels as needed
4. Power/breaker requirements
5. System Interconnect Diagram and Interconnect System Details (see Section 33 83 40 for interconnect network requirements)
6. Any other information required to successfully install the provided equipment
7. Installation and User Manuals for all provided equipment

RACOM Response: Read & Understood – Kick Off meeting will be used to start the overall Detailed Design process which will produce the items outlined above. They will not be provided as part of the Kick-Off meeting.

- B. Attendance is to include all parties directly affecting, or affected by work of this section, including electrical sub-contractor, and installers responsible for installation of DC power systems and microwave radio at the City of Moscow sites.

RACOM Response: Read & Understood

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products with adequate protection against damage. Avoid breakage, denting and scoring finishes. Do not install damaged equipment.
- B. Deliver material to work site in original factory packaging.
- C. Store radios, transmitter combiners and receiver multicouplers, GPS receivers, transceivers and site controllers, equipment racks, and other components and accessories in original cartons or shipping containers and in a clean dry space; protect from weather and construction traffic. Wet materials should be unpacked and dried before storage.

RACOM Response: Read & Understood – equipment that is racked and tested before the delivery to the sites will not be in its original factory packaging but will be protected from damage and kept dry.

1.14 FIELD MEASUREMENTS

- A. Verify field measurements prior to equipment installation.

RACOM Response: Read & Understood – field measurements will be done as part of the installation along with pre testing and staging that is done with the equipment.

1.15 SEQUENCING

- A. Sequence work to allow for installation of electrical systems, cable tray systems, site grounding systems, DC power systems and other work required before installation of radio systems.

RACOM Response: Read & Understood – Overall installation plan will be defined and agreed as part of the Detailed Design.

1.16 COORDINATION

- A. Coordinate work with sub-contractors installing electrical systems, site grounding systems, cable tray systems, tower work and site construction work.

RACOM Response: Read & Understood

PART 2 PRODUCTS

2.1 GENERAL

A. Shown below are detailed specifications for the equipment items to be provided, installed and tested by the Contractor.

B. Specifications for base station repeater transceivers are shown below.

1. Base station transceivers shall meet the following specifications as measured per the methods as described in TIA-603-E:
2. Transmitters rated for continuous duty
3. Maximum Transmit power 100 W (including external power amplifier if required)
4. Transmitter Spurious & Harmonic Emissions Attenuation ≥ 90 dB
5. FM Hum and Noise > 45 dB
6. RF Output Impedance = 50Ω
7. Receiver Sensitivity 12 dB SINAD $\leq 0.25 \mu V$
8. Receiver Adjacent Channel Rejection ≥ 80 dB
9. Receiver Intermodulation Rejection ≥ 85 dB
10. Receiver Spurious and Image Rejection ≥ 100 dB

RACOM Response: Read & Understood

C. Specifications for external RF power amplifiers (if required to produce required transmitter output power) are shown below:

RACOM Response: RACOM is not proposing external power amplifiers.

1. Crescend Technologies 100-Watt RF Power Amplifiers (or approved equivalent)

General Specifications		
Band	VHF	UHF
Frequency Range:	136-144 MHz (DA) 144-152 MHz (DB) 152-162 MHz (EA) 162-174 MHz (EB)	403-450 MHz (UL) 450-512 MHz (UH)
Current Draw:	23 Amperes (Max)	26 Amperes (Max)
Operating Voltage:	+13.8 VDC	
Duty Cycle:	100%	
Power Input:	See chart below	
Power Output:	100 Watts, set at factory	
Spurious & Harmonics:	-65 dBc	
Input/Output Impedance:	50 ohms (Nominal)	
Load VSWR Tolerance:	VSWR Protected	
Indicator LEDs:	DC On, Low Output, High VSWR, High Temp	
Alarm:	Summary Alarm Pin	
Input/Output Connector:	Type 'N' Female	
Cooling Method:	Fan Forced Air Over Heat sink	
Operating Temp. Range:	-30° C to +60° C	
Storage & Transport:	-40° C to +70° C	
Humidity:	80% at +40° C (non-condensing)	
Altitude:	10,000 feet maximum	
SIZE		
Vertical Mounting:	7.0"	
Horizontal Mounting:	3.4"	
Depth:	19.0"	
Weight:	10 pounds	
POWER INPUT RANGE		
Model Description*	Required Power In	Power Output
P10-R1XX1-C7-001	100-200 mW	100 W
P10-R2XX1-C7-001	200-500 mW	100 W
P10-R5XX1-C7-001	500 mW-1 W	100 W
P10-1XX1-C7-001	1-2 W	100 W
P10-2XX1-C7-001	2-5W	100 W
P10-5XX1-C7-001	5-10 W	100 W
P10-10XX1-C7-001	10-20 W	100 W
P10-20XX1-C7-001	20-50 W	100 W

** XX Insert the letter definition for the frequency range chosen*

*XX-Insert the letter definition for the frequency range chosen.

2. Crescend Technologies 50-Watt External power amplifiers (or approved equivalent)

136-174 MHz 50 Watts Output Power		
Frequency Range:	136-174 MHz (DE)	
Operating Voltage:	13.8 VDC	
Current Draw:	12 Amperes (Max)	
Duty Cycle:	100%	
Power Input:	See chart below	
Power Output:	50 Watts, set at factory	
Spurious & Harmonics:	Meets FCC Requirements	
Input/Output Impedance:	50 ohms (Nominal)	
Load VSWR Tolerance:	VSWR Protected	
Indicator LEDs:	DC On, Low Output, High VSWR, High Temp	
Alarm:	Summary Alarm Pin (Open Collector, LOW when Alarm)	
Input/Output Connector:	Type 'N' Female	
Cooling Method:	Fan Forced Air Over Heat Sink	
Operating Temp. Range:	-30° C to +60° C	
Storage & Transport:	-40° C to +70° C	
Humidity:	80% at +40° C (non-condensing)	
Altitude:	10,000 feet maximum	
SIZE		
Vertical Mounting:	7"	
Horizontal Mounting:	3.4"	
Depth:	19.0"	
Weight:	10 pounds nominal	
POWER INPUT RANGE		
Model Description	Required Power In	Power Output
P5-R1DE1-C7-001	100-200 mW	50 W
P5-R2DE1-C7-001	200-500 mW	50 W
P5-R5DE1-C7-001	500 mW-1 W	50 W
P5-1DE1-C7-001	1-2 W	50 W
P5-2DE1-C7-001	2-5 W	50 W
P5-5DE1-C7-001	5-10 W	50 W
P5-10DE1-C7-001	10-20 W	50 W

- D. Specifications for the VHF duplexer for the Public Works base station at the Courthouse site are shown below:

ELECTRICAL SPECIFICATIONS		TPRD-1554	TPRD-1556
Tuning range		144-174 MHz	
Frequency separation (min)		600 KHz	400 KHz
Maximum input power		350 watts	
VSWR (max)		1.5:1	
Insertion loss: TX/RX to ant.		1.5 dB	2.0 dB
RX isolation at TX frequency		77 dB at 600 KHz	100 dB at 400 KHz
TX noise suppression at RX frequency		77 dB at 600 KHz	100 dB at 400 KHz
Temperature range			-30°C to +70°C
Cavities		(4) 5"	(6) 5"
MECHANICAL SPECIFICATIONS			
Dimensions (HWD) in. (cm)		28 x 19 x 11 (71.1 x 48 x 28)	28 x 19 x 11 (71.1 x 48 x 28)
(Including typical tuner extension)			
Cavity dimensions			5" dia x 23" L
Mounting			19" Rack or wall mount
Connectors			N or UHF female (opt.)
Finish			Acrylic enamel
Net weight lb. (kg)		19 (8.6)	27 (12.3)

RACOM Response: Read & Understood

- E. The specifications for the Manual RF Switch, Power Divider and RG-213 Jumper Cables for Public Works main/backup repeater switching at Courthouse site are shown below:

1. Manual RF Coaxial Switch – Pasternack PE7139 or approved equivalent

Configuration – SPDT
Connectors – Type N Female
Frequency Band – DC-1.3 GHz
Max Power (Watts) – 500

2. VHF 2-way Power Divider (EMR 2412-0/C or approved equivalent)

Electrical Specifications	
Frequency Band	150-175 MHz
Input Power (Max.)	10W as splitter, 5W as combiner
Insertion Loss (Max. / Typ.)	3.5 / 3.15 dB
VSWR (Max.)	1.5:1
Impedance (Nom.)	50 Ω
RF Connectors	N Female
Mechanical Specifications	
Finish	Yellow Chem Film
Overall Size (HxWxD)	1.5" x 2.75" x 3.5" (38 x 70 x 89 mm)
Net Weight	0.35 lbs (0.2 kg)
Ship Weight	1 lbs (0.5 kg)
Environmental Specifications	
Operating Temp. Range	-20 to +50 °C

3. 24" RG-213 Jumper Cables (Pasternack PE3496LF-24 or approved equivalent)

Connector Mount Method 1	None
Connector Impedance 1	50 Ohm
Connector Series 2	N
Connector Gender 2	Male
Connector Polarity 2	Standard
Connector Angle 2	Straight
Connector Mount Method 2	None
Connector Impedance 2	50 Ohm
RF Cable Part Number	RG213/U
RF Cable Type	RG213
RF Cable Impedance	50 Ohm
Length	24 inches

RACOM Response: Read & Understood – The manufacturers made be different but the products will be equivalent and agreed to within the Detailed Design.

- F. The specifications for the GPS oscillators at the simulcast repeater sites (Orilia Securesync 1200-433 [-48 VDC power, Rubidium Oscillator, Multi-GNSS] or approved equivalent are shown below:

1. Network Services

Timing

- NTP v2, v3, v4: Conforms with or exceeds RFC 1305 and 5905. Supports Unicast, Broadcast, Multicast, MD5 encryption, Peering, Stratum 2, Autokey
- SNTP v3, v4: Conforms with or exceeds RFC 1769, 2030, 4330, and 5905
- Time (RFC 868)
- Daytime (RFC 867)
- IEEE-1588v2 (PTP) via option card(s)
- NTP over Anycast

Management

- IPv4/IPv6: Dual stack
- DHCPv4/DHCPv6 (AUTOCONF)/SLAAC: Automatic IP address assignment
- Authentication: LDAP, RADIUS, TACACS+
- Syslog: Logging
- SNMP: Supports v1, v2c, and v3 (no auth/auth/priv) with Enterprise MIB

Communications

- HTTP: Browser-based configuration and monitoring
- Telnet: Remote configuration
- FTP Server: Access to files (logs, etc.)
- SMTP: Email

Security Features

- Enable/Block Protocols
- Set SNMP Community Names and Network Access
- Password Protected

- Standard encryption/authentication protocols
- SSL Web-based Interface: SSL is used to secure HTTPS protocol to access configuration and status web pages.
- SSH: SSL and data compression technologies provide a secure and efficient means to control, communicate with, and transfer data to or from the time server remotely.
- SCP: Securely transfers files to and from the time server over an SSH session.
- SFTP: FTP replacement operates over an encrypted SSH transport
- SNMP v3: Remotely configure and manage over an encrypted connection
- Alert notifications via SNMP Traps and e-mail

2. GNSS Receiver

- Connector: Type N, +5V to power active antenna
- Frequency: GPS L1 (1575.42 MHz), Galileo E1 (1575.42 MHz), GLONASS L1 (1602.0 MHz), BeiDou B1 (1561.1 MHz), QZSS L1 (1575.42 MHz); optional SAASM: GPS L1 & L2 (1227.6 MHz)
- Satellite tracking: 1 to 72, T-RAIM satellite error management
- Synchronization time: Cold start < 15 minutes (includes almanac download), warm start < 5 minutes (assumes almanac download)

3. Option Module Cards

a.) Frequency Output (1, 5, 10 MHz)

The 1, 5, and 10 MHz SecureSync option cards provide three (3) sine wave BNC outputs. Outputs are phased-locked to the SecureSync's disciplined oscillator

Specifications

Frequency Output	Quantity 3 per card
Signal Type and Connector	+13 dBm (10 MHz) into 50 ohm, BNC
Spurious	-70 dBc (10 MHz)
Harmonics	-40 dBc
Maximum Number of Cards:	4 total (1 MHz, 5 MHz or 10 MHz)

4. Antenna system – Model 8230AJ

Electrical

Type: Active

Frequency: 1559 to 1606 MHz

Out-of-Band Rejection:

- < 1500 MHz: > 50 dB
- > 1650 MHz: > 50 dB

Gain: 40 dB from internal LNA

Antenna Pattern: 0 dB at zenith

15 dB or more rejection at < 30 degrees elevation

Connector: N type, female

Recommended Cable: Low Loss LMR-400 Equivalent

Maximum Cable Length: 125 meters (400 ft.) maximum with most Orolia equipment and LMR-400 equivalent cable;
250 meters (800 ft.) maximum with Inline Amplifier - Model 8227
Power: 2.5 to 16 Volts, 19 milliamps (typical), powered by receiver

Mechanical

Size: 100 mm dia. (3.9");
101.5 mm H (4") from base to top;
127.2 mm H (5") including "N" connector
Enclosure: Radome: High Temperature UV Resistant Polycarbonate.;
Base: Zamak White Metal
Weight: 370g (13.1oz)
Compliance: IP67 and RoHS
Temperature Range: -40° to +85° C (-40° to +185° F)
Mounting: L-bracket (included) for vent pipe/pole mounting
via hose clamps (included), PVC pipe sold separately

Warranty

1-Year Limited

RACOM Response: Read & Understood

- G. Specifications for the 16-port Ethernet switches (Cisco CBS250-16P-2P Stackable Managed Switch or approved equivalent) at the simulcast repeater sites and at the voting receiver sites are shown below:

Network Ports	16 X 1G
Uplink Ports	2 x 1G SFP
Power over Ethernet (POE)	120 Watts
Fan	Fanless
Power Supply	Internal (120 VAC, 50/60 Hz)
Features	Layer 2 switching, VLAN support, Spanning Tree Protocol (STP), access control list (ACL), quality of service (QoS), IPv4/IPv6 static routing
Network Management	On-device UI, Cisco Business Dashboard and mobile app
Warranty	Limited lifetime warranty

RACOM Response: Read & Understood – RACOM is proposing a different line of Cisco products that support -48VDC power supplies that are equivalent to what is outlined.

- H. The specifications for the equipment racks to be installed at the base station repeater sites, as described above, are shown below. These racks are Two Post Seismic Relay Rack 19" Panel Mounting, Welded Steel (Copper B-Line SB506084XUYZ, or approved equivalent).

- a.) 84" x 20-5/16" x 15" (Height x Overall Width x Overall Depth).
- b.) Independently tested to the NEBS GR-63-CORE Seismic Zone 4 standard and rated for 900 lbs. (408kg) of equipment
- c.) Conformance to EIA/ECA-310-E.
- d.) Mounting rail spacing is adjustable from 3" (76mm) to 8" (203mm).
- e.) 45 rack mounting units.
- f.) Open top, bottom, and sides permit unlimited cable management options.

- g.) Industry standard mounting holes on sides allow attachment of vertical cable managers.
- h.) #12-24 panel mounting screw holes (universal pattern)
- i.) Top angles drilled for runway attachment.
- j.) Openings in front and rear of base for duplex receptacle mounting.
- k.) Holes for grounding provided in four locations.
- l.) Tubular steel frame provides a high degree of strength to weight ratio.
- m.) Zinc chromate finish.

RACOM Response: Read & Understood – The racks provided will be industry standard as outlined.

- I. Commscope AVA5P-50-C, HELIAX® Foam Coaxial Cable, corrugated copper, 7/8" in, black PE jacket (or approved equivalent)

Construction Materials

Jacket Material	PE
Outer Conductor Material	Corrugated copper
Dielectric Material	Foam PE
Flexibility	Standard
Inner Conductor Material	Copper tube
Outer Conductor	Corrugated Copper
Jacket Color	Black

Dimensions

Nominal Size	7/8 in
Cable Weight	0.302 lb/ft 0.45 kg/m
Diameter Over Dielectric	24.13 mm 0.950 in
Diameter Over Jacket	27.991 mm 1.102 in
Inner Conductor OD	9.449 mm 0.372 in
Outer Conductor OD	25.4 mm 1.0 in

Electrical Specifications

Cable Impedance	50 ohm ±1 ohm
Capacitance	22.25 pF/ft 73 pF/m
dc Resistance, Inner Conductor	0.473 ohms/kft 1.435 ohms/km
dc Resistance, Outer Conductor	0.340 ohms/kft 1.116 ohms/km
dc Test Voltage	6000 V
Inductance	0.184 µH/m 0.056 µH/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	8000 V
Operating Frequency Band	1 – 5000 MHz
Peak Power	91 kW

Velocity

91%

Environmental Specifications

Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)

Mechanical Specifications

Bending Moment	19 Nm 168.164 in lb
Flat Plate Crush Strength	72.97 lb/in 1.3 kg/mm

Minimum Bend Radius, Multiple Bends	254 mm 10 in
Minimum Bend Radius, Single Bend	127 mm 5 in
Number of Bends, minimum	15
Number of Bends, typical	30
Tensile Strength	159 kg 350.535 lb

Note

Performance Note Values typical, unless otherwise stated

Standard Conditions

Attenuation, Ambient Temperature	20 °C 68 °F
Average Power, Ambient Temperature	40 °C 104 °F
Average Power, Inner Conductor Temperature	100 °C 212 °F

Regulatory Compliance/Certifications

Agency	Classification
CENELEC	EN 50575 Compliant, Declaration of Performance (DoP) available
China RoHS	Below Maximum Concentration Value (MCV)
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

RACOM Response: Read & Understood – RACOM is recommending the use of Eupen coax as an equivalent. Currently we are finding the availability to be better and the support from the manufacturer.

J. Commscope LDF4-50A, HELIAX® Low Density Foam Coaxial Cable, corrugated copper, 1/2 in, black PE jacket (or approved equivalent)

Construction Materials

Jacket Material	PE
Outer Conductor Material	Corrugated copper
Dielectric Material	Foam PE
Flexibility	Standard
Inner Conductor Material	Copper-clad aluminum wire
Jacket Color	Black

Dimensions

Nominal Size	1/2 in
Cable Weight	0.148 lb/ft 0.22 kg/m
Diameter Over Dielectric	12.954 mm 0.51 in
Diameter Over Jacket	15.875 mm 0.625 in
Inner Conductor OD	4.826 mm 0.190 in
Outer Conductor OD	13.97 mm 0.550 in

Electrical Specifications

Cable Impedance	50 ohm ±1 ohm
Capacitance	23.104 pF/ft 75.8 pF/m
dc Resistance, Inner Conductor	0.451 ohms/kft 1.480 ohms/km
dc Resistance, Outer Conductor	0.820 ohms/kft 2.690 ohms/km
dc Test Voltage	4000 V
Inductance	0.190 µH/m 0.058 µH/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	8000 V

Operating Frequency Band	1 – 8800 MHz
Peak Power	40 kW
Velocity	88%
Environmental Specifications	
Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)

Mechanical Specifications	
Bending Moment	3.8 Nm 33.633 in lb
Flat Plate Crush Strength	111.995 lb/in 2.0 kg/mm
Minimum Bend Radius, Multiple Bends	127 mm 5 in
Minimum Bend Radius, Single Bend	50.8 mm 2 in
Number of Bends, minimum	15
Number of Bends, typical	50
Tensile Strength	113 kg 249.122 lb

Standard Conditions	
Attenuation, Ambient Temperature	20 °C 68 °F
Average Power, Ambient Temperature	40 °C 104 °F
Average Power, Inner Conductor Temperature	100 °C 212 °F

Regulatory Compliance/Certifications

Agency	Classification
CENELEC	EN 50575 Compliant, Declaration of Performance (DoP) available
China RoHS	Below Maximum Concentration Value (MCV)
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

RACOM Response: Read & Understood – RACOM is recommending the use of Eupen coax as an equivalent. Currently we are finding the availability to be better and the support from the manufacturer.

- K. Commscope F4A-NMNM-P (or approved equivalent) or F4ANMDM-P (or approved equivalent) foam dielectric superflexible jumpers terminated with Type N connectors male connectors or 7/16" DIN connectors

Produce Classification

Product Type	Shureflex®
Body Style	Straight
Product Series	RSJ4-50

General Sepecifications

Body Style – Connector A	Straight
Body Style – Connector B	Straight
Interface – Connector A	N Male
Interface – Connector B	N Male or 7-16 DIN Male
Cable Impedance	50 ohm
3rd Order IMD, Static	-112 dBm
3rd Order IMD Test Method	Two +43 dBm carriers
VSWR/Return Loss	30.04 dB

Regulatory Compliance/Certifications

Agency

RoHS
China-RoHS
ISO 9001:2015

Classification

Compliant
Below Maximum Concentration Value (MCV)
Designed, manufactured and/or distributed under this quality management system

RACOM Response: Read & Understood – RACOM is recommending the use of Eupen coax as an equivalent. Currently we are finding the availability to be better and the support from the manufacturer.

- L. Commscope L4NF-F or L4NM-F, Type N Female or Type N Male for 1/2 in LDF4-50A cable (or approved equivalent)

General Specifications

Interface	N Female or N Male
Body Style	Straight
Brand	HELIAX®
Mounting Angle	Straight

Electrical Specifications

Connector Impedance	50 ohm
Operating Frequency Band	0 – 8800 MHz
Cable Impedance	50 ohm
3rd Order IMD, typical	-159 dBc @ 900 MHz
3rd Order IMD Test Method	Two +43 dBm carriers
RF Operating Voltage, maximum (vrms)	707 V
dc Test Voltage	2000 V
Outer Contact Resistance, maximum	0.25 mOhm
Inner Contact Resistance, maximum	1.00 mOhm
Insulation Resistance, minimum	5000 MOhm
Average Power	0.6 kW @ 900 MHz
Shielding Effectiveness	-110 dB

Mechanical Specifications

Outer Contact Attachment Method	Clamp
Inner Contact Attachment Method	Captivated
Outer Contact Plating	Trimetal
Inner Contact Plating	Silver
Interface Durability	500 cycles
Interface Durability Method	IEC 61169-16:9.5
Connector Retention Tensile Force	600 N 134.885 lbf
Connector Retention Torque	4.5 N-m 39.828 in lb

Dimensions

Nominal Size	1/2 in
Diameter	23.0 mm 0.906 in
Length	61.7 mm 2.429 in

Environmental Specifications

Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-65 °C to +125 °C (-85 °F to +257 °F)
Immersion Depth	1 m

Immersion Test Mating	Mated
Immersion Test Method	IEC 60529:2001, IP68
Mechanical Shock Test Method	IEC 60068-2-27

Thermal Shock Test Method	IEC 60068-2-14
Vibration Test Method	IEC 60068-2-6
Corrosion Test Method	IEC 60068-2-11

Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
0-1000 MHz	1.08	28.30 - Male
0-1000 MHz	1.05	32.26 - Female

RACOM Response: Read & Understood – RACOM is recommending the use of Eupen coax as an equivalent. Currently we are finding the availability to be better and the support from the manufacturer.

- M. Commscope 78EZ NF or 78EZNM, Type N Female or Type N Male for 7/8 in AVA5-50 cable (or approved equivalent)

General Specifications

Interface	N Female or N Male
Body Style	Straight
Brand	HELIAX®
Mounting Angle	Straight

Electrical Specifications

Connector Impedance	50 ohm
Operating Frequency Band	0 – 5000 MHz
Cable Impedance	50 ohm
3rd Order IMD, typical	-116 dBm @ 1800 MHz
3rd Order IMD Test Method	Two +43 dBm carriers
RF Operating Voltage, maximum (vrms)	707 V
dc Test Voltage	2000 V
Outer Contact Resistance, maximum	0.30 mOhm
Inner Contact Resistance, maximum	2.00 mOhm
Insulation Resistance, minimum	5000 MOhm
Peak Power, maximum	10.0 kW

Mechanical Specifications

Outer Contact Attachment Method	Clamp
Inner Contact Attachment Method	Captivated
Outer Contact Plating	Trimetal
Inner Contact Plating	Silver
Interface Durability	500 cycles
Interface Durability Method	IEC 61169-16:9.5
Connector Retention Tensile Force	1334.47 N 300 lbf
Connector Retention Torque	8.14 N-m 72.001 in lb

Dimensions

Nominal Size	7/8 in
Diameter	37.08 mm 1.46 in
Length	52.07 mm 2.05 in

Environmental Specifications

Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-65 °C to +125 °C (-85 °F to +257 °F)
Immersion Depth	1 m
Immersion Test Mating	Mated
Immersion Test Method	IEC 60529:2001, IP68
Mechanical Shock Test Method	IEC 60068-2-27
Thermal Shock Test Method	IEC 60068-2-14
Vibration Test Method	IEC 60068-2-6
Corrosion Test Method	IEC 60068-2-11

Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
50-1000 MHz	1.02	40.09

RACOM Response: Read & Understood – RACOM is recommending the use of Eupen coax as an equivalent. Currently we are finding the availability to be better and the support from the manufacturer.

- N. Specifications for ground kits for ½" coaxial cable (Commscope CSG12-06B1A or approved equivalent are shown below:

General Specifications

Bonding Conductor Jacketing Material	PVC
Bonding Conductor Material	Copper
Bonding Conductor Wire Size	16 mm ²
Cable Type	Corrugated Smoothwall
Color	Black
Grounding Kit Type	Compact SureGround® Grounding Kits
Grounding Strap Material	Tinned copper
Lug Attachment	Factory attached
Lug Type	One-hole lug
Thread Size	3/8 in

Dimensions

Enclosure Width	25.4 mm 1 in
Bonding Conductor Length	609.6 mm 24 in
Enclosure Length	55.88 mm 2.2 in
Compatible Diameter, maximum	16.256 mm 0.64 in
Compatible Diameter, minimum	15.367 mm 0.605 in
Nominal Size	1/2 in

Electrical Specifications

Current Handling	Tested to withstand 100,000 amps peak current surge
Current Handling	Test Method MIL-STD-1757
Grounding, Bonding and Shielding	Test Method MIL-STD-188-124A
Lightning Protection Test Method	IEC 1024-1

Material Specifications

Locking Bail Material	Stainless steel
Rivet Material	Tinned copper

Environmental Specifications

Operating Temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Storage Temperature	-40 °C to +80 °C (-40 °F to +176 °F)
Blowing Rain Test Method	MIL-STD-810, Method 506
Corrosion Test Method	MIL-STD-1344, Method 1001
Freezing Rain/Icing Test Method	MIL-STD-810, Method 521
Humidity Test Method	MIL-STD-1344, Method 1002
Immersion Test Method	IEC 60529:2001, IP68
UV Resistance Test Method	MIL-STD-810, Method 505
Vibration Test Method	MIL-STD-202, Method 214
Weatherproofing Method	Tinned copper strap contact overmolded with EPDM rubber

RACOM Response: Read & Understood

- O. Specifications for ground kits for 7/8" coaxial cable (Commscope CSG78-12B2U or approved equivalent are shown below:

General Specifications

Bonding Conductor Jacketing Material	PVC
Bonding Conductor Material	Copper
Bonding Conductor Wire Size	6 gauge
Cable Type	Corrugated Smoothwall
Color	Black
Grounding Kit Type	Compact SureGround® Grounding Kits
Grounding Strap Material	Tinned copper
Lug Attachment	Field attached
Lug Type	Two-hole lug
Thread Size	3/8 in

Dimensions

Enclosure Width	40.64 mm 1.6 in
Bonding Conductor Length	1143 mm 45 in
Enclosure Length	63.5 mm 2.5 in
Compatible Diameter, maximum	28.372 mm 1.117 in
Compatible Diameter, minimum	27.559 mm 1.085 in
Nominal Size	7/8 in

Electrical Specifications

Current Handling	Tested to withstand 100,000 amps peak current surge
Current Handling Test Method	MIL-STD-1757
Grounding, Bonding and Shielding Test Method	MIL-STD-188-124A
Lightning Protection Test Method	IEC 1024-1

Material Specifications

Locking Bail Material	Stainless steel
Rivet Material	Tinned copper

Environmental Specifications

Operating Temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Storage Temperature	-40 °C to +80 °C (-40 °F to +176 °F)
Blowing Rain Test Method	MIL-STD-810, Method 506
Corrosion Test Method	MIL-STD-1344, Method 1001
Freezing Rain/Icing Test Method	MIL-STD-810, Method 521

Humidity Test Method	MIL-STD-1344, Method 1002
Immersion Test Method	IEC 60529:2001, IP68
UV Resistance Test Method	MIL-STD-810, Method 505
Vibration Test Method	MIL-STD-202, Method 214
Weatherproofing Method	Tinned copper strap contact overmolded with EPDM rubber

RACOM Response: Read & Understood

- P. Specifications for the Commscope 221213 Weatherproofing Kit (or approved equivalent) are shown below:

General Specifications

Application Provides additional moisture seal for cable connections

Applications per Kit Four 1/2 in–7/8 in | Twelve 1/2 in–1/2 in | Twelve 1/2 in–7/8 in to device | Two 1/2 in–2-1/4 in

Harmonized System (HS) Code 854420 (Coaxial cable and other coaxial electric conductors)

Dimensions Nominal Size 1-1/4 in | 1-5/8 in | 1/2 in | 1/4 in | 2-1/4 in | 3/8 in | 5/8 in | 7/8 in

Material Specifications

Material Type Butyl rubber tape | PVC tape

Environmental Specifications

UV Resistance Test Method Butyl test method in QUV weatherometer cycle of 8 hours UV at 150 °F then 4 hours of condensation at 104 °F | PVC tape test method UL 510, ASTM D1000

UV Resistance, minimum with no degradation ≥1000 hours

Weather Resistance Test Method 04AS00-03.6.0 | MIL-STD-1344A, Method 1002

RACOM Response: Read & Understood

- Q. Specifications for 6-Port transmission line entry panels (Site Pro E1449 transmission 6-port (2 X 3) 4" transmission line entry ports (or approved equivalent) with Site Pro BA121M (or approved equivalent) boots are shown below:

Port Size 4"
Port Layout 2 x 3 • # of Ports = 6
Overall Size 17.5" x 23"
Wall Opening 9.5" x 15"
Manufactured from heavy gauge T6 Aluminum.
Baked-on powder coat finish
Sealing caps and mounting hardware included.

Boots

of Holes 3
Cable Size Mixed (1) 1/2" Foam Coax (2) 7/8" Coax.
One piece design for easy installation.
Kit includes rubber boot, insert, and hose clamps.

RACOM Response: Read & Understood

- R. Specifications for 1-Port transmission line entry panels (Site Pro E220 transmission 6-port (2 X 3) 4" transmission line entry panel (or approved equivalent) are shown below:

Port Size 4"
Port Layout 1 x 1
of Ports 1
Overall Size 7" x 7"
Wall Opening 4" x 4"
Manufactured from heavy gauge T6 Aluminum.
Baked-on powder coat finish
Sealing caps and mounting hardware included.

Boot

of Holes 3
Cable Size Mixed (1) 1/2" Foam Coax (2) 7/8" Coax.
One piece design for easy installation.
Kit includes rubber boot, insert, and hose clamps.

RACOM Response: Read & Understood

- S. Specifications for the Commscope AT-K306-U Arrestor Trapeze Kit (or approved equivalent) are shown below:

Product Classification

Product Type Arrestor trapeze kit

General Specifications

Mounting Ceiling | Walls

Dimensions

Height 76.2 mm | 3 in
Width 457.2 mm | 18 in
Length 1,219.2 mm | 48 in
Material Thickness 7.62 mm | 0.3 in

RACOM Response: Read & Understood

- T. Specifications for the Valmont Site Pro MG206U-K (or approved equivalent) ground bar are shown below:

- 1/4" x 2" x 6" Ground Bar with Insulators & Brackets
- Weight 1.9 lb
- Accepts 3/8" Lugs
- 10 holes allow up to 5 runs with two-hole Lugs
- Universal hole pattern
- Accepts two-hole Lugs with 3/4" to 1" hole spacing
- Kits include Insulators and Stainless Steel Mounting Brackets

RACOM Response: Read & Understood

- U. Specifications for the Polyphaser IS-B50HN-C2 DC Block bulkhead mount surge suppressor (or approved equivalent) ground bar are shown below:

Insertion Loss:	≤ 0.1dB
Freq. Range:	125-1000 MHz
Mounting:	Bulkhead Flange
Protected Side Connector:	N Female 50Ω
RF Power:	500 Watts
Surge Side Connector:	N Female 50Ω
Throughput Energy:	≤ 800 μJ
Throughput Voltage:	≤ 12 Vpk
Unit Impedance:	50Ω
Voltage Standing Wave Ratio:	1.1:1

RACOM Response: Read & Understood

- V. Specifications for the cable ladders at the KUID-TV site [Eaton B-Line SB17U12BYZ (or approved equivalent)] are shown below:

Tubular Stringer Style - 1 1/2" (Boxed)

- Ladder type cable runway for communication cabling pathways
- Mounts to ceilings, walls, floors, relay racks, and electronic enclosures
- 3/8" (9mm) x 1 1/2" (38mm) x 0.049" (1.2mm) tubular steel stringers
- 3/8" (9.5mm) x 1 1/2" (38.1mm) steel tube welded rungs spaced 12" (305mm) on center
- All finishes are UL Classified as suitable as an equipment grounding conductor (File number E60548)
- Material: ASTM A513 grade 1008 steel tube
- Finish____: Yellow zinc (YZ)

RACOM Response: Read & Understood

- W. The specifications for the 2-bay outdoor equipment cabinets (DDB Unlimited 20D-78DDXC or approved equivalent) and their associated HVAC units (Pentair ACP-6000/8000-N36-110 (6000 BTU/hr with heating option + 110 VAC operation or approved equivalent) are shown below:

20D-78DDXC Enclosure

INDUSTRY STANDARDS

UL/cUL Listed; Type 12, 3R, 4; 4X optional; File No. SA6453

CE
IP 56 Internal Loop
IP 34 on External Loop
Telcordia GR-487 capable (Outdoor)

APPLICATION

- Industrial automation
- Waste water treatment systems
- Package handling equipment
- Security and defense systems

FEATURES

- Narrow design accommodates 12-in. [300-mm] deep cabinets
- Energy efficient reciprocating compressor on N28 models
- Energy efficient rotary compressor on N36 and N43 models
- R407c and R134a earth-friendly refrigerants
- Models for 115, 230 and 400/460 3-phase VAC power input
- UL Listed to save customers time and money with agency approvals
- Outdoor model operating temperature range from -40 F/-40 C to 131 F/55 C [125 F/52 C on N28 Series]
- Attractive industrial design with minimal use of visible fasteners
- Reliable mechanical thermostat on enclosure side of the unit
- Galvanized sheet-metal cover for rugged factory and outdoor environments

SPECIFICATIONS

- Nominal cooling - N36 6000 & 8000 Outdoor model only 131 F/55 C [125 F/52 C]

FINISH

- RAL 7035 light-grey
- Other colors and

- Easy-mount flanges for simple installation
- Cut-out adapter options for enclosures with GENESIS® air conditioners enable users to easily transition to the new unit
- Dust-resistant condenser coil allows the unit to be run filterless in most applications
- Cleanable, reusable aluminum mesh filter protects coils for maximum cooling performance
- Mounting hardware, gaskets and user manual furnished with the unit
- Every unit functionally tested before shipping
- Standard Indoor Air Conditioner models also include:
 - Power-off relay for door switch and other system requirements

CATALOG NUMBER	
Indoor Model	N360616G050
Indoor Model Stainless Steel Type 4X	N360616G051
Indoor Model with Remote Access Control*	N360616G060
Outdoor Model without Heat Pkg.	N360616G100
Outdoor Model without Heat Pkg.	N360616G102
Stainless Steel Type 4X	
Outdoor Model with Heat Pkg.	N360616G150
Outdoor Model with Heat Pkg.	N360616G151
Stainless Steel Type 4X	
COOLING PERFORMANCE	
Nominal:	
BTU/Hr.	5400 / 6000
Watts	1581 / 1757
At 131 F / 131 F [55 C / 55 C]:	
BTU/Hr. [50 / 60 Hz]	5585 / 6180
Watts [50 / 60 Hz]	1637 / 1811
At 95 F / 95 F [35 C / 35 C]:	
BTU/Hr. [50 / 60 Hz]	4909 / 5485
Watts [50 / 60 Hz]	1439 / 1607
Refrigerant	R134a
Refrigerant Charge [ounces/grams]	20 / 567
Operating Temperature Range:	
Maximum [°F / °C]	131 / 55
Minimum [°F / °C]	-40 / -40
Air Flow at 0 Static Pressure:	
Internal loop 50 Hz [CFM / M ³ /Hr.]	251 / 426
External loop 50 Hz [CFM / M ³ /Hr.]	284 / 483
Internal loop 60 Hz [CFM / M ³ /Hr.]	261 / 443
External loop 60 Hz [CFM / M ³ /Hr.]	311 / 528
Max. Heater W [Outdoor Models]	1300
ELECTRICAL DATA	
Rated Voltage	115
Frequency [Hz]	50 / 60
Operating Range	+/-10%
Max. Power Consumption [Watts at 50 / 60 Hz]	911 / 1108
Max. Nominal Current [Amps at 50 / 60 Hz]	9.1 / 10.1
Starting Current [Amps]	39.2
Agency Approvals	
Power Input Description	
ENCLOSURE PROTECTION	
UL Type	
CONTROLLER	
Description	
Thermostat Location	
Factory Thermostat Setting [°F / °C]	
SOUND LEVEL	
At 1.5 Meters	66.9 dBA
UNIT CONSTRUCTION	
Material	Galvanized sheet metal standard Stainless steel optional
Finish	RAL 7035 light-gray, semi-textured powder-coat pain standard Other colors available
ACCESSORIES	
EASYSWAP Adaptor Plenum [GENESIS™ M36]	
UNIT DIMENSIONS	
Height [in. / mm]	36.00 / 914.4
Width [in. / mm]	11.50 / 292.1
Depth [in. / mm]	14.00 / 355.6
Weight [lb. / kg]	100 / 45

General

*Approximate Weight

- 555 Lbs. assembled
- 705 Lbs. shipping weight

Doors

- 4, secured by three point locking system
- Locks via customer supplied padlocks
- Sealed with 3/8" aluminum filled gaskets
- 4 Auto door stops standard

Material

- .125" Alumiflex™
- Finish: Painted cream
- RF properties: Non-ferrous

Vents

- 30 bottom louvers per door
- 20 top louvers – In top cover, under Alumishield™
- One removable filter panel per door
- 20 fixed filter pads in top cover

Handles

- Zinc Die Powder-coated Black EMKA Three Point Padlocking Handles

Lifting Hooks

- 8, standard

Racking Specifications

Rails

- Four sets standard (for additional rails see accessories)
- Alodine coated
- Holes tapped for 10-32 threads
- Each rail supported by three R-STRUTS™
- .125" Material (Alumiflex™)

Spacing

- 19" or 23" Racking standard

Inside Clearance – Less Rails

Height

- 77.98"

Width

- 27.625" each side

Depth

- 35.75"

Ratings

NEMA Class Types available

- NEMA 3R (Vented), NEMA 4 (closed loop-a/c), NEMA 4X

Paint Tested

- 1000 Hour salt spray (textured)
- 1000 Hour immersion

Door Opening Clearance

Height

- 74"

Width

- 23.5"

Exterior Cabinet Dimensions

Main Body

- Height: 78.23"
- Width: 59"
- Depth: 42"

Alumishield™

- Hang down height: 1.71"
- Width: 61.96"
- Depth: 44.67"

Handles

- Protrude 2.2"

Total Space Occupied

- Height: 78.85"
- Width: 65"
- Depth: 46.4"

RACOM Response: Read & Understood

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means installer accepts existing conditions.

RACOM Response: Read & Understood

3.2 INSTALLATION

- A. Install equipment racks, VHF base station radios, transmitter combiner and receiver multicoupler systems, GPS oscillators and other radio system equipment as described in this specification and as shown in the Contract Drawings. Install all required interconnecting cable in compliance with all applicable electrical codes.
- B. Coordinate installation radio system equipment with other electrical and DC power system work as necessary to properly integrate installation of radio system work with other work.

RACOM Response: Read & Understood

3.3 PROJECT MANAGEMENT

- A. The Vendor shall create a Work Breakdown Structure (WBS). From the WBS, the Vendor shall derive a Schedule, Risk Management Plan, Quality Management Plan, and Communication Plan to be delivered and approved by Con Fire. The WBS shall describe which party has which responsibilities for each task.
 - 1. The schedule should be in PERT form and be updated as needed.
 - 2. A Risk Registry should be updated and maintained.
 - 3. Updates to the Schedule and Risk Registry should be communicated at each status update meeting as well as a list of issues that require resolution.
 - 4. Periodic Status meetings shall be included in the Communication Plan. The Vendor may suggest the frequency of these calls, the frequency is allowed to vary based on the project activity.
- B. Change Orders: Either Party may request changes within the general scope of this Agreement. If a requested change causes an increase or decrease in the cost or time required to perform this Agreement, the Parties will agree to an equitable adjustment of the Contract Price, Performance Schedule, or both, and will reflect the adjustment in a change order. Neither Party is obligated to perform requested changes unless both Parties execute a

RACOM Response: Read & Understood – Plan will be part of the Detailed Design and provided to the City of Moscow (not Con Fire).

written change order.

The Change Order Form shall describe the details of the change of scope, the reason why the change is needed, and the cost of the change broken out by materials and time and expenses for each discipline (PM, engineering, technician, etc), and any other applicable costs on a line item bases with any labor costs showing both hours, travel, and total cost. Delays causes include but are not limited to; Acts of God, site issues, and supply chain delays shall not be a reason for a Change Order other than to update the Project Schedule.

RACOM Response: Read & Understood

3.4 FIELD QUALITY CONTROL AND ACCEPTANCE TESTING

A. SYSTEM AND COVERAGE ACCEPTANCE TESTING

- 1) In order to confirm proper adjustment and operation of the City of Moscow VHF simulcast system the radio system coverage tests described below will be based on an evaluation of the DAQ ("Delivered Audio Quality") provided at test locations throughout the City of Moscow.
- 2) Prior to the commencement of the Coverage Acceptance Tests, the Contractor shall provide the City with a documentation of field tests performed on the installed radio system, including:
 - a.) Measured Base Station
Transmitter Output Power
(Watts/dBm)
 - b.) Measured Base Station
Receiver 12 dB SINAD
Sensitivity (dBm)
(Perform this measurement through an ISO-T or coupler with the input to the coupler terminated in a 50 ohm load and with the input connected to the receiver multicoupler.)
 - c.) Measured transmitter combiner and receiver multicoupler insertion loss for each channel.
 - d.) Calculated Effective Radiated Power for each channel at each site (which should correspond to the values shown in Table 3 for each channel at each site).
 - e.) Provide these measurement results to the City as a System Field Testing Report.

RACOM Response: Read & Understood – RACOM will provide the information outlined and will be based on the final approved values in the Detailed Design for final system design as implanted.

- 3) DAQ Tests will be performed on an unused channel that is part of the 3-site simulcast subsystem that includes the Moscow Mountain, KUID-TV and Well 10 sites. The most likely channel for the tests is the MFD Tac Channel (154.8900 MHz/159.0000 MHz). DAQ tests will also be performed on one of the two Shared Tactical Channels that make up the 3-site simulcast system that includes the Well 10, KUID-TV and City Hall sites.

RACOM Response: Read & Understood

- 4) DAQ Tests will be performed within each area defined by the rectangular grid laid over the Moscow city limits. Each square in this grid defines an area within which a DAQ test must be performed as part of the coverage testing. A map showing this grid (which is based on squares 500 meters on a side) is shown in Drawing R38.

RACOM Response: Read & Understood

- 5) DAQ tests shall be performed on-board a City of Moscow vehicle equipped with a mobile radio with outboard speakers installed by the contractor to allow the evaluation team members to hear the audio produced by the system well enough to provide a reasonable evaluation of its quality. The configuration of the mobile radio shall include 15 dB of attenuation between the antenna and the mobile radio to simulate a portable radio operating at belt level.

RACOM Response: Read & Understood – Radio(s) to be provided by the City of Moscow. The requirements are for Mobile and Portable coverage so two radios will need to be used or a switchable attenuation and two calls are made at each location. Radios are to be calibrated and its performance verified to specification.

- 6) The evaluation team will be made up of at least 5 members, at least three of whom shall be City of Moscow representatives.

RACOM Response: Read & Understood

- 7) At each test location, a test team member located at the Whitcom dispatch center with audio access to the channel being tested shall read a random selection from the Harvard Sentences (shown in Appendix 3), and each evaluation team member on the vehicle shall rate the audio quality of the received transmission on a DAQ scale from DAQ 1 to DAQ 5, based on the descriptions of these DAQ levels shown in Table 2 below (from *TSB 88.1-C, Wireless Communications Systems Performance in Noise Limited Situations; Part 1 – Recommended Methods for Technology Independent Performance Modeling; February 2008*):

Table 2 Delivered Audio Quality

DAQ Delivered Audio Quality	Faded Subjective Performance Description	Static SINAD equivalent intelligibility ^{1,2}
1	Unusable, Speech present but unreadable	<8 dB
2	Understandable with considerable effort. Frequent repetition due to Noise/Distortion	12 ± 4 dB
3	Speech understandable with slight effort. Occasional repetition necessary due to Noise/Distortion	17 ± 5 dB
3.4	Speech understandable with repetition only rarely needed. Some Noise/Distortion	20 ± 5 dB ³
4	Speech easily understood. Occasional Noise/Distortion	25 ± 5 dB
4.5	Speech easily understood. Infrequent Noise/Distortion	30 ± 5 dB
5	Speech easily understood.	>33 dB

RACOM Response: Read & Understood – The expiation of RACOM is that the test member at Whitcom will be using a console position for the testing and not a radio so the test involves the testing of both sides of the system not just radio to radio.

- 8) One of the evaluation team members shall record the results provided by each team member at each measurement location, as well as the location of each DAQ test. An example of the test sheet used in the similar tests to record results is shown in Appendix 3. Perform a DAQ test on each of the simulcast subsystems (described above) at each test grid location.

RACOM Response: Read & Understood

- 9) An average result for each measurement location shall be determined by discarding the highest and lowest results and taking the average of the remaining results. Both this weighted average and the average of all five results shall be shown in the table of results.

RACOM Response: Read & Understood – The City and RACOM need to agree on which of the averages will be used to determine the grid (tile) for evaluation of that grid as outlined in #10

- 10) The results of these tests shall be compiled into a coverage test map showing the coverage grids tested and using color –coding to depict the coverage results obtained in each grid, as follows:

GREEN	Good overage - DAQ 3.5 to DAQ 5.0
YELLOW	Marginal Coverage – DAQ 2.5-DAQ 3.0
RED	Poor Coverage - Below DAQ 2.5

RACOM Response: Read & Understood – The ranges outlined are not inline with the actual DAQ levels. RACOM would propose the following are better inline with the levels outlined: Green 3.4 to 5, Yellow 2 to 3 and Red 0 to 1 with 0 being no audio heard.

- 11) The contractor shall produce DAQ test result sheets, DAQ tabulated measurement result sheets, and DAQ measurement maps and shall provide them to the City in the form of a final coverage DAQ test report.

RACOM Response: Read & Understood – For any guaranty provided by RACOM, the coverage maps are based on 95% @ 95% reliability, so a passing test would be that 95% of the grids tested are Yellow or Green.

3.1 CLEANING

- A. Upon completion of this section of work, remove protective wraps and debris. Repair damages due to installation of this section of work.

RACOM Response: Read & Understood

3.2 PROTECTION OF FINISHED WORK

- A. Protect radio systems work from damage after installation.

RACOM Response: Read & Understood

END OF SECTION 33 83 00



IMPLEMENTATION DETAILS

- Project Plan
- Project Schedule
- Cutover Plan

CITY OF MOSCOW, IDAHO

RADIO SYSTEM UPGRADE PROJECT

February 27, 2024



IMPLEMENTATION DETAILS

City of Moscow, ID



Design

Kick-off Meeting and Preliminary Design Review

The RACOM project manager initiates project implementation with a kick-off meeting and a preliminary design review. The RACOM Team, and City of Moscow, will mutually agree on the timing of these meetings. The objectives of the meeting include:

- Introduction of all project participants
- Review the roles of the project participants
- Review the overall project scope, goals, and deliverables
- Review the current site status
- Review customer-owned site documentation and schedule site surveys to confirm space, power, and other considerations needed for installation
- Develop initial cutover plan
- Review the preliminary project schedule

1	2	3	4	5	6
					

Production

System Integration and Test –Staging

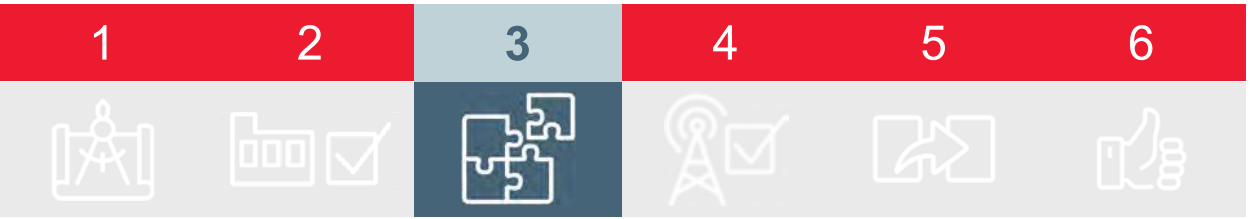
Immediately following the approved Detailed Design Review, the RACOM Team procures material and schedules system integration & testing.

Running the Staging Acceptance Test demonstrates that the radio system functionality will perform correctly on-site after delivering the equipment. The test plan defines each test, with instructions on how to set up and run the test and compares the actual results to the expected results. The test team scores and initials each test.

RACOM has included pricing for the Staging.

Shipping, Warehousing, and Inventory

After a successful staging acceptance test, the equipment will be warehoused at RACOM - Spokane until deployed to the field.



Implementation Plan

EXPERIENCE

The RACOM team that you entrust with the migration and the implementation of your new system has done this successfully many times before. Every aspect of the system installation, migration, and implementation has been improved over time. We will leverage lessons learned, all the tools and strategies we developed, implementing dozens of communication systems for City of Moscow.

Our implementation methodology is focused on identifying and meeting the critical objectives set out in the following pages. We understand these goals and support the vision the emergency responders in the City of Moscow expect from this solution.

In the following pages, we will lay out details about our approach, along with a bit of history and the people behind RACOM. We have provided mission-critical communication systems for 50 years and pioneered the nation’s first managed LMR service model. We have also implemented systems and numerous other large communications projects and systems that demonstrate our ability to successfully design and manage extensive system implementations.

The RACOM Team

The RACOM project team has decades of relevant expertise in integrating, implementing, and supporting complex communications systems. The City of Moscow specific team will be led by one of our highly trained Project Managers, each with years of industry experience.

Project Manager

A Project Manager (PM) will be assigned to lead your project. Their primary responsibility is the project's successful implementation, integration, optimization, and acceptance. The PM will manage all project phases from the beginning through acceptance. All official communications regarding the project will funnel through the PM and your designated City of Moscow project manager.

The Project Manager and implementation team will work with any subcontractors and vendors to prepare for the upcoming installation. We will determine when site surveys are required, assign a site survey team to begin work, and ensure that services are coordinated to support the project schedule.

The project manager's responsibilities include but are not limited to the following:

- Managing all aspects of the project
- Setting up and managing the project team
- Conducting project activities according to the contract and within scope, time, cost, and quality constraints
- Working with internal/external functional units to perform certain services
- Develop and maintain the formal project schedule
- Reviewing, approving, and distributing all plan changes
- Approving, validating, and distributing design decisions
- Maintaining quality control procedures and practices
- Managing risks
- Communicating safety plans and scheduling safety meetings with the project team and subcontractors
- Managing required subcontractors
- Monitoring and controlling the project budget
- Holding team progress meetings
- Holding issue resolution meetings
- Submitting progress reports to City of Moscow
- Maintaining project records and files
- Communicating directly with your designated City Project Manager

During implementation, RACOM's project manager will have weekly or bi-weekly progress reviews with the implementation teams to compare actual performance to the planned schedule established at the Detailed Design Review. If a situation arises where performance is not meeting plans, the PM will work with the implementation team to develop and implement corrective actions. Risk management is employed at the same time to prepare for contingencies.

A Communications Management Plan will establish and define regular meetings, reporting structure, and other communication activities. It will determine who and what information needs to be communicated, the means of communication, how often communication is needed, and where it is stored.

RACOM will then schedule and deliver this information to the Stakeholders through the project lifecycle. Formal communications with the City's project manager will include monthly reports and quarterly meetings. Weekly conference calls will be held with the RACOM project team and the City Project team.

System Engineering

Our System Engineering team is experienced in IT, RF, and Microwave and works with our OEM partners to optimize every solution design we provide. System Engineering has full technical responsibility for the proposed system and will integrate all Tait and vendor products into a complete operational system.

RACOM has designed your system to provide the maximum amount of coverage and interoperability while being fiscally conservative. We have chosen sites that will ultimately provide City of Moscow with the most optimal solution. Our System Engineers will work with the Project Manager to ensure the successful implementation of your system.

The System Engineer is responsible for:

- Creating documents for Customer Design Review (CDR) such as:
 - ✓ Frequency plan
 - ✓ Combiner plan
 - ✓ Antenna drawings
 - ✓ Rack drawings
 - ✓ Electrical power loads/BTUs
 - ✓ Acceptance Test Plan (ATP)
 - ✓ Performing coverage prediction
 - ✓ Network plan
 - ✓ Microwave/fiber/T1 layout
 - ✓ System block diagrams
- Finalizing system design and reviews
- Executing coverage and acceptance testing
- Providing fleet map planning support
- Configuring the system
- Providing implementation support
- Creating final system and as-built document

MAJOR TASK DATES AND PROJECT SCHEDULE

RACOM will provide a preliminary project schedule for the Analog Conventional Simulcast System design as a Microsoft Project Gantt chart and PERT format. The high-level schedule will show the time frames for the various project activities, including the detailed design phase. The schedule includes a kickoff and preliminary project planning session. RACOM will conduct thorough site surveys and meet with City of Moscow to review its results and the contract materials to formulate the final design. During the Detailed Design Review, more detailed schedules will be presented. The schedule lists each major milestone and defines each party's responsibility so the reader can understand the timing and inter-relationships. Throughout the project, RACOM's project manager will review the

project progress as compared to the schedule. The PM will Provide monthly project updates to to City's project lead.

Kick-Off Meeting

RACOM will meet with the City of Moscow shortly after the contract award for a project Kick-Off meeting. Together the teams will develop the project plan. Some of the points of discussion will include:

- Develop a Work Breakdown Structure
- Update schedules start date and responsibility assignments
- Major milestones
- Project staffing
- Project Risks: Assumptions and Assessment
- Project Management plans for schedule and scope management, a project budget, change controls, acceptance testing, and project closure
- Initial Cutover Plan
- A Project Communication Plan

Detailed Design Phase

In preparation for the Detailed Design Review (DDR), RACOM will gather all submittal materials and any feedback received. RACOM will also pull the information from the Kick-Off meeting and preliminary design.

The DDR will be an opportunity to present the detailed system design and operation to City of Moscow. The engineers will present design decisions used to support the project design, and the Project Manager will present site documents for each Site. City of Moscow will review the material and approve the final RACOM system design. RACOM and City of Moscow can mutually agree to proceed with system implementation and review open issues later if additional information is available and design solutions need to be modified.

RACOM will provide the following material for review and approval:

DETAILED DESIGN REVIEW DOCUMENTATION DELIVERABLES

1. Overall system block diagram
2. Equipment rack elevations
3. Equipment (cabling) interconnections, with references to any cable labels as needed
4. Power/breaker requirements
5. System Interconnect Diagram and Interconnect System Details
6. Any other information required to successfully install the equipment
7. Installation and User Manuals; if applicable

Ordering and Delivery of Equipment

Following the final design approval, RACOM will process equipment orders for procurement. All equipment will be shipped to RACOM for staging.

Staging and Acceptance Test (FATP)

The VHF Conventional Simulcast system will be staged at the Spokane, WA facility for acceptance testing. Acceptance tests are performed with a customer signoff before the systems are crated for shipment to the client for field installation. After the field installation, the systems will be tested again with a field acceptance test and customer signoff.

While the staging acceptance test and the field acceptance test are similar with some of the same tests performed at the factory and in the field, the emphasis of the tests is different.

Staging provides other tangible benefits to the project. The customer has an opportunity to witness the operations of the systems to validate a myriad of detailed design decisions for operational scenarios.

In field acceptance, the emphasis on system testing and network elements is expected as several systems and network elements are integrated for the first time with the field installation.

As with all testing, the effectiveness of any test is improved with a specific description of the test including execution steps and a clear understanding of the criteria for passing, failing, or passing with exceptions. If changes are going to be made to the systems and services during the tests, people capable and empowered to make the necessary changes will be participating in the tests. Customer signoff is best provided immediately after the execution of the tests.

CIVIL AND SITE DEVELOPMENT

After receipt of the notice to proceed for the Wells 10 site, from the City, RACOM will provide and install a new 85' monopole capable of supporting the antenna and transmission line systems at the Well 10 site. The monopole priced within this proposal is in compliant with the latest revision of TIA 2222, which is currently Rev I. It also includes site development work for a 60 x 60 8' (6' +2" Barbed Wire) chain link enclosed compound including grounding and AE work. Assumptions made after reviewing the initial site survey and the Geotechnical Report within RFP include but not limited to

1. Standard Soil
2. Appropriate Soil Resistivity
3. Power within 50' of Site location
4. Access to site allows vehicles/equipment
5. Minimal Grading/Zero Cut/Fill

The following equipment is being provided by RACOM, as proposed for the following sites:

	Site Name	VHF TX - Simulcast	VHF stand- alone base station repeaters	uWave	VHF RX voting system	Console (DFS)	DC Power (-48VDC)
1	Moscow Mountain	X		X	X		X
2	KUID-TV	X		X	X		X
3	Well 10 (Greenfield)	X		X	X		X
4	City Hall	X			X		X
5	Latah County Courthouse		X				X
6	Residence Water Tower			X	X		X
7	Rotary Park Water Tower			X	X		X
8	Vista Water Tank				X		X
9	Whitcom			X		X	X

System Installation Plan

Pre-installation meeting will occur one week prior to commencing work. For each installation we utilize standard installation checklists. Widely used in the telecommunications industry, installation checklists allow equipment vendors to communicate their expectations for installations to the people (direct employees or subcontractors) installing the equipment. The equipment checklist also provides documentation and customer signoff for the completion of the equipment installation.

System Optimization

Once the infrastructure installation is complete, RACOM will work with the installation and microwave technicians to optimize and commission the system. Alarm systems and fallback modes at each Site will be tested. RACOM will conduct a preliminary Acceptance Test with the City.

System Commissioning

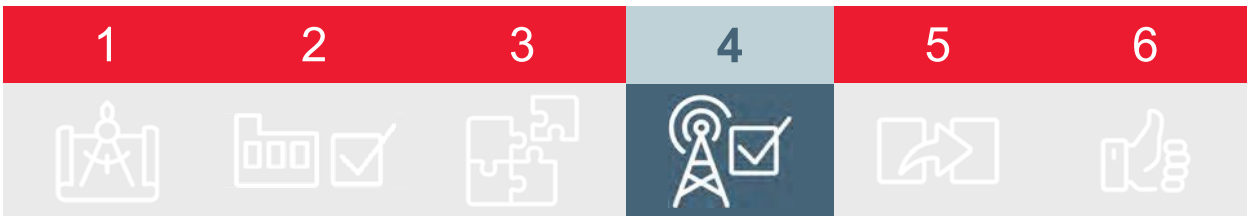
RACOM will complete system commissioning and conduct live system testing from end to end. System commissioning will include but not be limited to:

- Redundancy Testing
- Call Processing
- Failure Modes
- Alarm Functionality and Reporting
- Reporting Features
- Interoperability

- **Call Patching**
- **Encryption**
- **Talk Around**
- **Emergency Calls**
- **Protective Ring Switching**

System Technical Training

Using RACOM support services dramatically reduces the City's need for system administration responsibilities. Tait and RACOM will conduct Administration and User Training courses.



Acceptance Testing

RACOM will perform systems acceptance testing per the agreed-upon Acceptance Test Plan (ATP). The RACOM Team will notify the City of Moscow when installation and optimization are complete, and the system is ready for acceptance testing.

System Acceptance Testing

Once system installation and optimization have been verified, the new system will be confirmed by completing the Acceptance Test procedures defined in the contract document. RACOM has included preliminary acceptance testing documents with this proposal.

Coverage Acceptance Testing

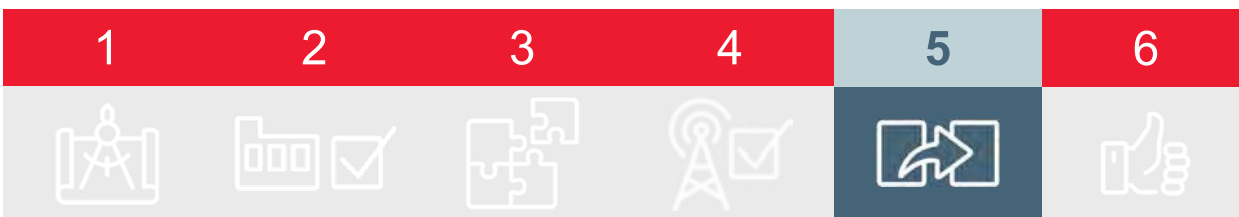
The VHF Conventional radio system has been developed to provide today's public safety standard of outdoor Mobile radio use in the coverage area of City of Moscow.

The design is based on a Covered Area Reliability with a 95% target delivering a Delivered Audio Quality (DAQ) of 3.0 as defined by TAI/TSB-88-C. DAQ levels are defined as:

- DAQ 1: Unusable. Speech present but not understandable
- DAQ 2: Speech understandable with considerable effort. Requires frequent repetition due to noise or distortion.
- DAQ 3: Speech understandable with slight effort. Requires occasional repetition due to noise or distortion.
- DAQ 3.4: Speech understandable without repetition. Some noise or distortion present.
- DAQ 4: Speech easily understandable. Little noise or distortion
- DAQ 4.5: Speech easily understood. Infrequent noise or distortion
- DAQ 5: Speech easily understood. No noise or distortion discernable.

Coverage Acceptance Test Plan

The delivered coverage will be verified to meet or exceed the coverage reliability based on the testing grids, often called tiles, as prescribed in the TSB-88 guidelines. The Vendor will divide each test area into tiles to produce the location of DAQ tests required and as outlined in the RFP for the various bounded area identified.



Cutover Approach

RACOM and City of Moscow will work together to prepare the cutover plan before user integration.

RACOM is confident that we all share the same overarching goals in the process – that there are no missed calls, and that each user maintains adequate communications during the cutover process.

The cutover plan will address the following:

- **Timing and Use of New and Existing RF Frequencies** – The migration of existing frequencies must be carefully planned and balanced against traffic loading to minimize the impact on end-users.
- **System User Migration** – A transition plan will be jointly developed to schedule the City users radio programming and migrating the frequencies from the legacy system to the new system.
- **User Unit Personalities** – RACOM will assist the City project manager in developing a series of user profiles for the radio system users. These profiles will determine the user-defined parameters for each agency and radio.
- **Dispatch Support During Cutover** – Since there may be a period when dispatchers may need to coordinate users on both systems, an interim solution will be created where the new dispatcher positions can talk to field units on both the existing system and the new system during the transition phase.
- **Dispatcher and Radio User Training** - Radio users will need to be trained on the subscriber radios' operation. Our training team will help the City develop quick-reference materials and produce seminar-oriented train-the-trainer documents to facilitate this.

Other than the bulleted items above, the cutover plan may also include topics such as the type of the cutover, systematic fleet-by-fleet or department-by-department. Users' cutover, initial test users or live system test window for the first batch of migrated users. milestones

during cutover process, and finally, a fallback plan in case of any uncertainty. The entire cutover plan will be broken into multiple phases to ensure the smooth transition to the new system.

After completion of cutover planning, the RACOM Team and the City of Moscow agree on a day and time for the cutover to begin. The RACOM Team will be present with the City to provide any last-minute answers to users as they go live on the new system.

Migration

RACOM will carefully manage migration activities to minimize any disruption to ongoing services. Any service-affecting installation activities will be carefully coordinated with the City of Moscow.

After the testing and optimization phase is complete, RACOM will coordinate with the City and identify which groups of users can start migrating over to the new system.

During the migration period, RACOM will have personnel in the field to monitor and support the City and its users. A technician will be on-hand to respond to alarm calls or assist in helping a new user adjust to the changes introduced by the new system. City of Moscow will have the full support of the RACOM team during this transition.

User Equipment

The City of Moscow schedules and coordinates the fleet of vehicles and users that will use the mobile and portable user equipment per the cutover plan.

Transition/Cut-over

RACOM and the City will work together to prepare a mutually agreed upon cut-over plan 30 days before the installation of work.

The cut-over plan will include the following:

- RACOM will minimize disruptions and balance traffic loading during system testing and migration
- User migrations will be jointly developed to move emergency responders to the new system.
- RACOM will assist the city in developing user profiles for the radio system users. These will determine the parameters for each radio and agency.
- RACOM will support dispatch through the transition. An interim solution will be provided to talk to field units about the existing system and the new system.
- RACOM will conduct dispatcher and Radio User Training. Our training team will help the city develop quick-reference guides and train-the-trainer materials.

SYSTEM DOCUMENTATION

All systems and subsystems provided under the contract shall be included in the written documentation plan as supplied by RACOM. In addition all ID, IP addresses, voltage and testing outcomes, model/serial numbers, and operating manuals.

PROJECT CLOSE-OUT AS-BUILT DOCUMENTATION DELIVERABLES

System Close-Out Package

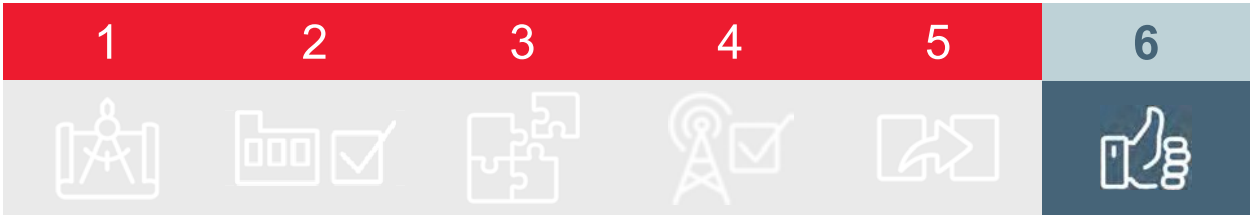
The System Close-Out Package is based on the same drawings included in the DDR. These drawings will include all changes in design and equipment layout captured during installation.

It will also include serial numbers for infrastructure equipment, and terminals, along with IP addressing scheme, access info, training documentation, FCC licenses, system test results, and system manuals.

Due to the size of the Close-Out Package, it will be presented in digital form only.

PROJECT SCHEDULE

A project schedule in form of a Gantt chart has been included.



System Acceptance and Closeout submittals

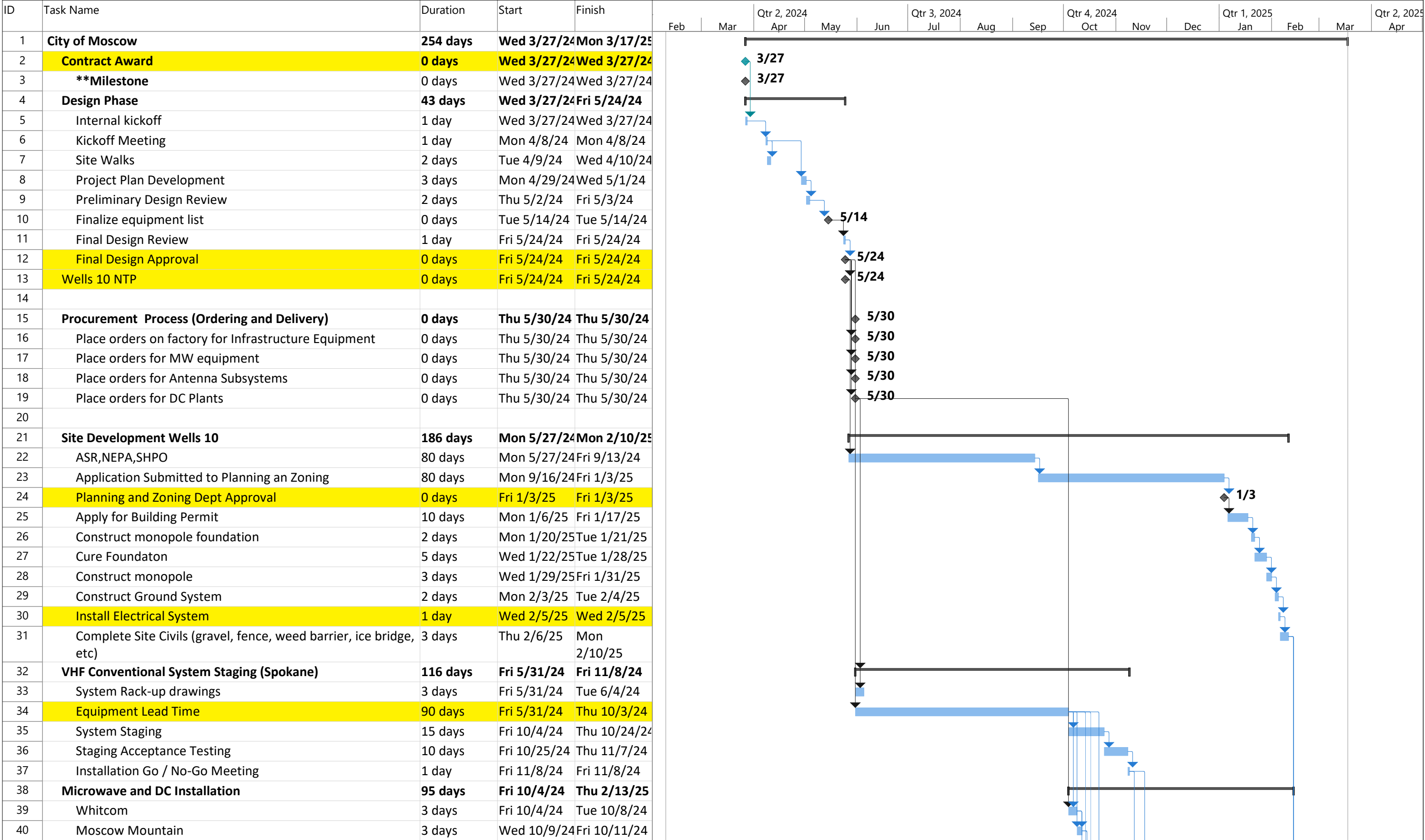
RACOM will submit initial system acceptance documentation for City of Moscow to sign, marking the successful conclusion of cutover.

Final Acceptance

Upon the successful completion of acceptance tests, cutover, and submission of the final Project Record Documents (as-built drawing packages including configuration and installation details for the DC power systems) the project manager submits the final system acceptance letter for City of Moscow to sign.

With the final acceptance, the project manager arranges a meeting with the field service team to review maintenance support during the warranty period. The RACOM Team provides the contact information and procedures for obtaining service during the warranty period.

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Project: Proposed Project Sched
Date: Wed 1/24/24

Task

Split

Milestone

Summary

Project Summary

Inactive Task

Inactive Milestone

Inactive Summary

Manual Task

Duration-only

Manual Summary Rollup

Manual Summary

Start-only

Finish-only

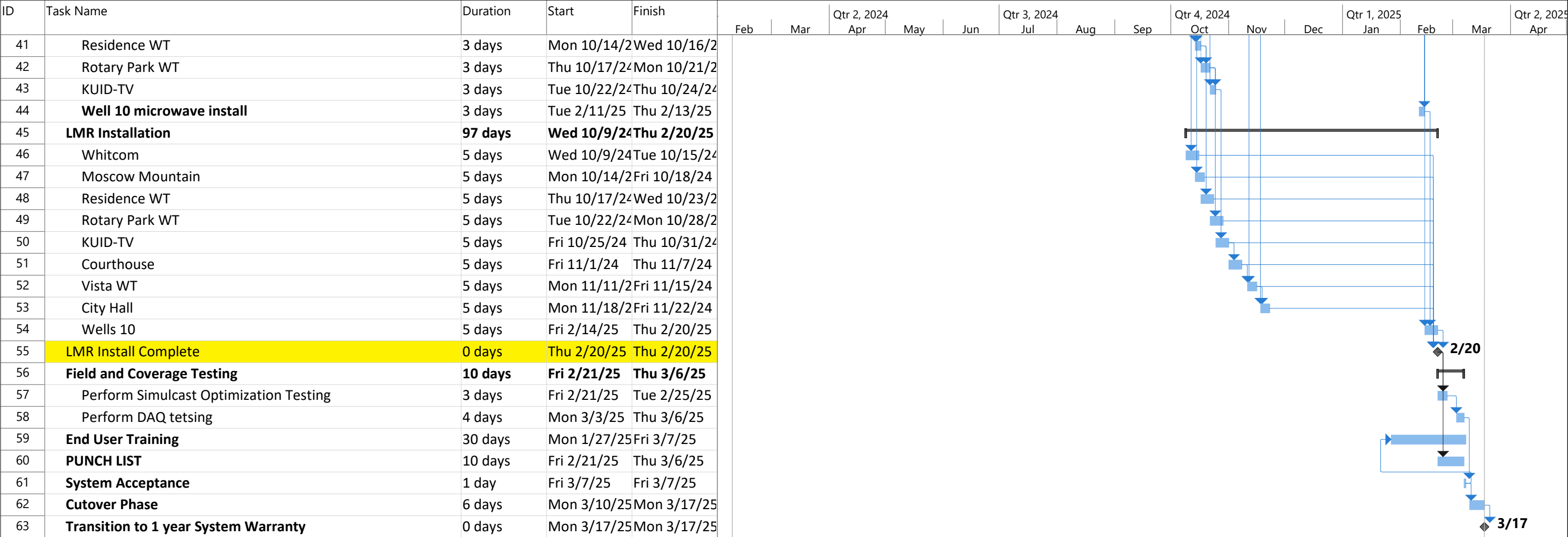
External Tasks

External Milestone

Deadline

Progress

Manual Progress



Project: Proposed Project Sched
Date: Wed 1/24/24

Task

Split

Milestone

Summary

Project Summary

Inactive Task

Inactive Milestone

Inactive Summary

Manual Task

Duration-only

Manual Summary Rollup

Manual Summary

Start-only

Finish-only

External Tasks

External Milestone

Deadline

Progress

Manual Progress



PRICING

- Equipment Price Sheet
- Services Cost Sheet
- Post Warranty Services Cost Sheet

CITY OF MOSCOW, IDAHO

RADIO SYSTEM UPGRADE PROJECT

February 27, 2024



City of Moscow, ID

SERVICES PRICING

Category	Per Hour	Total Hours	Labor Cost	Expenses	Total
Project Management	1 LS		\$ 69,208.57	\$ -	\$ 69,208.57
Engineering	1 LS		\$ 67,567.07	\$ -	\$ 67,567.07
Documentation	1 LS		\$ 34,228.57	\$ -	\$ 34,228.57
Coverage Testing	1 LS		\$ 18,678.57	\$ -	\$ 18,678.57
Technician Optimization	1 LS		\$ 73,678.57	\$ -	\$ 73,678.57
Training	1 LS		\$ 15,148.57	\$ -	\$ 15,148.57
Warranty Services	1 LS		\$ -	\$ -	\$ -
Estimated Bonds	1 LS		\$ 23,044.50	\$ -	\$ 23,044.50
Tower Work	1 LS		\$ 54,162.57	\$ -	\$ 54,162.57

Services Total

\$ 355,716.99

City of Moscow, ID

EQUIPMENT PRICING

Site	Model Number	Description	Qty	Contract Price	Extended Contract Price
01 -Moscow Mountain	RACK-MISC	Equipment Racks & Miscellaneous Installation Materials	1	\$ 3,784.50	\$ 3,784.50
01 -Moscow Mountain	MP2P-NE	Aviat MW, GPS Oscillators, Network Equipment	1	\$ 107,132.74	\$ 107,132.74
01 -Moscow Mountain	DC-POWER	-48VDC Power Plant	1	\$ 16,719.50	\$ 16,719.50
01 -Moscow Mountain	TAIT-S	Tait TB9400, VHF, 100W, Satellite	3	\$ 12,771.00	\$ 38,313.00
01 -Moscow Mountain	ANT-SYS	Antenna System Components (Antennas, Cabling, Combiner/Multicoupler, etc.)	1	\$ 38,965.33	\$ 38,965.33
02 - KUID-TV	RACK-MISC	Equipment Racks & Miscellaneous Installation Materials	1	\$ 3,784.50	\$ 3,784.50
02 - KUID-TV	MP2P-NE	Aviat MW, GPS Oscillators, Network Equipment	1	\$ 71,224.84	\$ 71,224.84
02 - KUID-TV	DC-POWER	-48VDC Power Plant	1	\$ 16,719.50	\$ 16,719.50
02 - KUID-TV	TAIT-CV	Tait TB9400, VHF, 100W, Central Voter	5	\$ 16,984.50	\$ 84,922.50
02 - KUID-TV	ANT-SYS	Antenna System Components (Antennas, Cabling, Combiner/Multicoupler, etc.)	1	\$ 61,721.33	\$ 61,721.33
02 - KUID-TV	RAC-SI	Site Improvements	1	\$ 4,050.00	\$ 4,050.00
03 - Well 10	RACK-MISC	Equipment Racks & Miscellaneous Installation Materials	1	\$ 3,784.50	\$ 3,784.50
03 - Well 10	MP2P-NE	Aviat MW, GPS Oscillators, Network Equipment	1	\$ 120,204.10	\$ 120,204.10
03 - Well 10	DC-POWER	-48VDC Power Plant	1	\$ 16,719.50	\$ 16,719.50
03 - Well 10	TAIT-CV	Tait TB9400, VHF, 100W, Central Voter	5	\$ 16,984.50	\$ 84,922.50

City of Moscow, ID

EQUIPMENT PRICING

Site	Model Number	Description	Qty	Contract Price	Extended Contract Price
03 - Well 10	ANT-SYS	Antenna System Components (Antennas, Cabling, Combiner/Multicoupler, etc.)	1	\$ 61,721.33	\$ 61,721.33
03 - Well 10	RAC-SI	Site Improvements	1	\$ 286,132.50	\$ 286,132.50
04 - City Hall	RACK-MISC	Equipment Racks & Miscellaneous Installation Materials	1	\$ 3,784.50	\$ 3,784.50
04 - City Hall	NETWORK-EQUIP	Network Equipment	1	\$ 23,635.32	\$ 23,635.32
04 - City Hall	DC-POWER	-48VDC Power Plant	1	\$ 16,719.50	\$ 16,719.50
04 - City Hall	TAIT-S	Tait TB9400, VHF, 100W, Satellite	2	\$ 12,771.00	\$ 25,542.00
04 - City Hall	ANT-SYS	Antenna System Components (Antennas, Cabling, Combiner/Multicoupler, etc.)	1	\$ 34,001.33	\$ 34,001.33
05 - Residence Water Tank	RACK-MISC	Equipment Racks & Miscellaneous Installation Materials	1	\$ 27,367.65	\$ 27,367.65
05 - Residence Water Tank	MP2P-NE	Aviat MW, GPS Oscillators, Network Equipment	1	\$ 45,418.90	\$ 45,418.90
05 - Residence Water Tank	DC-POWER	-48VDC Power Plant	1	\$ 16,719.50	\$ 16,719.50
05 - Residence Water Tank	TAIT-3RX	Tait TB9400, VHF, Rx Only (3-Channel)	1	\$ 9,135.00	\$ 9,135.00
05 - Residence Water Tank	TAIT-2RX	Tait TB9400, VHF, Rx Only (2-Channel)	1	\$ 7,203.00	\$ 7,203.00
05 - Residence Water Tank	ANT-SYS	Antenna System Components (Antennas, Cabling, Combiner/Multicoupler, etc.)	1	\$ 28,789.66	\$ 28,789.66
06 - Rotary Park Water Tank	RACK-MISC	Equipment Racks & Miscellaneous Installation Materials	1	\$ 27,367.65	\$ 27,367.65
06 - Rotary Park Water Tank	MP2P-NE	Aviat MW, GPS Oscillators, Network Equipment	1	\$ 45,418.90	\$ 45,418.90

City of Moscow, ID

EQUIPMENT PRICING

Site	Model Number	Description	Qty	Contract Price	Extended Contract Price
06 - Rotary Park Water Tank	DC-POWER	-48VDC Power Plant	1	\$ 16,719.50	\$ 16,719.50
06 - Rotary Park Water Tank	TAIT-3RX	Tait TB9400, VHF, Rx Only (3-Channel)	1	\$ 9,135.00	\$ 9,135.00
06 - Rotary Park Water Tank	TAIT-2RX	Tait TB9400, VHF, Rx Only (2-Channel)	1	\$ 7,203.00	\$ 7,203.00
06 - Rotary Park Water Tank	ANT-SYS	Antenna System Components (Antennas, Cabling, Combiner/Multicoupler, etc.)	1	\$ 28,789.66	\$ 28,789.66
07 - Vista Water Tank	RACK-MISC	Equipment Racks & Miscellaneous Installation Materials	1	\$ 13,909.50	\$ 13,909.50
07 - Vista Water Tank	NETWORK-EQUIP	Network Equipment	1	\$ 8,255.32	\$ 8,255.32
07 - Vista Water Tank	DC-POWER	-48VDC Power Plant	1	\$ 16,719.50	\$ 16,719.50
07 - Vista Water Tank	TAIT-3RX	Tait TB9400, VHF, Rx Only (3-Channel)	1	\$ 9,135.00	\$ 9,135.00
07 - Vista Water Tank	TAIT-2RX	Tait TB9400, VHF, Rx Only (2-Channel)	1	\$ 7,203.00	\$ 7,203.00
07 - Vista Water Tank	ANT-SYS	Antenna System Components (Antennas, Cabling, Combiner/Multicoupler, etc.)	1	\$ 28,789.66	\$ 28,789.66
08 - Whitcom	TAIT-EM	Tait Enable Monitor	1	\$ 14,264.25	\$ 14,264.25
08 - Whitcom	MP2P-NE	Aviat MW, GPS Oscillators, Network Equipment	1	\$ 52,878.92	\$ 52,878.92
08 - Whitcom	DC-POWER	-48VDC Power Plant	1	\$ 16,719.50	\$ 16,719.50
08 - Whitcom	ZET-MRG	Zetron MAX Radio Gateways with DFSI Licensing	3	\$ 5,554.40	\$ 16,663.20

Equipment Total **\$ 1,578,310.09**

City of Moscow, ID

Post Warranty Services

Category	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9	YR 10
Technical Support	\$ 31,735.10	\$ 31,735.10	\$ 31,735.10	\$ 31,735.10	\$ 32,345.22	\$ 32,973.64	\$ 33,620.91	\$ 34,287.60	\$ 34,974.29
Depot Repair	\$ 18,318.24	\$ 22,524.14	\$ 22,781.17	\$ 23,045.92	\$ 23,437.29	\$ 23,840.41	\$ 24,255.62	\$ 24,683.29	\$ 25,123.79
Other (Describe)									

Annual Totals \$ 50,053.34 \$ 54,259.24 \$ 54,516.27 \$ 54,781.02 \$ 55,782.51 \$ 56,814.05 \$ 57,876.53 \$ 58,970.89 \$ 60,098.08

**City of Moscow, ID
Package Breakdown**

Site Name	Model Number	Part Number	Description	Quantity
01 -Moscow Mountain	ANT-SYS	DBS-VHF-3CH	dbSpectra Equipment (3Ch TxRx)	1
01 -Moscow Mountain	ANT-SYS	RACOM-LINE-MM	Bucket for Antenna Systems - Moscow Mountain	1
01 -Moscow Mountain	ANT-SYS	TELEWAVE-ANT-RX	Telewave Antennas (Rx)	1
01 -Moscow Mountain	ANT-SYS	TELEWAVE-ANT-TX	Telewave Antennas (Tx)	1
01 -Moscow Mountain	DC-POWER	NEWMAR-48VDC	Newmar Power Plant	1
01 -Moscow Mountain	MP2P-NE	CISCO-MANAGED-SWITCH	Cisco Ethernet Switch	1
01 -Moscow Mountain	MP2P-NE	MPLS-ROUTER	Nokia MPLS Router	1
01 -Moscow Mountain	MP2P-NE	S4D-OSC	GPS Oscillator, 48VDC	1
01 -Moscow Mountain	MP2P-NE	AVIAT-MOSCOW MOUNTAIN	Avait MW System - MOSCOW MOUNTAIN	1
01 -Moscow Mountain	RACK-MISC	RAC-RACK	Rack	2
01 -Moscow Mountain	TAIT-S	TAIT-TB94-A-S	Tait ASIP, 100W, Satellite	3
02 - KUID-TV	ANT-SYS	DBS-VHF-5CH	dbSpectra Equipment (5Ch TxRx)	1
02 - KUID-TV	ANT-SYS	RACOM-LINE-KUID	Bucket for Antenna Systems - KUID-TV	1
02 - KUID-TV	ANT-SYS	TELEWAVE-ANT-RX	Telewave Antennas (Rx)	1
02 - KUID-TV	ANT-SYS	TELEWAVE-ANT-TX	Telewave Antennas (Tx)	1
02 - KUID-TV	DC-POWER	NEWMAR-48VDC	Newmar Power Plant	1
02 - KUID-TV	MP2P-NE	CISCO-MANAGED-SWITCH	Cisco Ethernet Switch	1
02 - KUID-TV	MP2P-NE	MPLS-ROUTER	Nokia MPLS Router	1
02 - KUID-TV	MP2P-NE	S4D-OSC	GPS Oscillator, 48VDC	1
02 - KUID-TV	MP2P-NE	AVIAT-KUIDTV	Avait MW System - KUIDTV	1
02 - KUID-TV	RACK-MISC	RAC-RACK	Rack	2
02 - KUID-TV	RAC-SI	RACOM-SI-KUID	Site Improvements - KUID-TV	1
02 - KUID-TV	TAIT-CV	TAIT-TB94-A-CV	Tait ASIP, 100W, Central Voter	3
02 - KUID-TV	TAIT-CV	TAIT-TB94-A-CV	Tait ASIP, 100W, Central Voter	2
03 - Well 10	ANT-SYS	DBS-VHF-5CH	dbSpectra Equipment (5Ch TxRx)	1
03 - Well 10	ANT-SYS	RACOM-LINE-W10	Bucket for Antenna Systems - Wells 10	1
03 - Well 10	ANT-SYS	TELEWAVE-ANT-RX	Telewave Antennas (Rx)	1
03 - Well 10	ANT-SYS	TELEWAVE-ANT-TX	Telewave Antennas (Tx)	1
03 - Well 10	DC-POWER	NEWMAR-48VDC	Newmar Power Plant	1
03 - Well 10	MP2P-NE	CISCO-MANAGED-SWITCH	Cisco Ethernet Switch	1
03 - Well 10	MP2P-NE	CISCO-FIBER-MODULE	Cisco Fiber Module	1
03 - Well 10	MP2P-NE	MPLS-ROUTER	Nokia MPLS Router	1
03 - Well 10	MP2P-NE	S4D-OSC	GPS Oscillator, 48VDC	1
03 - Well 10	MP2P-NE	AVIAT-WELL10	Avait MW System - WELL10	1
03 - Well 10	RACK-MISC	RAC-RACK	Rack	2
03 - Well 10	RAC-SI	RACOM-SI-W10	Site Improvements - Wells 10	1
03 - Well 10	TAIT-CV	TAIT-TB94-A-CV	Tait ASIP, 100W, Central Voter	3
03 - Well 10	TAIT-CV	TAIT-TB94-A-CV	Tait ASIP, 100W, Central Voter	2
04 - City Hall	ANT-SYS	DBS-VHF-2CH	dbSpectra Equipment (2Ch TxRx)	1
04 - City Hall	ANT-SYS	RACOM-LINE-CH	Bucket for Antenna Systems - City Hall	1
04 - City Hall	ANT-SYS	TELEWAVE-ANT-RX	Telewave Antennas (Rx)	1

City of Moscow, ID
Package Breakdown

Site Name	Model Number	Part Number	Description	Quantity
04 - City Hall	ANT-SYS	TELEWAVE-ANT-TX	Telewave Antennas (Tx)	1
04 - City Hall	DC-POWER	NEWMAR-48VDC	Newmar Power Plant	1
04 - City Hall	NETWORK-EQUIP	CISCO-MANAGED-SWITCH	Cisco Ethernet Switch	1
04 - City Hall	NETWORK-EQUIP	CISCO-FIBER-MODULE	Cisco Fiber Module	1
04 - City Hall	NETWORK-EQUIP	MPLS-ROUTER	Nokia MPLS Router	1
04 - City Hall	NETWORK-EQUIP	S4D-OSC	GPS Oscillator, 48VDC	1
04 - City Hall	RACK-MISC	RAC-RACK	Rack	2
04 - City Hall	TAIT-S	TAIT-TB94-A-S	Tait ASIP, 100W, Satellite	2
05 - Residence Water Tank	ANT-SYS	DBS-VHF-BASIC-RxOnly	dbSpectra Equipment (5Ch Rx Only)	1
05 - Residence Water Tank	ANT-SYS	RACOM-LINE-Rrx	Bucket for Antenna Systems - Residence WT	1
05 - Residence Water Tank	ANT-SYS	TELEWAVE-ANT-RX	Telewave Antennas (Rx)	1
05 - Residence Water Tank	DC-POWER	NEWMAR-48VDC	Newmar Power Plant	1
05 - Residence Water Tank	MP2P-NE	CISCO-MANAGED-SWITCH	Cisco Ethernet Switch	1
05 - Residence Water Tank	MP2P-NE	MPLS-ROUTER	Nokia MPLS Router	1
05 - Residence Water Tank	MP2P-NE	AVIAT-RESIDENCE WT	Avait MW System - RESIDENCE WT	1
05 - Residence Water Tank	RACK-MISC	DDB-OENC	DDB Unlimited Outdoor Cabinet	1
05 - Residence Water Tank	RACK-MISC	DDB-AC8000	DDB Unlimited HVAC AC Unit	1
05 - Residence Water Tank	RACK-MISC	RAC-RACK	Rack	2
05 - Residence Water Tank	TAIT-2RX	TAIT-TB94-A-2RxS	Tait Rx Only, 2 Ch, Satellite	1
05 - Residence Water Tank	TAIT-3RX	TAIT-TB94-A-3RxS	Tait Rx Only, 3 Ch, Satellite	1
06 - Rotary Park Water Tan	ANT-SYS	DBS-VHF-BASIC-RxOnly	dbSpectra Equipment (5Ch Rx Only)	1
06 - Rotary Park Water Tan	ANT-SYS	RACOM-LINE-RPrx	Bucket for Antenna Systems - Rotary Park WT	1
06 - Rotary Park Water Tan	ANT-SYS	TELEWAVE-ANT-RX	Telewave Antennas (Rx)	1
06 - Rotary Park Water Tan	DC-POWER	NEWMAR-48VDC	Newmar Power Plant	1
06 - Rotary Park Water Tan	MP2P-NE	CISCO-MANAGED-SWITCH	Cisco Ethernet Switch	1
06 - Rotary Park Water Tan	MP2P-NE	MPLS-ROUTER	Nokia MPLS Router	1
06 - Rotary Park Water Tan	MP2P-NE	AVIAT-ROTARY PARK WT	Avait MW System - ROTARY PARK WT	1
06 - Rotary Park Water Tan	RACK-MISC	DDB-OENC	DDB Unlimited Outdoor Cabinet	1
06 - Rotary Park Water Tan	RACK-MISC	DDB-AC8000	DDB Unlimited HVAC AC Unit	1
06 - Rotary Park Water Tan	RACK-MISC	RAC-RACK	Rack	2
06 - Rotary Park Water Tan	TAIT-2RX	TAIT-TB94-A-2RxS	Tait Rx Only, 2 Ch, Satellite	1
06 - Rotary Park Water Tan	TAIT-3RX	TAIT-TB94-A-3RxS	Tait Rx Only, 3 Ch, Satellite	1
07 - Vista Water Tank	ANT-SYS	DBS-VHF-BASIC-RxOnly	dbSpectra Equipment (5Ch Rx Only)	1
07 - Vista Water Tank	ANT-SYS	RACOM-LINE-Vrx	Bucket for Antenna Systems - Vista WT	1
07 - Vista Water Tank	ANT-SYS	TELEWAVE-ANT-RX	Telewave Antennas (Rx)	1
07 - Vista Water Tank	DC-POWER	NEWMAR-48VDC	Newmar Power Plant	1
07 - Vista Water Tank	NETWORK-EQUIP	CISCO-MANAGED-SWITCH	Cisco Ethernet Switch	1
07 - Vista Water Tank	NETWORK-EQUIP	CISCO-FIBER-MODULE	Cisco Fiber Module	1
07 - Vista Water Tank	RACK-MISC	ES-HVAC	HVAC FOR EXISTING SHELTER	1
07 - Vista Water Tank	RACK-MISC	RAC-RACK	Rack	2

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Package Breakdown

Site Name	Model Number	Part Number	Description	Quantity
07 - Vista Water Tank	TAIT-2RX	TAIT-TB94-A-2RxS	Tait Rx Only, 2 Ch, Satellite	1
07 - Vista Water Tank	TAIT-3RX	TAIT-TB94-A-3RxS	Tait Rx Only, 3 Ch, Satellite	1
08 - Whitcom	DC-POWER	NEWMAR-48VDC	Newmar Power Plant	1
08 - Whitcom	MP2P-NE	CISCO-MANAGED-SWITCH	Cisco Ethernet Switch	1
08 - Whitcom	MP2P-NE	MPLS-ROUTER	Nokia MPLS Router	1
08 - Whitcom	MP2P-NE	AVIAT-WHITCOM	Avait MW System - WHITCOM	1
08 - Whitcom	TAIT-EM	TAIT-ENABLEMON	Tait EnableMonitor	1
08 - Whitcom	ZET-MRG	ZETRON-DFSI	Zetron DFSI Interface	1

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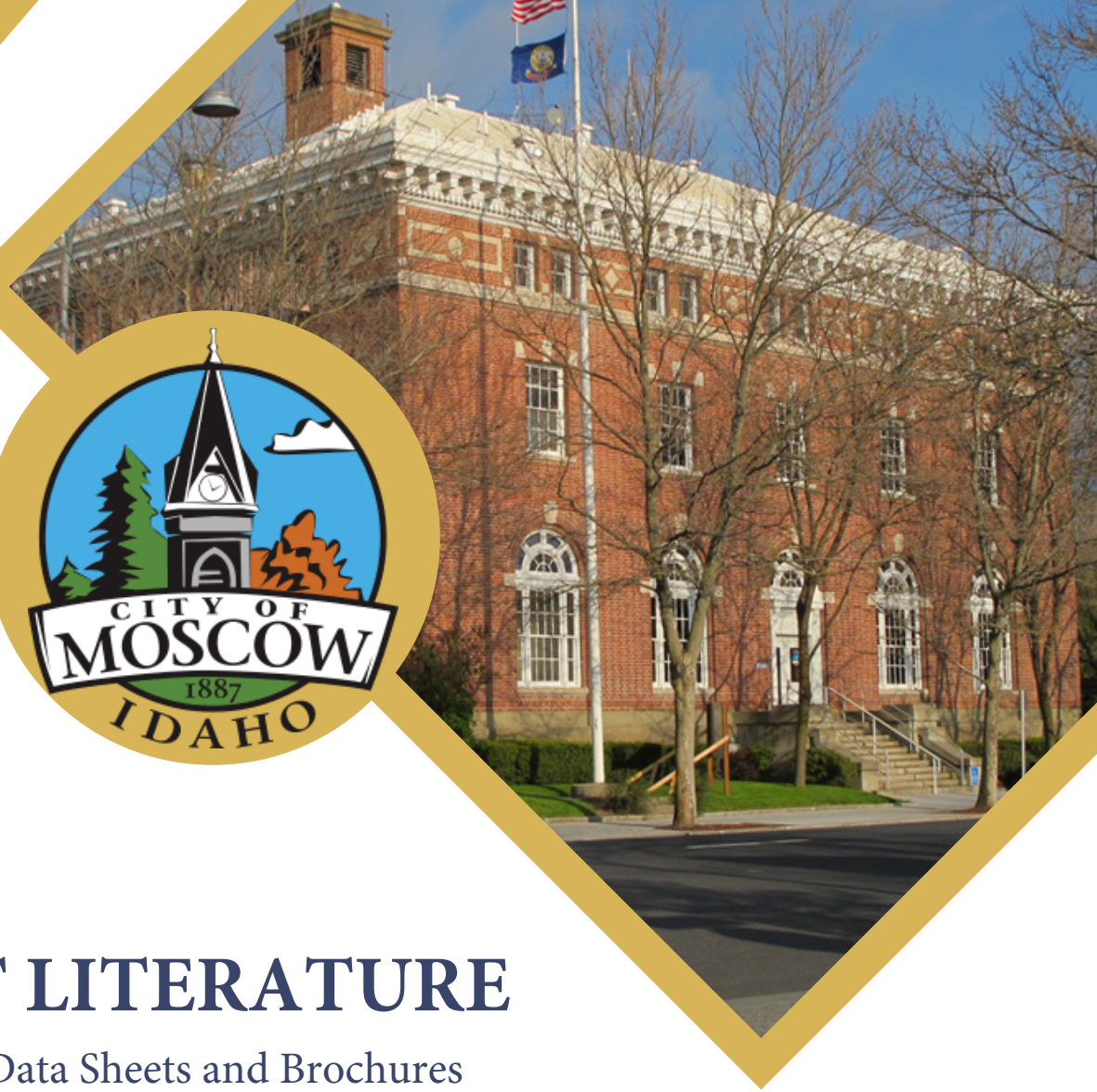
Component Part Number	Description	Qty
M-ECH-11	ODU 600v2, 11 GHZ, PLANNING PART NUMBER	16
037-579311-150	CABLE,ODU WITH CONN.GROUND KIT, 150M 0.4INCH 50OHM COAX	12
179-530062-002	LIGHTNING ARRESTOR KIT, UNIVERSAL, 50 OHM, TYPE N, MALE TO FEMALE	24
086-523300-113	Coupler Assy ODU 600v2 , 10/11 GHz Equal 3 dB, V and H Pole (840D611H1A)	8
EXX-000-205	INUe Shelf e/w Node Controller Card & Fan Shelf	8
179-530064-001	INUe Forward Mounting Kit	8
EXS-002	Node Protection Card	8
EXR-700-002	RAC 70v2, QPSK-4096QAM, NO XPIC, ACM	24
EXD-181-002	Gigabit Ethernet Card (DAC GE3)	16
037-579461-500	Protection / Bridging Cable, DAC GE3 to DAC GE3, SFP Direct Fit, 500 mm	16
EXA-001	Aux Card for Alarm I/O	8
037-579315-001	Aux Card Alarm I/O Cable, HD15 to Stub, 10 Meters	8
EZE-08006	NODE SW LICENSE, 400 Mbps TOTAL RADIO PAYLOAD CAPACITY	1
EZF-02	Node Software License: Adaptive Coding & Modulation (ACM)	8
EZF-03	Node Software License: Secure Management	8
EZF-54	ODU 600 Nodal High power option 4 x ODU	4
EZF-01	LAYER 1 LINK AGGREGATION NODAL ON DAC GE / DAC GE3	8
EZF-09	SYNCHRONOUS ETHERNET NODAL LICENSE for DAC GE3	8
079-422656-001	SFP OPT GIGE 1310nm SMF LC 10KM 0 to 70C	16
083-845434-001	SFP Elec GIGE RJ45 100m 0 to 70C	12
AND-VHLP3-11W-GTU	ANTENNA, 10/11 GHZ, 0.9 M (3FT), VALULINE, HPLP (RECTANGULAR AND CIRCULAR INTERFACE), DIRECT MOUNT, DISH (STD: WHITE), 10.125-11.7 GHZ, RADOME (STD: GRAY), CLASS III/FCC101A/B, WTM4K AND ODU600V2, 250 KMPH, 180 KMPH (VHLP3-11W-GTU)	4
NSM-ICE-SHIELD3	ICE SHIELD FOR 3 FT DISH (ICE-SHIELD3)	8
VAS-ODU000-003	ODU Level 3, Standard Integration Service	8
PLI	Placeholder Line Item	6
EZE-08007	NODE SW LICENSE, 800 Mbps TOTAL RADIO PAYLOAD CAPACITY	4
EZF-52	ODU 600 Nodal High power option 2 x ODU	4
AND-VHLP4-11W-GTU	ANTENNA, 10/11 GHZ , 1.2 M (4FT), VALULINE, HPLP (RECTANGULAR AND CIRCULAR INTERFACE), DIRECT MOUNT, DISH (STD: WHITE), 10.125-11.7 GHZ, RADOME (STD: GRAY), CLASS III/FCC101A/B, WTM4K AND ODU600V2, 250 KMPH, 200 KMPH (VHLP4-11W-GTU)	4
NSM-ICE-SHIELD4	ICE SHIELD FOR 4 FT DISH (ICE-SHIELD4)	4
M-ECH-23	ODU 600v2, 23 GHZ, PLANNING PART NUMBER	8
086-523300-233	Coupler Assy ODU 600v2 , 23 GHz Equal 3 dB, V and H Pole (840D623H1A)	4
EZE-08004	NODE SW LICENSE, 200 Mbps TOTAL RADIO PAYLOAD CAPACITY	2
AND-VHLP2-23-GTU	ANTENNA, 23 GHZ, 0.6 M (2FT), VALULINE, HPLP (RECTANGULAR AND CIRCULAR INTERFACE), DIRECT MOUNT, DISH (STD: WHITE), 21.2-23.6 GHZ, RADOME (STD: GRAY), CLASS III/FCC101A, WTM4K AND ODU600V2, 252 KMPH, 180 KMPH (VHLP2-23-GTU)	4

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Component Part Number	Description	Qty
TRN-GP-ECLPV-D	Eclipse Operations & Maintenance & ProVision Configuration & Management, 5 Days @ Customer Facility, Customer's ProVision System	1
SWW-PV85G1XX1299	ProVision Software Support, Up to 20 Nodes, 8x5 Coverage - Year 1	10
EZE-08005	NODE SW LICENSE, 300 Mbps TOTAL RADIO PAYLOAD CAPACITY	1
EZF-10	Node Software License: Ethernet OAM w/ G.8032 Ring Protection	1
614-225009-002	ProVision Solution Pack, Electronic Shipment - 10 Nodes	1
C9300-NM-4G	Cisco Catalyst 9300 Series Network Module - expansion module - Gigabit SFP x 4	3
C9300L-24P-4GE	CISCO C9300L 24-PORT WITH POE	8
SPD3403A-2	VHF RF Distribution System 2-CH Site	1
SPD3403A-3	VHF RF Distribution System 3-CH Site	1
SPD3403A-5	VHF RF Distribution System 5-CH Site	2
SPD3407A-1	VHF RF Distribution System Basic RX-only	3
ACP-8000-N36-110	8000 BTU Nvent Air Conditioners	2
2OD-78DDXC	78"H x 59"W x 42"D (84 RU* x2)	2
MISC-DDB-01	Miscellaneous Installation Materials	2
ES-HVAC	HAVC System for Vista Water Tank	1
VS-CR2U	ROUTER,NOKIA,7705,SAR-8,DC	7
CMDR-II+	Commander II+ Shelf	8
RM3048HE	CII and CII+ 48V Rectifier 3000W	24
C3C-12-40	Centurion III 12VDC DC Converter Module	16
CMDR-X	Circuit Breakers	144
C2BP	Centurion II Blank Panel	88
405-4355-0	19x19 battery tray	8
591-1210-0	100AH front terminal battery	32
RACOM-PB	Estimate for Performance Bond	1
ANT-CH	Transmission Line, Connectors, Surge Protectors, etc.	1
ANT-KUID	Transmission Line, Connectors, Surge Protectors, etc.	1
ANT-MM	Transmission Line, Connectors, Surge Protectors, etc.	1
ANT-RPrx	Transmission Line, Connectors, Surge Protectors, etc.	1
ANT-Rrx	Transmission Line, Connectors, Surge Protectors, etc.	1
ANT-Vrx	Transmission Line, Connectors, Surge Protectors, etc.	1
ANT-W10	Transmission Line, Connectors, Surge Protectors, etc.	1
SI-KUID	Site Improvements - KUID-TV	1
SI-W10	Site Improvements - Wells 10	1
MASV-NMR1H	Rack,Open,86 in(Xtra Dp) with support	14
MISC	Miscellaneous Installation Materials	14
2402-613	SecureSync 2400 Time & Frequency synchronization system with 2 expansion slots for option cards, support for AC or DC dual hot swappable power supply modules (modules not included), OCXO oscillator, and L1 GNSS reference. Includes a SMA to N-type conversion RF cable, front panel mounting ears and quick start guide. Order AC power cord(s) as a no charge line item (for AC power supply configuration only).	4

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Component Part Number	Description	Qty
2400-HS-D2	Hot Swappable 24/48 VDC Power Supply ; Compatible only with SecureSync 2400 configuration with Hot Swap power supply support. Limit 2 per system. Includes mating connector & clamp	4
8230	GPS/GNSS Outdoor Antenna supporting GPS L1, GLONASS L1, BeiDou B1, Galileo E1, and QZSS L1, with L-bracket for vent pipe/pole mounting via metal straps (included). Compatible with CA01-0N0N, CAL7XXX or CALP7XXX cables.	4
8226	GPS Surge protector, highly recommended for all outdoor GPS antenna installations. Includes MP10-0000-0002 Mounting Bracket. Compatible with cable with Type N connectors. Recommended to purchase 2 GPS antenna cables to and from 8226.	4
TE1000-0201-0001-AAAA-10	EnableMonitor Server AC Professional 100 Network Devices 1 Year Maintenance	1
TB9444-RX2T	TB9400 Multi Receiver x2 Capable Chassis Assembly	3
T01-01104-DAAA	TB94 RxOnly 148-174MHz	15
TBA30A4-4100	TB9000 Power Management Unit ACDC48volts with Aux12volts	21
219-01561-00	Cable cord 2m USA/CAD IEC black	21
TBAS071-R0	SFE Key - IP Networking Satellite Rx Only	15
TB9444-RX3T	TB9400 Multi Receiver x3 Capable Chassis Assembly	3
TB9435S-100T	TB9400 Single 100Watts Chassis Assembly	15
T01-01103-BAAA	TB9400 Reciter 136-174MHz	15
T01-01121-BBBA	TB94 Linear PA 136-174MHz 100Watts	15
TBAS060	Digital Fixed Station Interface	10
TBAS062	Simulcast Enable	15
TBAS061	Central Voter	10
TBAS071	IP Networking Satellite	5
ANT150F6	Antenna, Telewave ANT150F6	7
ANT150F2	Antenna, Telewave ANT150F2	4
901-9725	MAX Digital Radio Gateway	3
930-0270	P25 DFSI Interface License	6



PRODUCT LITERATURE

- Manufacturers Data Sheets and Brochures

CITY OF MOSCOW, IDAHO

RADIO SYSTEM UPGRADE PROJECT

February 27, 2024





ODU 600v2

SPLIT-MOUNT MICROWAVE RADIO OPERATING W/ RAC 70

[DATASHEET \[ANSI\]](#)

Aviat's ODU 600v2 is a next generation, universal Outdoor Unit (ODU) for split-mount applications, incorporating latest ASIC technology to combine ultra-small size and weight with smooth evolution to ultra-high capacity by supporting up to 4096 QAM and 80 MHz channel spacings. This ODU is compatible with Aviat's Eclipse, including backwards compatibility with already deployed hardware and software to facilitate easy introduction to existing networks.

Saving on TCO

The Aviat ODU 600v2 has one of the highest system gain in its class of ODU across frequency bands from 5-38 GHz, enabling high performance operation at higher modulations while minimizing antenna diameter and tower loading.

Old meets new

Interoperable with the Eclipse series of indoor units to facilitate easy upgrade and capacity evolution^[1], combined with over-the air (OTA) compatibility with previous Aviat ODU 600 outdoor units to simplify introduction and sparing for existing network deployments.

Flexibility and upgradeability

Ultra-compact for low profile installation, lower shipping costs, with integrated handle, it can be deployed in 1+0 unprotected, 1+1 MHSB (Monitored Hot Standby), 1+1 SD (Space Diversity) or FD Frequency Diversity, and 2+0 (with or without XPIC) configurations.

Possibility to upgrade existing Aviat ODU links using optional adapter kit, without changing the antenna and mount.

Network flexibility is assured with ODU 600v2 - supporting TDM, hybrid and IP networks in a single radio channel with Eclipse indoor unit.

Capacity expansion enabled with up to 80MHz wide channels, XPIC, 4096 QAM modulation and link aggregation.

Designed for high reliability and paired with Strong Security suite – enabling operation in robust and high-security environments.

ODU 600v2

SPLIT-MOUNT MICROWAVE RADIO OPERATING W/ RAC 70

DATASHEET [ANSI]



Specifications

General		
Frequency Bands		5, L6/U6, FCC7, 7/8, 10.5, 11, 13, 15, 18, 23, 26 ^[5] , 32 and 38 GHz
Modulation and Coding Options	Fixed and Adaptive	QPSK, 16, 32, 64, 128, 256, 512, 1024, 2048 and 4096QAM
Channel Sizes Supported		3.75, 5, 10, 14, 20, 25, 28, 30, 40, 50, 56, 60 MHz
Capacity Range	Airlink Capacity	9 - 716 Mbit/s
Configuration Options		NP (1+0) Protected HSB (1+1) Protected HSB w/SD, FD, XPIC
Eclipse Compatibility		
Radio Access Cards (RACs)		RAC 70
Electrical and Mechanical		
Power	Typical	50W (5-11 GHz), 35W (13-42 GHz)
Size		9 in x 7 in x 2.5 in, 2.7L (230 mm x 180 mm x 75 mm, 2.7L)
Weight		7.94 lb (3.6 kg)
Environmental		
Operating Temperature	Guaranteed Extended	-33° to +55°C (-27° to +131°F) -45° to +65°C (-49° to +149°F) ^[2]
Humidity	Guaranteed	100%
Altitude	Guaranteed	15,000 ft (4500 m)
Standards Compliance		
EMC		FCC CFR 47, Part 15, ICES-003 EN 301 489-1, EN 301 489-4
Operation		EN 300 019-2-4, Class 4.1 (ODU 600v2)
Safety		UL 60950-1, UL 60950-22, UL 62368-1
RF Performance	All federal frequencies	FCC CFR 47, Part 101 Manual of Regulations for Federal Radio Frequency Management
Water Ingress		IEC 60529, IP66
Lightning Protection		IEC 61000-4-5
Electric Power Substations		IEEE 1613
Security	with Eclipse INUe	FIPS 197 validated (Certificate #C5) FIPS 140-2 validated (Certificate #3558)

ODU 600v2

SPLIT-MOUNT MICROWAVE RADIO OPERATING W/ RAC 70

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IF Specifications		
IF Frequency	Transmit Receive	311 MHz 126 MHz
IF Cable Length	CNT-400	656 ft (200m)
IF Cable Connector		
IF Cable Connector		N-Type
AGC Monitor Point		BNC
Antenna Port Interface		Direct and Remote Antenna Mount
Polarization, Field Selectable		ODU Polar rotator
RAC 70		
IF Connector		SMA
LED Indicators		2 x Tri-state
Dimensions including Connectors		0.866 in ^[0.5 RU] x 5.12 in x 10.55 in (22 mm ^[0.5 RU] x 130mm x 268mm)
Weight		<0.88 lb (<0.38Kg)
Power Consumption		13W
Transmitter		
Transmit Power Tolerance	6-26 GHz ^[5] 38 GHz	± 2.0 dB ± 2.5 dB
Transmitter Source		Synthesized
Frequency Stability		± 5 ppm
Manual Transmitter Power Control	Range	Configurable in 0.1 dB steps from min to max power levels ^[4] (Refer Tx Power Specifications)
Automatic Transmitter Power Control	Range Resolution / Speed	Configurable over the full available manual attenuation range available 0.1 dB steps / 6 dB per second
Synthesizer Resolution		250 kHz
Transmitter Mute		> 50 dB
Receiver		
Receiver Source		Synthesized
Frequency Stability		± 5 ppm
Receiver Overload	BER = 1E ⁻⁶	-20 dBm
Residual (Background) Bit Error Rate		Better than 1E ⁻¹³
RSSI Accuracy ^[3]	-20 to -30 dBm (-27° to +131°F)	± 3.5dB
	-30 to -70 dBm (-27° to +131°F)	± 2.5dB
	-70 to -90 dBm (-27° to +131°F)	± 3.5dB

ODU 600v2

SPLIT-MOUNT MICROWAVE RADIO OPERATING W/ RAC 70

DATASHEET [ANSI]



System	5 GHz	L6/U6 GHz	FCC 7 GHz	7 GHz	8 GHz	10.5 GHz	11 GHz
Frequency Range (GHz)	4.4-4.996	5.925-7.125	6.875-7.125	7.125-7.9	7.7-8.5	10.15-10.68	10.7-11.7
TR-Spacings Supported (MHz)	300, 310, 334	160, 170, 180, 240, 252.04, 266, 340, 345	150	150, 160, 175, 300	300, 310, 360	65	490, 500, 520, 530
Standard	FCC Part 15.407 RSS-247, Issue 2, NTIA red book	FCC Part 101 SRSP 306.4 & 305.9	FCC Part 74 & 101	SRSP 307.1 NTIA Red Book	SRSP 307.7 NTIA Red Book	FCC Part 101 SRSP 310.5	FCC Part 101 SRSP 310.7
Maximum Tuning Range Dependent upon T-R Spacing (MHz)	181	210	50	180	196	10	305
Antenna Waveguide Type	R70 (WR137)	R70 (WR137)	R70 (WR137)	R84 (WR112)	R84 (WR112)	R100 (WR90)	R100 (WR90)

System Cont.	13 GHz	15 GHz	18 GHz	23 GHz	26 GHz	32 GHz	38 GHz
Frequency Range (GHz)	12.7-13.15	14.4-15.35	17.7-19.7	21.2-23.6	24.549-26.472	31.8 – 33.4	38.6-40.0
TR-Spacings Supported (MHz)	225	475, 640	1560, 340	1200, 1232	1008	812	700
Standard	FCC Part 74 & 101	SRSP 314.5 NTIA Red Book	FCC Part 101 SRSP 317.8	FCC Part 101 SRSP 321.8 NTIA Red Book	SRSP 325.25 NTIA Red Book	SRSP 331.8	FCC Part 101 SRSP 338.6
Maximum Tuning Range Dependent upon T-R Spacing (MHz)	125	261	440	616	467	407	400
Antenna Waveguide Type	R140 (WR62)	R140 (WR62)	R220 (WR42)	R220 (WR42)	R260 (WR34)	R320 (WR28)	R320 (WR28)

Notes:

- [1] Minimum SW version and configuration rules may apply. Please check with Aviat Networks for details.
- [2] ATPC is recommended for operation at Extended Temperature ranges. Contact Aviat Networks for more details.
- [3] RSSI accuracy applies when there is no potential interferer signal present within +/- 28MHz of the Rx. Frequency.
- [4] The amount of attenuation varies by configuration.
- [5] ODU 600v2 is not ISCED certified for 24.25 - 24.45GHz/25.05- 25.25GHz and is not available for sale and use in Canada.

Disclaimer

This material is for informational purposes only and does not constitute a legal obligation to deliver any product, feature or functionality and should not be relied upon in making purchasing decisions. All specifications are guaranteed values, at room temperature (20 to 30°C, 68 to 86°F), referenced to the ACU antenna port (including ACU losses) unless otherwise stated, and are subject to change without notice. The development, release and timing of any features or functionality described for our products is at Aviat Networks' sole discretion.

For details of availability, Please contact your Aviat Networks Sales Representative.



ECLIPSE PACKET NODE INTELLIGENT NODE UNIT

The Eclipse™ Packet Node Intelligent Node Unit is a highly modular and scalable indoor unit that delivers a unique combination of high capacity hybrid or all-packet transport, Carrier Ethernet/IP networking, and comprehensive Mission Critical Microwave features, enabling operators to prepare for the all-IP future.



PROTECT YOUR INVESTMENT

A highly modular architecture provides maximum protection of your investment. As your network and traffic requirements change over time, modules can be easily added to support additional radio directions or to change the traffic mix to facilitate the smooth migration from legacy TDM to advanced Carrier Ethernet/IP.

HIGHEST NODAL DENSITY

The Eclipse Packet Node INU comes in two platform options, a 1RU INU or a 2RU INUe which supports the highest nodal density in the smallest form factor, enabling the compact aggregation nodes that support up to 5 Gbit/s of packet handling capacity.

HIGH SPEED PACKET TRANSPORT

Eclipse Packet Node represents the very latest generation of microwave transmission, with a combination of advanced features to enable link speeds up to 2.8 Gbit/s from a single compact and modular unit.

MAXIMIZING FREQUENCY EFFICIENCY AND UTILIZATION

Adaptive Coding and Modulation, co-channel operation with XPIC, and optimized packet transmission drives more throughput than ever before, while also preserving valuable frequency resources.

ADVANCED CARRIER ETHERNET/IP INTELLIGENCE

A carrier-grade Ethernet switch provides traffic classification into 8 priority queues, QoS traffic priority assignment, VLAN support, Ethernet Optimization for improved throughput, and packet synchronization features.

MISSION CRITICAL FEATURES

Eclipse supports Mission Critical Microwave applications through a fully redundant architecture, native support for legacy TDM and new Ethernet/IP traffic for maximum efficiency and lowest latency, and exceptional security through integrated payload encryption and secure management options.

KEY FEATURES

- Compact 1RU (INU) and 2RU (INUe) shelf options, supporting 3x IF connected or 12 Ethernet connected RF units per rack unit
- FIPS 140-2 Level 2 validated; FIPS 197 validated
- Selection of hot swappable interface card options, including NxDS1, NxDS3, NxOC3, NxFE and NxGigE
- Hybrid native-TDM plus native-Ethernet/IP, or all-Ethernet/IP, transport
- Compact, modular design enabling simple expansion and upgrades
- High throughput, exceeding 460 Mbit/s per RF channel.
- Co-channel operation with optional XPIC to double frequency channel capacity
- QPSK to 256QAM, with hitless Adaptive Coding and Modulation (ACM) options
- Carrier Ethernet features, including Sync-E (G.8262), VLANs, and Ethernet OAM
- High density Ethernet interface capability with 6x Gigabit Ethernet ports per module
- Protected Configurations include Monitored Hot Standby, Frequency and Space Diversity, and 2+0 with L1 Link aggregation
- Fully protected traffic ports: electrical and optical Ethernet, and electrical T1 interfaces
- Integrated T1 Loop Switch
- Embedded Strong Security, featuring Payload Encryption, Secure Management and RADIUS client support
- Management support by Provision NMS and Eclipse Portal
- RoHS and WEEE compliant



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SYSTEM PARAMETERS

GENERAL		PER LINK	PER NODE
Throughput/Capacity Range	Native Carrier Ethernet/IP ^[1]	11 - 462 Mbit/s	2.77 Gbit/s
	Native TDM	7 - 127x DS1	127x DS1
		1, 3, 4x DS3	6x DS3
		1, 2x OC-3	2x OC3
Fixed Modulation Options	Fixed		QPSK, 16, 32, 64, 128, 256 QAM
Adaptive Coding and Modulation	Modulation Options		QPSK, 16, 64, 256 QAM
	Coding Options		Max Throughput, Max System Gain
Co-Channel Operation with XPIC	Optional		>20dB XPOL improvement
Adaptive Equalization			24 tap T/2 spaced feed-forward filter
ETHERNET SPECIFICATIONS			
Ethernet Standards Compliance	Ethernet		IEEE 802.3
User Ports, per Data Access Card (DAC)			3x 10/100/1000BaseT, 2x SFP Optical or Electrical
Networking Protocols			IPv4 and IPv6
Switch Capacity			5x 1Gbit/s user ports + 6x backplane ports
Maximum Frame Size			10000 bytes bi-directional
Throughput Acceleration (Frame Size Dependent)			IFG & Preamble Suppression
Traffic Prioritization			Per port based prioritization
VLAN Support			IEEE 802.1Q, 802.1ad (Q-in-Q)
Flow Control			IEEE 802.3x
Link Aggregation			802.1AX LAG L1LA (proprietary)
OAM			IEEE 802.1ag / ITU-T Y.1731
Monitoring	Port and Channel Status		Performance Graphs, RMON-1, Port and Channel
TDM SPECIFICATIONS			
Interfaces per Data Access Card (DAC)	NxDS1		1 to 16x 1.544 Mbit/s (DS1)
[Multiple DACs of the same or different kind can be used per shelf]	NxDS3		1 to 3x 44.736 Mbit/s (DS3)
	DS3 Mux		2x DS3 to 2x28x DS1 Mux, channelized
	NxOC3	Optical or Electrical	1 or 2x 155.52 Mbit/s (OC3)
	OC3 Mux		1x OC3 to 84x DS1 Mux
Standards Compliance	DS1, DS3		ITU-T Rec. G.703, G.823
	OC3, Electrical / Optical		ITU-T Rec. G.703, G.825 / ITU-T Rec. G.957, G.825
PROTECTION			
Link Protection options			Hot-Standby, Space or Freq Diversity
Ring/Network Protection options			Resilient Wireless Packet Ring (RWPRTM), IEEE 802.1w RSTP ITU-T G.8032 ERP
User Line Interface Protection			1+1: Ethernet, OC3, DS3, DS1
SECURITY COMPLIANCE			
Security and Encryption			Optional FIPS 197 validated, 128/256-bit AES encryption Optional FIPS 140-2 Level 2 validated
SYNCHRONIZATION			
Synchronization Options			Synchronous Ethernet (G.8262) IEEE 1588v2 frames passed transparently DS1 Line clock
STANDARDS COMPLIANCE			
EMC			FCC CFR 47, Part 15
Operation			EN 300 019, Class 3.1E
Safety			UL 60950-1
NEBS			GR-1089-CORE, GR-63-CORE
Electric power substations			IEEE 1613
MECHANICAL, ENVIRONMENTAL			
Plug-in card slots			INU: 4; INUe: 10
Rack Height			INU: 1RU; INUe: 2RU
Operating Temperature	Guaranteed		-5° to +55° C (23° to +131° F)
Humidity	Guaranteed		0 to 95%, non-condensing
FAULT AND CONFIGURATION MANAGEMENT			
Secure Management	Encryption		AES-128/256, DES, 3DES
Local/remote Configuration Tool			Eclipse Portal
Network Management			Aviat Networks ProVision™

All specifications are typical values unless otherwise stated, and are subject to change without notice.

[1] Maximum Ethernet Throughput is for one 80MHz RF channel, single polarization, for 64 byte frame sizes. Corresponding Airlink base capacity is 366 Mbit/s.

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Technical Specifications

Eclipse Packet Node INU/INUe

ANSI



TM: A CERTIFICATION MARK OF NIST, WHICH DOES NOT IMPLY PRODUCT ENDORSEMENT BY NIST, THE U.S. OR CANADIAN GOVERNMENTS.

System Parameters

General

Throughput/Capacity Range	Native Carrier Ethernet/IP ^[1] Native TDM	Per Link	Per Node
		11 - 462 Mbit/s 7 - 127x DS1 1, 3, 4x DS3 2x OC3	2.77 Gbit/s 127x DS1 6x DS3 2x OC3
Fixed Modulation Options	Fixed	QPSK, 16, 32, 64, 128, 256 QAM	
Adaptive Coding and Modulation	Modulation Options	QPSK, 16, 64, 256 QAM	
	Coding Options	Max Throughput, Max System Gain	
Co-Channel Operation with XPIC	Optional	>20dB XPOL improvement	
Error Correction		LDPC	
Adaptive Equalization		24 tap T/2 spaced feed-forward filter	

Standards Compliance

EMC	FCC CFR 47, Part 15
Operation	EN 300 019, Class 3.1E
Storage	EN 300 019, Class 1.2
Transportation	EN 300 019, Class 2.3
Safety	UL 60950-1
NEBS	GR-1089-CORE, GR-63-CORE
Electric Power Substations	IEEE 1613

Security

Payload Encryption	Compliance	FIPS 197 validated
	Cryptography Support Key	AES-CCM (RFC-3610) Cipher suite 128-, 192-, or 256-bit symmetric key Diffie-Hellman Key agreement method (RFC-2631)
Management Encryption	Compliance	FIPS 140-2 Level 2 validated (Certificate #2206)

Environmental

Operating Temperature	Guaranteed	-5° to +55° C (23° to +131° F)
Humidity	Guaranteed	0 to 95%, non-condensing
Altitude	Guaranteed	4,500 meters (15,000 ft)

Fault and Configuration Management

Protocol	SNMP v2c (standard), v3 (optional)	
Secure Management Features	Encryption	AES-128, -196 or -256
	Validated Algorithms	FIPS 140-2
	Key and Certificate Management	ITU-T X.509
	Centralized User Accounts	RADIUS Protocol (RFC-2865)
Local/remote Configuration Tool	Eclipse Portal	
Element/Network Management	Aviat Networks ProVision™	

All specifications are typical values unless otherwise stated, and are subject to change without notice.

[1] Maximum Ethernet Throughput figures are L1 throughput based upon 64 byte frames, and will vary depending upon actual mix of traffic frame sizes.

System Parameters (cont.)

Emission Designator

Emission Designator	3.75MHz	5MHz	10MHz	20MHz	30MHz	40MHz	50MHz
QPSK	N/A	5M00G7W	10M0G7W	20M0G7W	30M0G7W	40M0G7W	50M0G7W
QAM	3M75D7W	5M00D7W	10M0D7W	20M0D7W	30M0D7W	40M0D7W	50M0D7W

Dispersive Fade Margin (DFM), typical

Capacity	Channel BW	Modulation	Symbol Rate (Mbaud)	Gross Bit Rate (Mbit/s)	DFM (dB)
12 Mbit/s	3.75 MHz	32 QAM	2.87	14	79
25 Mbit/s	5 MHz	128 QAM	3.98	28	67
11-13 Mbit/s	10 MHz	QPSK	8.4	17	66
23-27 Mbit/s	10 MHz	16 QAM	8.4	34	62
39-45 Mbit/s	10 MHz	64 QAM	8.4	50	62
50 Mbit/s	10 MHz	128 QAM	8.4	59	61
55-59 Mbit/s	10 MHz	256 QAM	8.4	67	61
24-28 Mbit/s	20 MHz	QPSK	17.1	34	66
48-57 Mbit/s	20 MHz	16 QAM	17.1	68	59
81-89 Mbit/s	20 MHz	64 QAM	17.1	103	57
114-122 Mbit/s	20 MHz	256 QAM	17.1	137	53
24-28 Mbit/s	30 MHz	QPSK	25.9	52	66
48-57 Mbit/s	30 MHz	16 QAM	25.9	104	59
81-89 Mbit/s	30 MHz	64 QAM	25.9	155	53
157 Mbit/s	30 MHz	128 QAM	25.9	181	50
178-189 Mbit/s	30 MHz	256 QAM	25.9	207	47
50-59 Mbit/s	40 MHz	QPSK	34.7	69	65
101-118 Mbit/s	40 MHz	16 QAM	34.7	139	58
135 Mbit/s	40 MHz	32 QAM	34.7	173	52
156-187 Mbit/s	40 MHz	64 QAM	34.7	208	51
238-255 Mbit/s	40 MHz	256 QAM	34.7	277	45
63-74 Mbit/s	50 MHz	QPSK	43.3	87	64
127-145 Mbit/s	50 MHz	16 QAM	43.3	173	55
212-243 Mbit/s	50 MHz	64 QAM	43.3	260	47
297-318 Mbit/s	50 MHz	256 QAM	43.3	346	38
72-85 Mbit/s	80 MHz	QPSK	49.6	99	54
145-170 Mbit/s	80 MHz	16 QAM	49.6	199	50
243-267 Mbit/s	80 MHz	64 QAM	49.6	298	44
318-365 Mbit/s	80 MHz	256 QAM	49.6	397	37

All specifications are typical values unless otherwise stated, and are subject to change without notice.

Intelligent Node Unit (INU) Common Units

IDC, Indoor Chassis 1RU

Dedicated plug-in card slots	2 (NCC, FAN)
Universal plug-in card slots	4
Maximum number of ODUs supported	3
Dimensions (including mounting brackets)	44mm (1RU) x 482mm (19in) x 282.5mm (11.1in)
Weight	Empty 2.6 kg (5.8 lb)

IDCe, Extended Indoor Chassis 2RU

Dedicated plug-in card slots	3 (NCC, NPC, 2RU FAN)
Universal plug-in card slots	9
Maximum number of ODUs supported	6
Dimensions (including mounting brackets)	88mm (2RU) x 482mm (19in) x 282.5mm (11.1in)
Weight	Empty 4.8 kg (10.6 lb)

NCC, Node Controller Card

NMS LAN interface	Type	4-port 10/100Base-T Hub
	Connector	4x 8-pin RJ-45
Serial Maintenance Interface	Standard	Complies to TIA/EIA-561
	Speed	1200 bps to 115.2 kbps
	Connector	8-pin RJ-45
Configuration memory, removable	512 Mbyte CompactFlash card (on-board)	
Electrical	DC Supply input range	-40.5 to -60 VDC
	DC Fuse type and rating	25A fast-acting ceramic body cartridge
	Over voltage protection	< -70 VDC
	Under voltage protection	-32 VDC
	DC connector	2-pin DSUB power type
Power consumption	11 W	
LED Indicators	2x Tri-state ('Test', 'Status')	
Dimensions (including front panel and rear connector)	22mm (0.5RU) x 260mm (10.2in) x 268mm (10.6in)	
Weight	0.6 kg (1.35 lb)	

NPC, Node Protection Card

Electrical	DC Supply input range	-40.5 to -60 VDC
	DC Fuse type and rating	25A fast-acting ceramic body cartridge
	Over voltage protection	< -70 VDC
	Under voltage protection	-32 VDC
	DC connector type	2-pin DSUB power type
Power consumption	8 W	
LED Indicators	2x Tri-state ('Protect', 'Status')	
Dimensions (including front panel and rear connector)	22mm (0.5RU) x 130mm (5.1in) x 268mm (10.6in)	
Weight	0.4 kg (0.88 lb)	

FAN, Fan Card 1RU

Fans	2
LED Indicators	1x Red LED ('Fault')
Power consumption	1 W
Dimensions (including front panel and rear connector)	44mm (1RU) x 40mm (1.6in) x 264mm (10.4in)
Weight	0.23 kg (0.5 lb)

Intelligent Node Unit (INU) Common Units (cont.)

FAN, Fan Card 2RU

Fans	2
LED Indicators	1x Red LED ('Fault')
Power consumption	2 W
Weight	0.46 kg (1.0 lb)

AUX, Auxiliary Services Card

Aux Data Channels	3
Interface	RS232 or RS422
Line Rate	<i>Asynchronous</i> 1.2 to 19.2 kbit/s <i>Synchronous</i> 64 kbit/s
Aux Data Connector	High Density DSUB26
External Alarm Inputs	<i>TTL Inputs</i> Up to 6 ^[1] <i>TTL input thresholds</i> 0.8V max low, 2.0V min high
External Alarm Outputs	<i>Form C Relays</i> Up to 4 ^[1]
Alarms Connector	High Density DSUB15
LED Indicators	1x Tri-state ('Status')
Power consumption	1 W
Dimensions (including front panel and rear connector)	22mm (0.5RU) x 130mm (5.1in) x 268mm (10.6in)
Weight	0.35 kg (0.77 lb)

All specifications are typical values unless otherwise stated, and are subject to change without notice.

[1] For applications requiring additional alarm inputs or outputs, multiple AUX cards can be installed if free INU/INUe slots are available.

Radio Access Cards (RAC)

General		
IF connector		SMA ^[1]
IF interface	<i>Transmit</i>	311 MHz, -8.0 to -12.0 dBm
	<i>Receive</i>	126 MHz, -8 to -27 dBm
LED Indicators		2x Tri-state ('Online', 'Status')
Dimensions (including front panel and rear connector)		22mm (0.5RU) x 130mm (5.1in) x 268mm (10.6in)
Weight		< 0.38 kg (0.84 lb)
Secondary Lightning protection		Gas tube, 150 V
RAC 60E/RAC 6XE		
Data Packet Plane (DPP)	<i>Interfaces, electrical</i>	1x 1000Base-T
	<i>Connector</i>	RJ-45
RFUs supported		IRU600, ODU600, ODU300hp, ODU300ep
Capacities supported		Ethernet to 462 Mbit/s ^[2] , 8-127x DS1, 1-4x DS3, 1-2x OC3
Modulations supported	<i>Fixed Modulation</i>	QPSK, 16, 32, 64, 128, 256QAM
Adaptive Coding and Modulation	<i>Modulation Options</i>	QPSK, 16, 64, 256 QAM
	<i>Coding Options</i>	Max Throughput, Max System Gain
XPD Improvement	<i>RAC 6XE only</i>	20 dB
XPIC connectors	<i>RAC 6XE only</i>	2x SMB
Power consumption	<i>RAC 60E / RAC 6XE</i>	13 W/ 19 W

All specifications are typical values unless otherwise stated, and are subject to change without notice.

[1] RAC Installation Kit includes 3 meter jumper cable, SMA to N-type.

[2] Maximum Ethernet Throughput figures are L1 based upon 64 byte frames, and will vary depending upon actual mix of traffic frame sizes.

Data Access Cards (DAC) - Ethernet

General

LED Indicators	2x Tri-state ('Online', 'Status') RJ-45 Ethernet Interface ("Link Status", "Activity")
Power Consumption (nominal)	4 W (DAC GE), 13 W (DAC GE3)
Dimensions (including front panel and rear connector)	22mm (0.5RU) x 130mm (5.1in) x 268mm (10.6in)
Weight (nominal)	< 0.34 kg (0.74 lb)

DAC GE3 - Carrier Ethernet/IP

Ethernet Standards Compliance	<i>Ethernet Networking Protocols</i>	IEEE 802.3 IPv4 and IPv6
		DAC GE3
Backplane Throughput Maximum		200 Mbit/s
Packet Plane Throughput Maximum		2 Gbit/s
Switch Capacity		5x 1 Gbit/s user ports + 6x channels
User Ports	<i>RJ-45</i> <i>SFP</i> <i>Optical SFP Options</i> <i>Electrical SFP Options</i>	3x 10/100/1000Base-T 2x Optical LC or Electrical RJ-45 1000Base-ZX 1000Base-LX 1000Base-SX 10/100/1000Base-T 1000Base-T
Backplane Ports (Channels)		6
Burst and Frame Handling (Typical)	<i>Buffer Size Per Port</i> <i>Max Frame Size</i>	Configurable up to 1.28 Mbytes ^[1] 10000 bytes bi-directional
Throughput Acceleration	<i>IFG & Preamble Suppression</i>	Yes Frame Size Dependent
MAC address register		16000 entries
QoS	<i>Port Based Prioritization</i> <i>IEEE 802.1p QoS/CoS Bits</i> <i>DSCP</i> <i>MPLS EXP bits</i> <i>Remarking</i> <i>Transmission Queues</i> <i>Scheduling</i>	Yes Yes IPv6/IPv4 Yes MPLS Exp and DSCP to 802.1p 8 Strict, DWRR or Strict+DWRR (flexible per port)
VLANs	<i>VLAN Tagging</i> <i>Q-in-Q (Provider Bridging)</i> <i>VLAN Translation</i>	IEEE 802.1Q IEEE 802.1ad Yes
Congestion Management	<i>Flow Control</i> <i>Ingress Policing</i>	IEEE 802.3x TrTCM (per port and per flow)
	<i>Broadcast/Multicast Storm Protection</i>	CIR, EIR, CBS, EBS Yes

Data Access Cards (DAC) - Ethernet (cont.)

DAC GE3 - Carrier Ethernet/IP - cont.

Redundancy	<i>1+1 Card Protection</i>	Yes
	<i>Link Status Propagation</i>	Yes
Synchronization	<i>Synchronous Ethernet</i>	ITU-T G.8262
	<i>ESMC/SSM</i>	ITU-T G.8264
	<i>Internal Reference</i>	Built-in Stratum 3 clock
Link Aggregation	<i>L1LA (Layer 1)</i>	DPP ports
		Fixed or adaptive modulation
	<i>LAG (Layer 2)</i>	IEEE 802.1AX static or LACP
		Layer 2-4 hashing
		User ports, DPP ports, and channels (LACP on user ports only)
Ring Protection		Fixed modulation
	<i>RSTP</i>	IEEE 802.1w
	<i>ERP</i>	ITU-T G.8032v2
Ethernet OAM	<i>IEEE 802.1ag/ITU-T Y.1731 CFM</i>	ETH-CC, ETH-LB, ETH-LT, ETH-RDI, ETH-AIS
	<i>ITU-T Y.1731 PM</i>	ETH-LM, ETH-DM and ETH-DVM
Monitoring	<i>Port and Channel Status</i>	Yes
	<i>Performance Graphs</i>	Yes
	<i>Per-Queue Performance Statistics</i>	Yes
	<i>RMON-1</i>	Ports and Channels
Diagnostics	<i>Port Shutdown</i>	Yes
	<i>Port Mirror</i>	Yes

All specifications are typical values unless otherwise stated, and are subject to change without notice.

[1] Dependent upon configuration settings and number of active interfaces.

Data Access Cards (DAC) - TDM

General

Power consumption (nominal)	Max 4 W
Dimensions (including front panel and rear connector)	22mm (0.5RU) x 130mm (5.1in) x 268mm (10.6in)
Weight (nominal)	< 0.34 kg (0.74 lb)

DAC 4x, DAC 16x v2 - TDM (NxDS1)

LED Indicators	1x Tri-state: 'Status'		
Interface, configurable	DAC 4x	Electrical	1 to 4x 1.544 Mbit/s (DS1)
	DAC 16x v2	Electrical	1 to 16x 1.544 Mbit/s (DS1)
Electrical interface parameters	Standards Compliance	DS1	Compliant to ITU-T Rec. G.703, G.824
	Line code	DS1	AMI or B8ZS, selectable per Tributary
	Connectors	DAC 4x	4x RJ-45
		DAC 16x v2	2x 50-pin HDR
	Impedance	DS1	100Ω balanced
Redundancy	Hot-standby tributary protection (DAC 16x v2 only)		
Ethernet over unframed DS1	1.5 Mbit/s per trib; 24 Mbit/s per DAC (DAC 16x v2 only)		

DAC 3xDS3M - TDM (NxDS3)

LED Indicators	2x Tri-state: 'Online', 'Status'	
Interface	1 to 3x 44.736 Mbit/s (DS3)	
Functionality	2x DS3 (Interface) to 2x28x DS1 (TDM Bus) Mux, channelized; M13	
	3x DS3 (Interface) to 3x DS3 (TDM Bus) Transparent	
	Ethernet over unframed DS3: 43 Mbit/s per DS3; 129 Mbit/s per DAC	
Electrical interface parameters	<i>Standards Compliance</i>	Compliant to ITU-T Rec. G.703, G.824
	<i>Line code</i>	B3ZS
	<i>Connectors</i>	Slimline BNC
	<i>Impedance</i>	75Ω unbalanced
Redundancy	Hot-standby tributary protection	

DAC 155o, 2x155o, 2x155e - SONET (1x/2xOC3/STS3)

LED Indicators			1x Tri-state: 'Status'
Interface, configurable	DAC 155o	Optical	1x 155.52 Mbit/s (OC3)
	DAC 2x155o	Optical	1 or 2x 155.52 Mbit/s (OC3)
	DAC 2x155e	Electrical	1 or 2x 155.52 Mbit/s (STS3)
Electrical interface parameters	Standards Compliance		Compliant to ITU-T Rec. G.703, G.825
	Line code		G703/CMI
	Connectors		BNC
	Impedance		75Ω unbalanced
Optical interface parameters	Standards Compliance		Compliant to ITU-T Rec. G.957, G.825
	Optical interface		Short Range S-1.1
	Connectors		SC
	Tx Output Center Wavelength		1310 nm
	Tx Average Optical Output Power		-15 to -8 dBm
	Rx Sensitivity		-31 dBm
	Rx Input Power Saturation		-7 dBm
Redundancy			Hot-standby tributary protection

All specifications are typical values unless otherwise stated, and are subject to change without notice.

Data Access Cards (DAC) - TDM (cont.)

DAC 155oM/DAC 155eM SONET Multiplexer (1xOC3/STS3)

LED Indicators	2x Tri-state: 'Online', 'Status'		
Functionality	1x OC3/STS3 (Interface) to 84x DS1 (TDM Bus) Mux		
DAC 155eM Electrical interface	Electrical SFP - Coaxial DIN 1.0/2.3 75 Ohm		
DAC 155oM Optical interface	Optical SFP - LC		
	<i>Single Mode Long Range L1.1</i>	<i>Single Mode Short Range S1.1</i>	<i>Multi Mode</i>
<i>Tx Output Center Wavelength</i>	1310 nm	1310 nm	850 nm
<i>Tx Average Optical Output Power</i>	-5 to 0 dBm	-15 to -8 dBm	-10 to -4 dBm
<i>Rx Sensitivity</i>	-35 dBm	-34 dBm	-24 dBm
<i>Rx Input Power Saturation</i>	0 dBm	0 dBm	0 dBm
Timing modes, configurable	Recovered Clock Local Reference Clock (XO)		

All specifications are typical values unless otherwise stated, and are subject to change without notice.

NCM Network Capabilities Module

Interface Configurable	<i>Electrical</i>	1 to 8x 1.544 Mbit/s (DS1)	
Electrical Interface Parameters	<i>Standards Compliance</i>	<i>DS1</i>	Compliant to ITU-T G.703, G.823
	<i>Line Code</i>	<i>DS1</i>	AMI or B8ZS, selectable per tributary
	<i>Framing</i>	<i>DS1</i>	Framed or Un-framed
	<i>Connectors</i>	<i>DS1</i>	50 pin HDR
	<i>Impedance</i>	<i>Electrical DS1</i>	RJ45 (not used for loopswitch option) 100 ohm balanced
Operational Mode	<i>Low latency non hitless</i>	Typ <5mS (20mS Max)	
	<i>Drops per INUe</i>	Maximum 63 DS1	
	<i>Maximum Circuits per Loop</i>	Maximum 63 DS1	
	<i>Links established over RAC or DAC Modules</i>	Including DAC DS3M, DAC 155oM/eM	
Protection	<i>1+1 Protection</i>	Requires 2 x NCM	

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PROVISION® ELEMENT MANAGEMENT SYSTEM

SUPPORT FOR ALL NETWORK EQUIPMENT TYPES

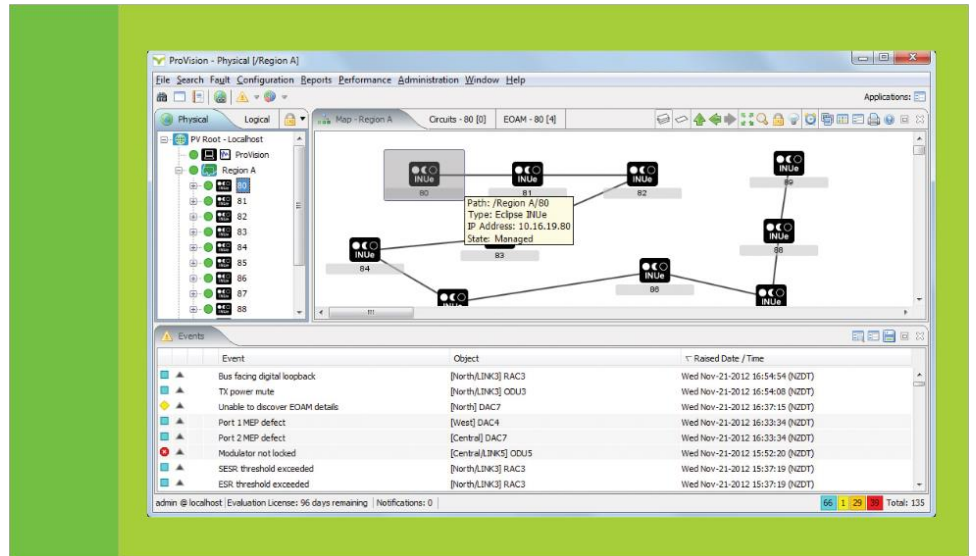


ProVision provides the following Aviat Networks and third-party device support:

- CTR 8540/8300 microwave router platform
- Eclipse and Eclipse Packet Node Platform
- Aviat WTM series of all-indoor and all-outdoor microwave systems
- All Aviat current, legacy, and future devices
- Generic Device Support fault management for a wide range of third-party SNMP devices; 50+ third-party device packages currently available
- Application Integration including craft tools, PCR collector, PCR viewer, MSUU.

NETWORK INTELLIGENCE

The ProVision Element Management System delivers superior wireless networking intelligence by offering a unique feature set, based on industry standards, designed to support the increasing demands of growing networks. By leveraging Aviat Networks' innovative microwave systems, ProVision maximizes network availability and throughput while significantly reducing OPEX.



Designed with the user in mind, ProVision is intuitive and adaptable for a wide range of activities that users can customize to match their network requirements. In addition, ProVision automates time consuming and error prone processes, such as the provisioning of end-to-end TDM and Ethernet services, bulk upgrading network firmware, and diagnosing network clock distribution problems.

With the ability to provide network management across Aviat's complete product portfolio, including many key partner products, ProVision delivers an efficient, seamless end-to-end network management solution for TDM, Ethernet, and hybrid microwave networks.

SMOOTH TRANSITION TO ALL-IP

Transitioning networks from legacy TDM to all-IP takes time and money, as well as risk of network interruptions. ProVision smooths the process by harmonizing microwave, TDM and Ethernet network operations with common concepts and features, a shared operator experience, and automation of complex processes.

Advanced Carrier Ethernet capabilities spanning Synchronization, Ethernet OAM, ERPS, EVC/VLAN and protection/diversity technologies include discovery of network and service resources, end-to-end visualizations, and automated provisioning. Collectively they remove significant complexity, deliver faster rollout with fewer mistakes, assure service availability and quality, providing confidence in transitioning from TDM, hybrid, to All-IP networks.

DEPLOYMENT PROFICIENCY THROUGH AUTOMATION

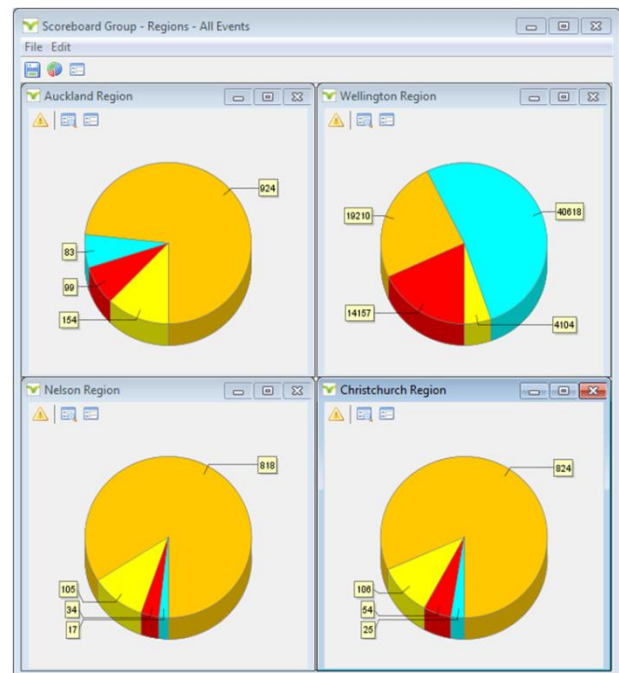
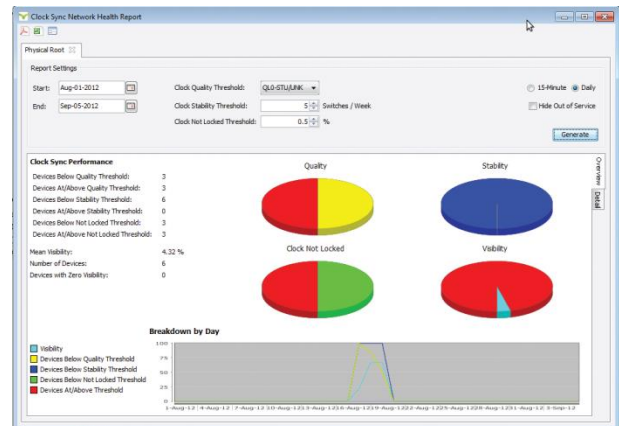
Deploy new element management with:

- Quick installation on Windows and Solaris and fast upgrade installations with automated database migration
- Automated discovery of network devices, inventory, configurations and end-to-end TDM and Ethernet services

SMART FAULT MANAGEMENT

ProVision's active health monitoring of critical microwave, TDM and Ethernet resources and service performance is smarter than traditional fault monitoring, delivering:

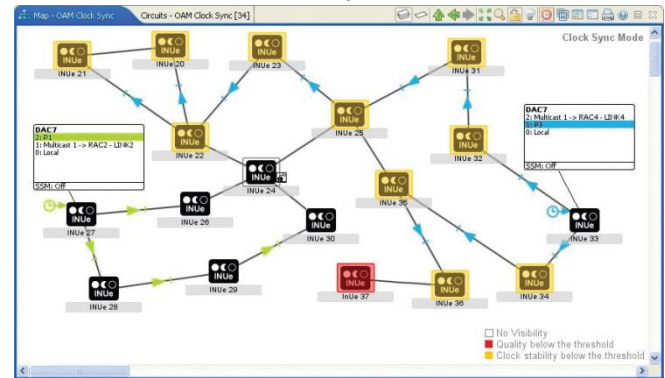
- Network Health Reports detect faults before an outage occurs by identifying performance degradation, for RF, Ethernet, Clock Sync
- Instant alerts of degraded performance via email, SMS and messaging, with deep-dive navigation to quickly investigate and resolve events
- Simple performance threshold management
- Flexible applications for networks, device types and more, via logical containers
- Advanced end-to-end diagnostics, including Ethernet service OAM (ITU-TY.1731 and IEEE 802.1ag) and TDM circuit PRBS testing
- Ethernet clock distribution and clock synchronization related faults across Eclipse networks
- Intelligent fault monitoring using browsers with correlation and filtering, digital scoreboards with dynamic rendering, and flexible event notifications
- Smartphone and tablet client application enabling out-of-NOC fault detection, isolation and handover to field staff



INTELLIGENT NETWORK PROVISIONING

ProVision's automated provisioning processes reduce human error and save substantially on effort, time and OPEX. Intelligent provisioning involves:

- Automated discovery of network and service resources, including end-to-end TDM and Ethernet services and network configurations
- End-to-end provisioning of TDM and Ethernet services through an intuitive graphical user interface
- Automatic and on-demand validation testing of end-to-end services and network design
- Bulk provisioning of device firmware and license upgrades



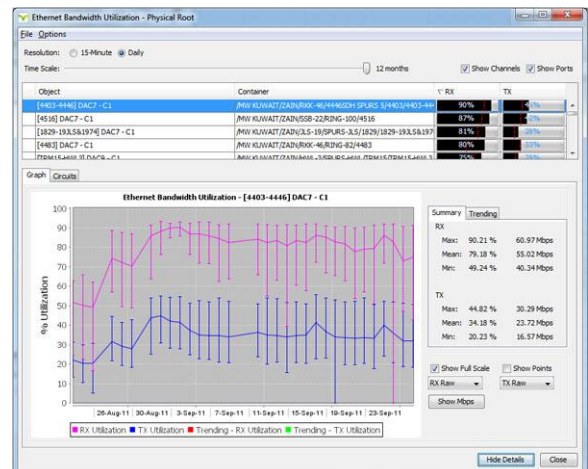
PROACTIVE NETWORK BANDWIDTH MANAGEMENT

To get the most data capacity out of networks, and to identify spare capacity, ProVision includes network bandwidth reporting. These capabilities support capacity planning, license management and congestion problem solving with:

- Ethernet Bandwidth Utilization instantly shows over or under utilization across all network ports, predicts future utilization, and provides navigation to deep-dive analysis tools
- RF Capacity Reports display the allocated, licensed, maximum & spare capacity available across all microwave interfaces in the network

SECURE, RELIABLE & TRUSTED ACCESS CONTROL

- Role based access control with Single-Sign-On
- Flexible containment based management providing access control by region, technology, etc.
- Secure device access including SNMPv3, HTTPS and SSH
- RADIUS based authentication, authorization and user access accounting
- Secure bulk provisioning of device security attributes including user accounts and Access Control Lists
- Audit logging, reporting and client session management



OSS AND DEVICE INTEGRATION READY

Operation Support Systems (OSS) manage networks and services on multiple levels. ProVision provides coherent management for your OSS platforms, significantly reducing system integration CAPEX:

- Proven OSS integration with many network providers and OSS vendors, spanning microwave, TDM and Ethernet resources.
- Easy to integrate traditional SNMP/XML/CSV based NBI provides events, performance, configuration/inventory, and network topology.

Scalable Solutions

- Up to 9,000 Network Elements and 150 concurrent user sessions per server
- Licensing based on network size and feature set
- Redundant server options available

Supported Platform Options

- Windows Server - 10, 2012, 2012R2, 2016, 2019
- Windows Client - 10, 2012, 2012R2, 2016, 2019
- UNIX Server - Solaris 10
- Mobile Client - Apple iOS, Android
- Internationalization available on request

Minimum Hardware Requirements

- Windows Server – 2 GHz processor, 8 GB RAM, 50 GB HD, Ethernet LAN card
- Windows Client – 2 GHz processor, 8 GB RAM (64-bit OS), 2 GB RAM (32-bit OS), 10 GB free HD, Ethernet LAN card, 10 Mbps LAN connection per Client connected to Server, Min. display resolution 1024 x 768, 32-bit color
- Solaris Server – 4-core SPARC processor, 16 GB RAM, 300 GB HD, Ethernet LAN card

Aviat Network Services And Support Options

- On-site training and installation services
- Custom software development
- 24/7 or 9/5 technical helpdesk available by email and telephone
- General Availability releases to AviatCare customers twice per year
- Expert network auditing available

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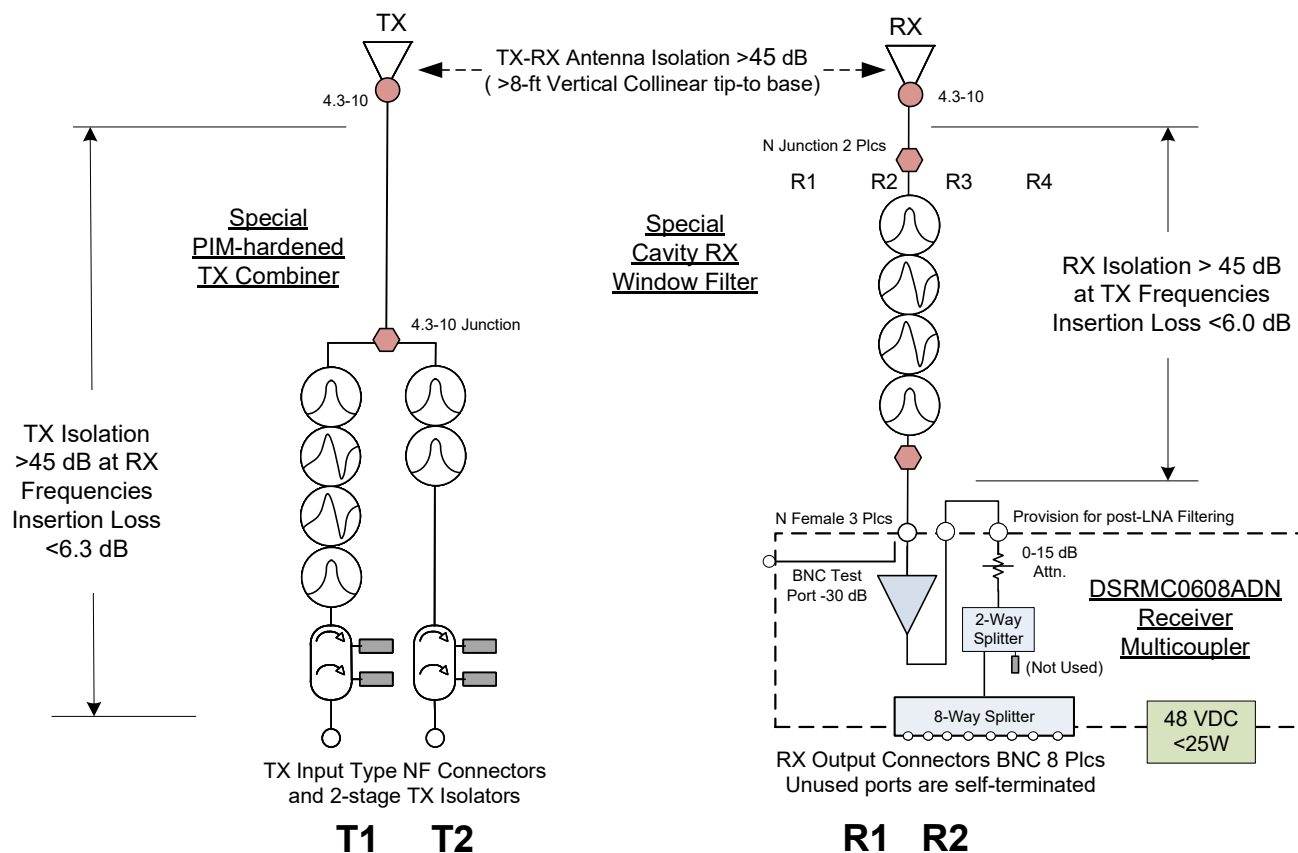


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SPD3403A-2 Frequency Plan & Filter Worksheet



FAIM Moscow 2CH

TX Separation		
Name	F(MHz)	Δ(MHz)
T1	154.44500	null
T2	159.21000	4.76500

RX Separation		
Name	F(MHz)	Δ(MHz)
R1	154.71000	null
R2	154.72500	0.01500

Transmit/Receive Frequency Spacing (MHz)						
		RX Antenna				
		R1	R2			
		154.71000	154.72500			
TX	T1	154.44500	0.2650	0.2800	5" BP x 2	5" BPBR x2
	T2	159.21000	-4.5000	-4.4850	5" BP x 2	
4		5" BP x 2			12-pack Maximize Separation	
		5" BPBR x2				
		RMC DSRMC0608				

SPD3403

Transmit Combiner Specifications	
Type	Cavity
Model	Special PIM-hardened
Cavities	5" & 8" BP and BPBR
Frequency Range	148-160 MHz
No. of Channels	See Drawing
Channel Power Rating	100W
Isolation & Insertion Loss	See Drawing
Return Loss	>14 dB
TX Isolators Dual Stage	
TX-TX Isolation	60
Ant-TX Isolation	50

Receive Special Window Filter Specifications	
Type	Cavity
Model	Special
Frequency Range	138-174 MHz
Isolation & Insertion Loss	See Drawing
Return Loss	>14 dB

Receive Multicoupler Specifications	
Type	DSRMC06
Frequency Range	138-174 MHz
Low Noise Amplifier	Quadrature Coupled
Input-output Max Gain	10 dB ± 1 dB
Input-output Noise Figure	2.7 dB Typical
LNA OIP3	>+40 dBm
Isolation RX-RX	>20 dB
Return Loss	>14 dB
Power Required	48 VDC Batt <25W (±36-72 VDC Isolated)

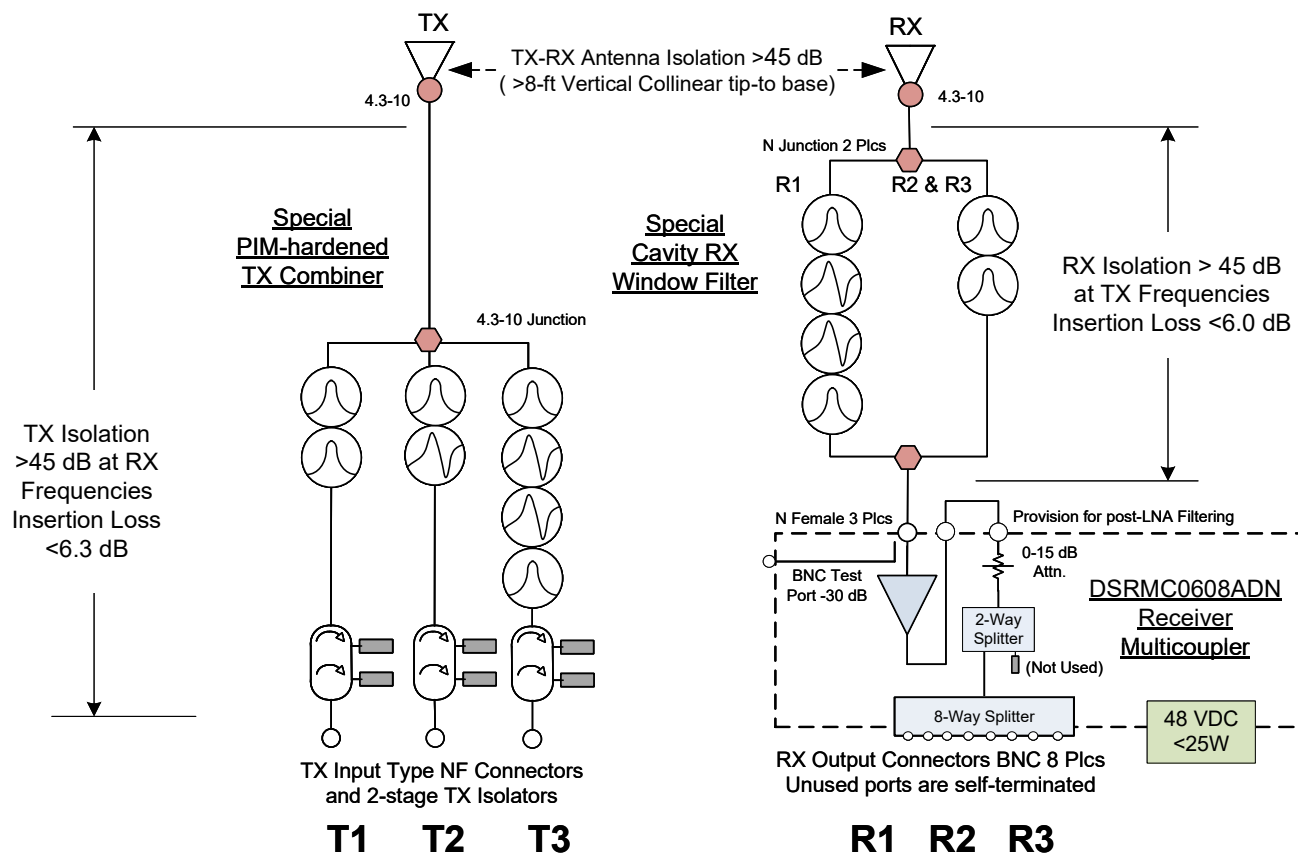
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SPD3403A-3 VHF RF Distribution System 3-CH Sites



FAIM Moscow 3CH

TX Separation		
Name	F(MHz)	Δ(MHz)
T1	153.80000	null
T2	154.89000	1.09000
T3	155.66750	0.77750

RX Separation		
Name	F(MHz)	Δ(MHz)
R1	155.88750	null
R2	158.98500	3.09750
R3	159.00000	0.01500

Transmit/Receive Frequency Spacing (MHz)					
		RX –Phase to RX Antenna			
		R1	R2	R3	
		155.88750	158.98500	159.00000	
TX	T1	153.80000	2.0875	5.1850	5.2000
	T2	154.89000	0.9975	4.0950	4.1100
	T3	155.66750	0.2200	3.3175	3.3325
6		5" BP x2	5" BP x2		
		5" BPBR x 2			
Phase to RMC DSRMC0608					

SPD3403

Transmit Combiner Specifications	
Type	Cavity
Model	Special PIM-hardened
Cavities	5" & 8" BP and BPBR
Frequency Range	148-160 MHz
No. of Channels	See Drawing
Channel Power Rating	100W
Isolation & Insertion Loss	See Drawing
Return Loss	>14 dB
TX Isolators Dual Stage	
TX-TX Isolation	60
Ant-TX Isolation	50

Receive Special Window Filter Specifications	
Type	Cavity
Model	Special
Frequency Range	138-174 MHz
Isolation & Insertion Loss	See Drawing
Return Loss	>14 dB

Receive Multicoupler Specifications	
Type	DSRMC06
Frequency Range	138-174 MHz
Low Noise Amplifier	Quadrature Coupled
Input-output Max Gain	10 dB ± 1 dB
Input-output Noise Figure	2.7 dB Typical
LNA OIP3	>+40 dBm
Isolation RX-RX	>20 dB
Return Loss	>14 dB
Power Required	48 VDC Batt <25W (±36-72 VDC Isolated)

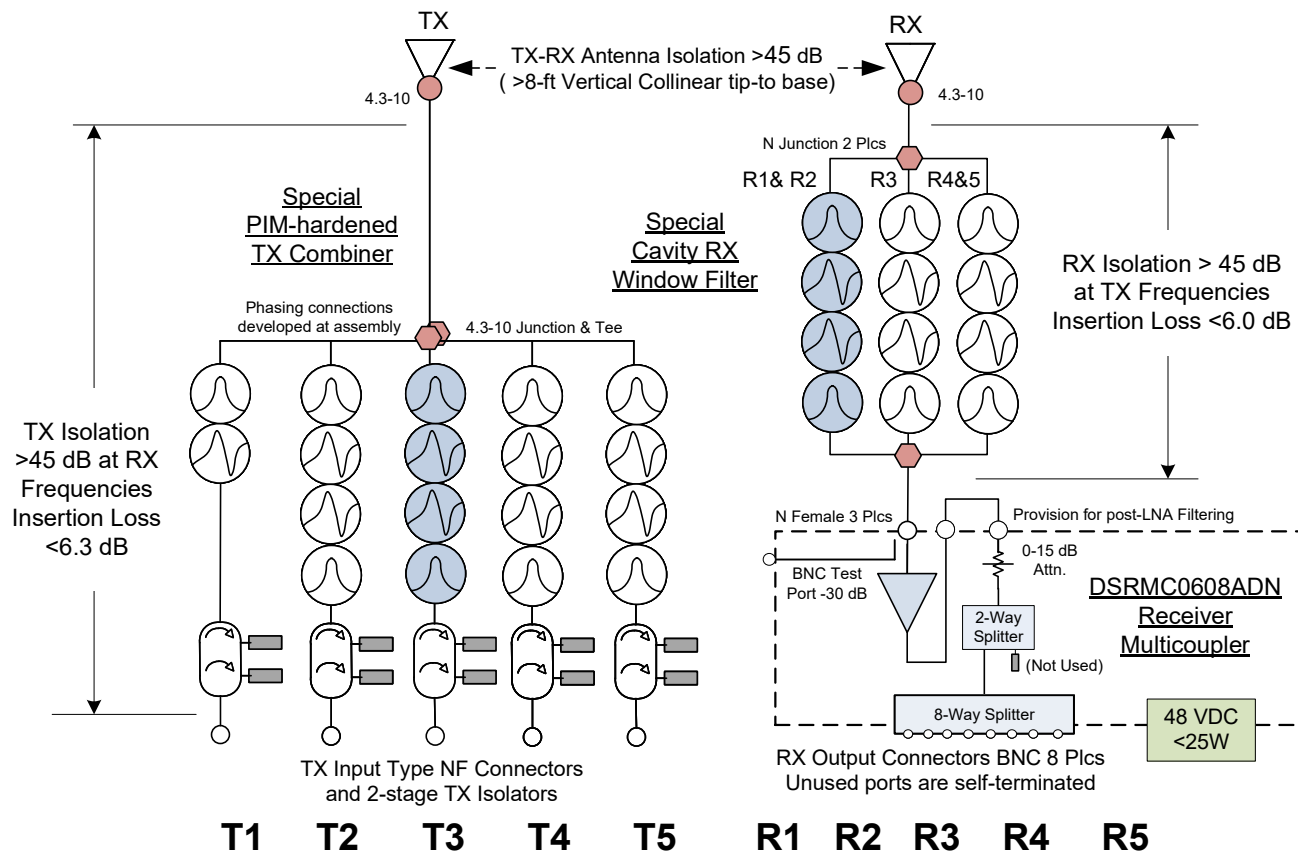
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SPD3403A-5 VHF RF Distribution System 5-CH Site



SPD3403

Transmit Combiner Specifications

Type	Cavity
Model	Special PIM-hardened
Cavities	5" & 8" BP and BPBR
Frequency Range	148-160 MHz
No. of Channels	See Drawing
Channel Power Rating	100W
Isolation & Insertion Loss	See Drawing
Return Loss	>14 dB

TX Isolators Dual Stage

TX-TX Isolation	60
Ant-TX Isolation	50

Receive Special Window Filter Specifications

Type	Cavity
Model	Special
Frequency Range	138-174 MHz
Isolation & Insertion Loss	See Drawing
Return Loss	>14 dB

Receive Multicoupler Specifications

Type	DSRMC06
Frequency Range	138-174 MHz
Low Noise Amplifier	Quadrature Coupled
Input-output Max Gain	10 dB $\pm$ 1 dB
Input-output Noise Figure	2.7 dB Typical
LNA OIP3	>+40 dBm
Isolation RX-RX	>20 dB
Return Loss	>14 dB
Power Required	48 VDC Batt <25W ($\pm$ 36-72 VDC Isolated)

FAIM Moscow 5CH

TX Separation			RX Separation		
Name	F(MHz)	Δ (MHz)	Name	F(MHz)	Δ (MHz)
T1	153.80000	null	R1	154.71000	null
T2	154.44500	0.64500	R2	154.72500	0.01500
T3	154.89000	0.44500	R3	155.88750	1.16250
T4	155.66750	0.77750	R4	158.98500	3.09750
T5	159.21000	3.54250	R5	159.00000	0.01500

TX-RX Antenna Isolation >45 dB

Transmit/Receive Frequency Spacing (MHz)						
Phase to RX AntennaRX						
		R1	R2	R3	R4	R5
		154.71000	154.72500	155.88750	158.98500	159.00000
TX	T1	153.80000	0.9100	0.9250	2.0875	5.1850
	T2	154.44500	0.2650	0.2800	1.4425	4.5400
	T3	154.89000	-0.1800	-0.1650	0.9975	4.0950
	T4	155.66750	-0.9575	-0.9425	0.2200	3.3175
	T5	159.21000	-4.5000	-4.4850	-3.3225	-0.2250
			8"BP x2	5"BP x2	5"BP x2	
			8"BPBR x2	5"BPBR x2	5"BPBR x2	
Phase to RX Multicoupler = DSRMC0608						

Requires two racks

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DSRMC06-Series Receiver Multicoupler (118-901 MHz)

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Best RF Practices Receiver Multicoupler



DSRMC06-Series Front & Rear Views, 8-Channel Model Shown

Features and Benefits

- ❖ Quadrature-coupled Low Noise Amplifier (LNA) for optimum noise figure and excellent third-order intercept.
- ❖ Provides signal gain to overcome post-LNA losses.
- ❖ High Third-Order Intercept Point ensures excellent performance in congested RF sites.
- ❖ Compact design requires only 1 RU of rack space for 8 or 16 channel models.
- ❖ Post LNA Filter Ports allow RF selectivity improvement with minimal impact on noise figure by inserting a secondary filter after the LNA.
- ❖ Test Port enables receiver sensitivity testing without disconnecting the RX path with 30 dB decoupling.
- ❖ Adjustable electronic 1-15 dB attenuator (0.5 dB steps) to optimize system reserve gain.
- ❖ Optional LNA-Fail Alarm Monitoring provides local LED and form "C" dry contacts for external alarming in the event of LNA current drain anomaly.
- ❖ Self-Terminating Splitter: unused outputs require no terminating loads due to ingenious splitter design.
- ❖ Auto-ranging AC or DC power supply models are available. AC models provide a secondary 12 VDC power input for back-up.

Specifications

Electrical Specifications		
Frequency Range	See Ordering Information	
Number of Channels	See Ordering Information	
Gain & Noise Figure	Gain (dB)	Noise Figure(dB)
118 – 150 MHz:	10.50 ±1	2.7
150 – 174 MHz:	10.00 ±1	2.7
217 – 222 MHz:	8.00 ±1	2.7
380 – 420 MHz:	11.00 ±1.6	2.2
450 – 470 MHz:	10.00 ±1.2	2.2
470 – 512 MHz:	9.00 ±1.6	2.5
796 – 824 MHz:	17.00 ±1	1.5
896 – 901 MHz:	15.25 ±1	2.0
LNA Type	Quadrature-Coupled	
Output IP3	>+40 dBm	
Adjustable Attenuator	Electronic, 1-15 dB, 0.5 dB steps	
Test Port	-30 dB coupler	
Post-LNA Filter Connections	Available on rear panel.	
RX – RX Port Isolation	>20 dB	
Input / Output Return Loss	14 dB	
Power Requirement – AC Model	90-240 VAC 50/60 Hz (<25 Watts) Or 12 VDC (nominal at <2 A)	
Power Requirement – DC Model	48 VDC at <0.5 A (<24 Watts) (±36-72 VDC isolated)	
Mechanical Specifications		
RF Connectors	N female (rear)	
RF Input, Post Filter Ports	BNC female (rear)	
RF Outputs	BNC female (front)	
Test Port	N female (front)	
Alarm Connector	Pluggable terminal block	
Mounting	19" x 1.75" 1 RU EIA panel, 10.25" depth (383 x 45 x 260 mm)	
Grounding Provision	1/4-20 x 1 in. stud (rear)	
Temperature Range	0 to +50° C (No degradation)	
Weight / Shipping Weight	6 lb. (2.7 kg) / 10 lb. (4.5 kg)	

Ordering Information

Number of Channels	Frequency Range	Power	Alarm Option
08 8 Channel	J 118-150 MHz	A 90-240 VAC	Bank Includes Alarm
16 16 Channel	A 150-174 MHz	D ±36-72 VDC	N No Alarm (Note)
	K 217-222 MHz		
	B 380-512 MHz		
	C 796-901 MHz		

Note: When the No Alarm option is ordered, remove the dash (-) following the 6 in the model number (e.g. DSRMC0608AAN).

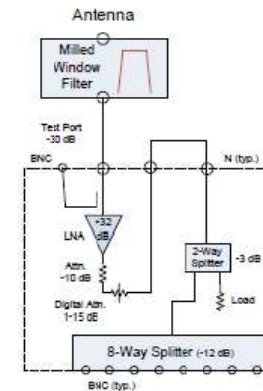
DSRMC0608ADN Receive Multicoupler

DSRMC06-Series Receiver Multicoupler (118-901 MHz)

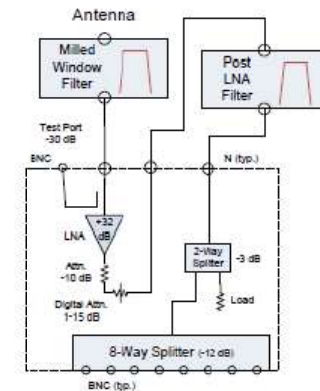
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Best RF Practices Receiver Multicoupler

Application



Typical Basic Installation



Installation with Post-LNA Filtering

Any receiver multicoupler (RMC) installation must always include filtering between the antenna and the RMC since the RMC is a wide-band device.

In situations where additional RF selectivity is needed to eliminate interference, additional filtering can be added to the RMC using the filter ports on the rear panel (labeled RF IN and RF OUT). As shown in the diagram above, the second filter is placed after the LNA in the RMC. Because it is placed after the LNA, the additional loss of the post-filter has minimal impact on system noise figure and therefore receiver sensitivity.

Field Modification Kits

Model	Description
DSRMC06-EXP	8-Channel Expansion Kit – Includes splitter and cable assembly to expand an 8-channel RMC to 16-channel capacity.
DSRMC06DCKIT	DSRMC06 AC to DC Modification Kit – Order to field modify an AC version to the DC version. Contains DC-DC power supply, parts and cabling necessary to complete the conversion in the field.
DSRMC06ACKIT	DSRMC06 DC to AC Modification Kit – Order to field modify a DC version to the AC version. Contains AC-DC power supply, parts and cabling necessary to complete the conversion in the field.

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2OD-78DDXC

(168 RU) Outdoor Enclosure



Picture shown are examples only : See details for specifications



General

*Approximate Weight

- 555 Lbs. assembled
- 705 Lbs. shipping weight

Doors

- 4, secured by three point locking system
- Locks via customer supplied padlocks
- Sealed with 3/8" aluminum filled gaskets
- 4 Auto door stops standard

Material

- .125" Alumiflex™
- Finish: Painted cream
- RF properties: Non-ferrous

Vents

- 30 bottom louvers per door
- 20 top louvers – In top cover, under Alumishield™
- One removable filter panel per door
- 20 fixed filter pads in top cover

Handles

Zinc Die Powder-coated Black EMKA Three Point Padlocking Handles

Lifting Hooks

- 8, standard

Racking Specifications

Rails

- Four sets standard (for additional rails see accessories)
- Alodine coated
- Holes tapped for 10-32 threads
- Each rail supported by three R-STRUTS™
- .125" Material (Alumiflex™)

Spacing

- 19" or 23" Racking standard

Inside Clearance - Less Rails

Height

- 77.98"

Width

- 27.625" each side

Depth

- 35.75"

Ratings

NEMA Class Types available

- NEMA 3R (Vented), NEMA 4 (closed loop-a/c), NEMA 4X

Paint Tested

- 1000 Hour salt spray (textured)
- 1000 Hour immersion

Door Opening Clearance

Height

- 74"

Width

- 23.5"

Exterior Cabinet Dimensions

Main Body

- Height: 78.23"
- Width: 59"
- Depth: 42"

Alumishield™

- Hang down height: 1.71"
- Width: 61.96"
- Depth: 44.67"

Handles

- Protrude 2.2"

Total Space Occupied

- Height: 78.85"
- Width: 65"
- Depth: 46.4"

	*Section Starting & Ending Points	Vertical Height Per section	Effective Depth For Each Section
Top	74.75" – 78.23"	3.25"	38.50"
	74.57" – 74.75"	.18"	37.50"
	45.00" – 74.57"	29.57"	38.50"
Center	33.00" – 45.00"	12.00"	36.75"
	3.43" – 33.00"	29.57"	38.50"
	3.25" – 3.43"	.18"	37.50"
Bottom	0.00" – 3.25"	3.25"	38.50"

SPECTRACOOL™ NARROW INDOOR/OUTDOOR



N36
6000/8000 BTU/Hr.
1758/2344 Watt

INDUSTRY STANDARDS

UL/cUL Listed; Type 12, 3R, 4; 4X optional; File No. SA6453

CE
IP 56 Internal Loop
IP 34 on External Loop
Telcordia GR-487 capable (Outdoor)

APPLICATION

- Industrial automation
- Waste water treatment systems
- Package handling equipment
- Security and defense systems

FEATURES

- Narrow design accommodates 12-in. (300-mm) deep cabinets
- Energy efficient reciprocating compressor on N28 models
- Energy efficient rotary compressor on N36 and N43 models
- R407c and R134a earth-friendly refrigerants
- Models for 115, 230 and 400/460 3-phase VAC power input
- UL Listed to save customers time and money with agency approvals
- Outdoor model operating temperature range from -40 F/-40 C to 131 F/55 C (125 F/52 C on N28 Series)
- Attractive industrial design with minimal use of visible fasteners
- Reliable mechanical thermostat on enclosure side of the unit
- Galvanized sheet-metal cover for rugged factory and outdoor environments
- Easy-mount flanges for simple installation
- Cut-out adapter options for enclosures with GENESIS® air conditioners enable users to easily transition to the new unit
- Dust-resistant condenser coil allows the unit to be run filterless in most applications
- Cleanable, reusable aluminum mesh filter protects coils for maximum cooling performance
- Mounting hardware, gaskets and user manual furnished with the unit
- Every unit functionally tested before shipping
- Standard Indoor Air Conditioner models also include:
 - Power-off relay for door switch and other system requirements

SPECIFICATIONS

- Nominal cooling capacity:
N36 6000 & 8000 BTU/Hr. (1758 and 2344 W)
Outdoor model operating temperature range from -40 F/-40 C to 131 F/55 C (125 F/52 C on N28 Series)

FINISH

- RAL 7035 light-gray, semi-textured powder-coat paint
- Other colors and textures available

NOTES

Visit www.PentairProtect.com to download 2D and 3D CAD drawings into the overall design of your electronic system.



Indoor and Outdoor Enclosures

Outdoor Nema 3, 3R, 4, 4X Cabinet Enclosures • LTE • 4G • Wimax • Telecom • Security • Traffic

Performance Data **N36 6000/8000 BTU/Hr. (1758/2344 Watt)**

CATALOG NUMBER						
Indoor Model	N360616G050	N360626G050	N360646G050	N360816G050	N360826G050	N360846G050
Indoor Model Stainless Steel Type 4X	N360616G051	N360626G051	N360646G051	N360816G051	N360826G051	N360846G051
Indoor Model with Remote Access Control*	N360616G060	N360626G060	N360646G060	N360816G060	N360826G060	N360846G060
Outdoor Model without Heat Pkg.	N360616G100	N360626G100	N360646G100	N360816G100	N360826G100	N360846G100
Outdoor Model without Heat Pkg. Stainless Steel Type 4X	N360616G102	N360626G102	N360646G102	N360816G102	N360826G102	N360846G102
Outdoor Model with Heat Pkg.	N360616G150	N360626G150	N360646G150	N360816G150	N360826G150	N360846G150
Outdoor Model with Heat Pkg. Stainless Steel Type 4X	N360616G151	N360626G151	N360646G151	N360816G151	N360826G151	N360846G151
COOLING PERFORMANCE						
Nominal:						
BTU/Hr.	5400 / 6000	5400 / 6000	5400 / 6000	8250 / 8500	8250 / 8500	8250 / 8500
Watts	1581 / 1757	1581 / 1757	1581 / 1757	2416 / 2489	2313 / 2635	2284 / 2401
At 131 F / 131 F (55 C / 55 C):						
BTU/Hr. [50 / 60 Hz]	5585 / 6180	5469 / 5965	5300 / 6089	8213 / 8453	7874 / 8063	7777 / 8166
Watts [50 / 60 Hz]	1637 / 1811	1603 / 1748	1553 / 1785	2405 / 2475	2306 / 2361	2277 / 2391
At 95 F / 95 F (35 C / 35 C):						
BTU/Hr. [50 / 60 Hz]	4909 / 5485	5159 / 5621	5572 / 6026	7028 / 7626	6660 / 7411	6877 / 7525
Watts [50 / 60 Hz]	1439 / 1607	1512 / 1647	1633 / 1766	2058 / 2233	1950 / 2170	2014 / 2203
Refrigerant	R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant Charge [ounces/grams]	20 / 567	22 / 624	16 / 454	36 / 1021	36 / 1021	36 / 1021
Operating Temperature Range:						
Maximum [°F / °C]	131 / 55	131 / 55	131 / 55	131 / 55	131 / 55	131 / 55
Minimum [°F / °C]	-40 / -40	-40 / -40	-40 / -40	-40 / -40	-40 / -40	-40 / -40
Air Flow at 0 Static Pressure:						
Internal loop 50 Hz [CFM / M ³ /Hr.]	251 / 426	250 / 425	250 / 425	250 / 425	245 / 416	243 / 413
External loop 50 Hz [CFM / M ³ /Hr.]	284 / 483	338 / 574	338 / 574	313 / 532	347 / 589	365 / 620
Internal loop 60 Hz [CFM / M ³ /Hr.]	261 / 443	261 / 443	261 / 443	263 / 447	258 / 439	254 / 432
External loop 60 Hz [CFM / M ³ /Hr.]	311 / 528	356 / 605	356 / 605	338 / 574	382 / 648	394 / 669
Max. Heater W [Outdoor Models]	1300	1300	1300	1300	1300	1300
ELECTRICAL DATA						
Rated Voltage	115	230	400 / 460 3~	115	230	400 / 460 3~
Frequency (Hz)	50 / 60	50 / 60	50 / 60	50 / 60	50 / 60	50 / 60
Operating Range	+/-10%	+/-10%	+/-10%	+/-10%	+/-10%	+/-10%
Max. Power Consumption [Watts at 50 / 60 Hz]	911 / 1108	908 / 1073	697 / 895	1334 / 1530	1265 / 1403	572 / 628
Max. Nominal Current [Amps at 50 / 60 Hz]	9.1 / 10.1	4.5 / 4.7	1.59 / 1.69	11.6 / 13.3	5.5/6.1	2.9/3.0
Starting Current [Amps]	39.2	23	8.1	48.3	27	16
Agency Approvals						
cUL Listed CE Others available upon request Terminal Block						
Power Input Description						
ENCLOSURE PROTECTION						
UL Type						
Type 12, 3R, 4 Standard Type 4X Stainless Steel Optional						
CONTROLLER						
Description						
Thermostat Location						
Factory Thermostat Setting [°F / °C]						
80 / 27						
SOUND LEVEL						
At 1.5 Meters	66.9 dBA	66.7 dBA	68.2 dBA	66.0 dBA	66.0 dBA	66.0 dBA
UNIT CONSTRUCTION						
Material						
Galvanized sheet metal standard Stainless steel optional						
Finish						
RAL 7035 light-gray, semi-textured powder-coat paint standard Other colors available						
ACCESSORIES						
EASYSWAP Adaptor Plenum (GENESIS™ M36)						
Enables SPECTRACOOL to be mounted to a GENESIS M36 air conditioner cutout Catalog Number PLM36N36						
UNIT DIMENSIONS						
Height (in. / mm)						
36.00 / 914.4						
Width (in. / mm)						
11.50 / 292.1						
Depth (in. / mm)						
14.00 / 355.6						
Weight (lb. / kg)						
100 / 45 100 / 45 104 / 47 106 / 48 106 / 48 114 / 52						

*Units with Remote Access Control utilize a digital controller and communicate via EtherNet/IP, Modbus TCP/IP and SNMP over ethernet or modbus RTU over USB.

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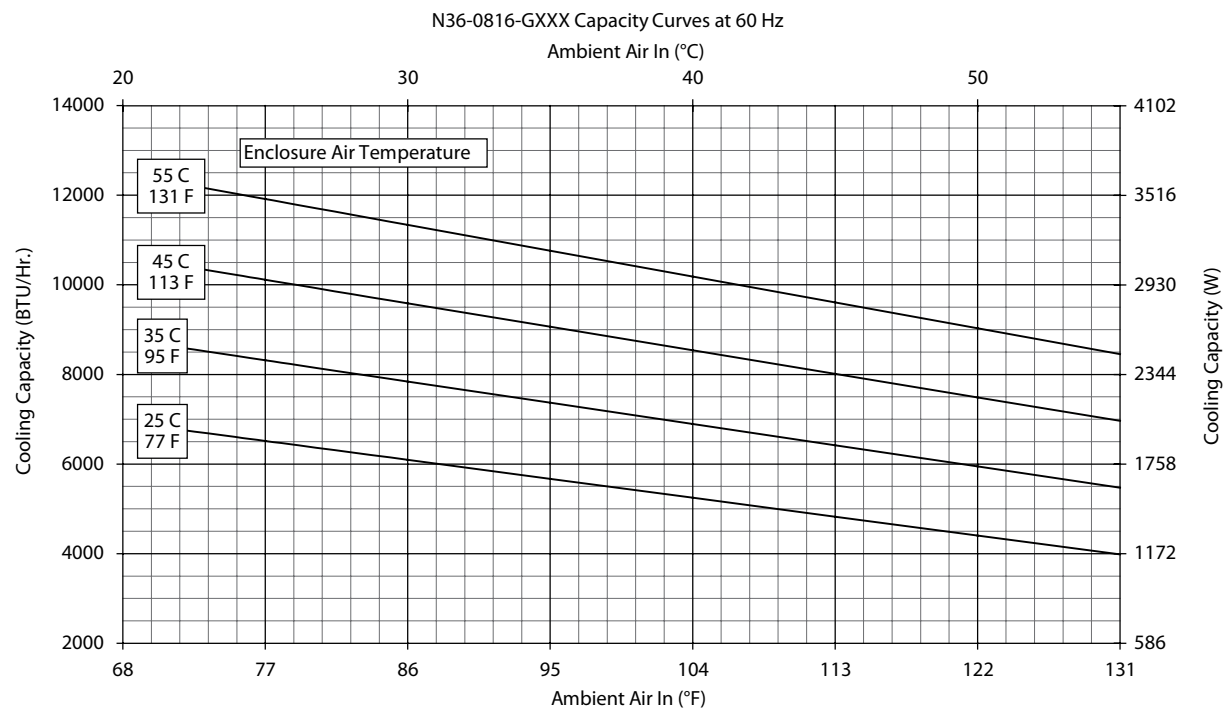
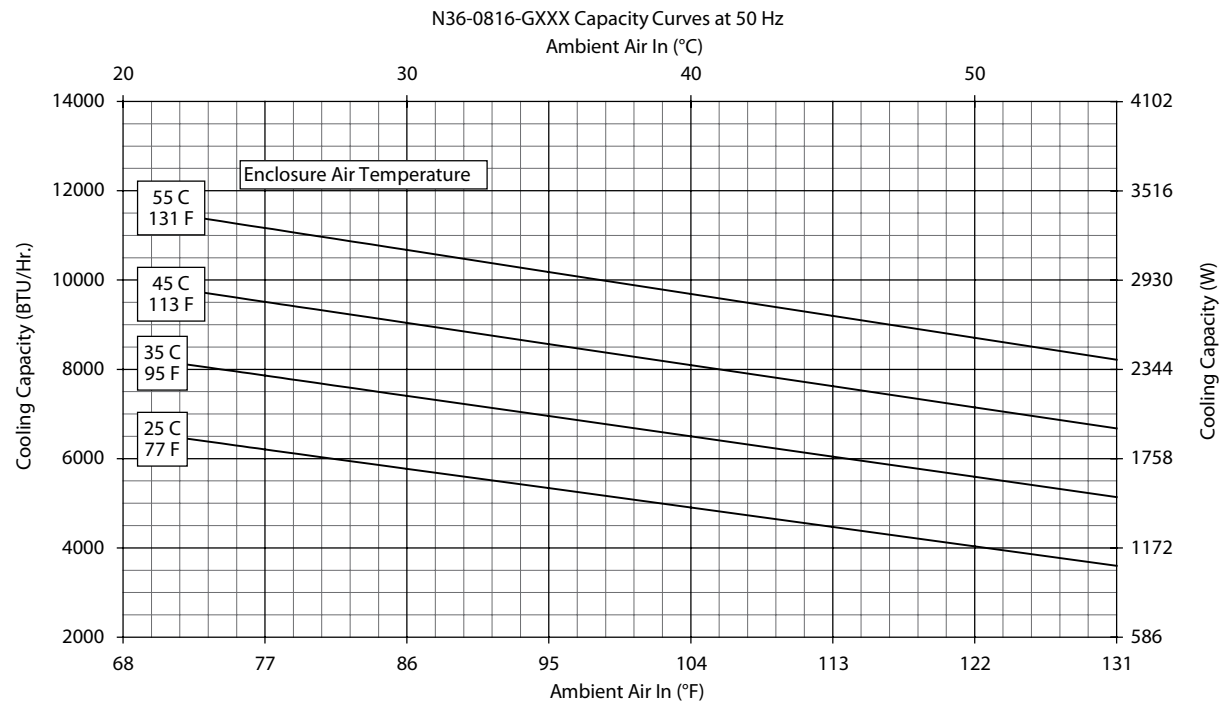
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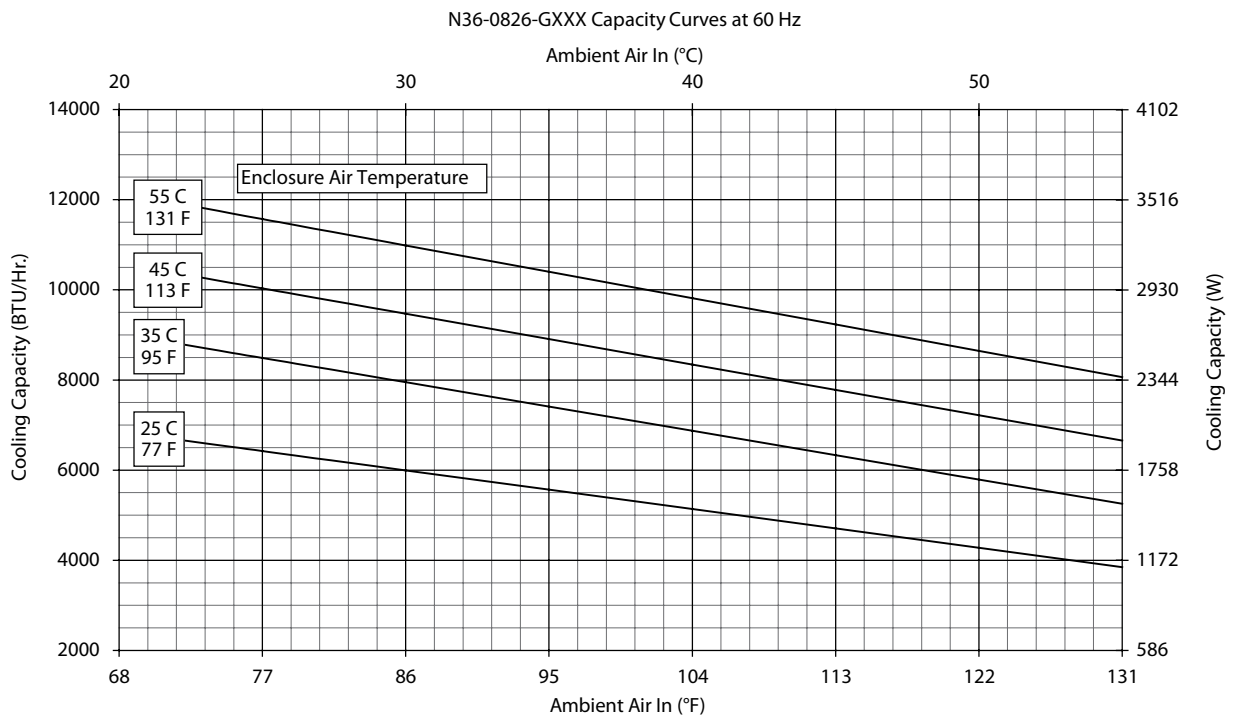
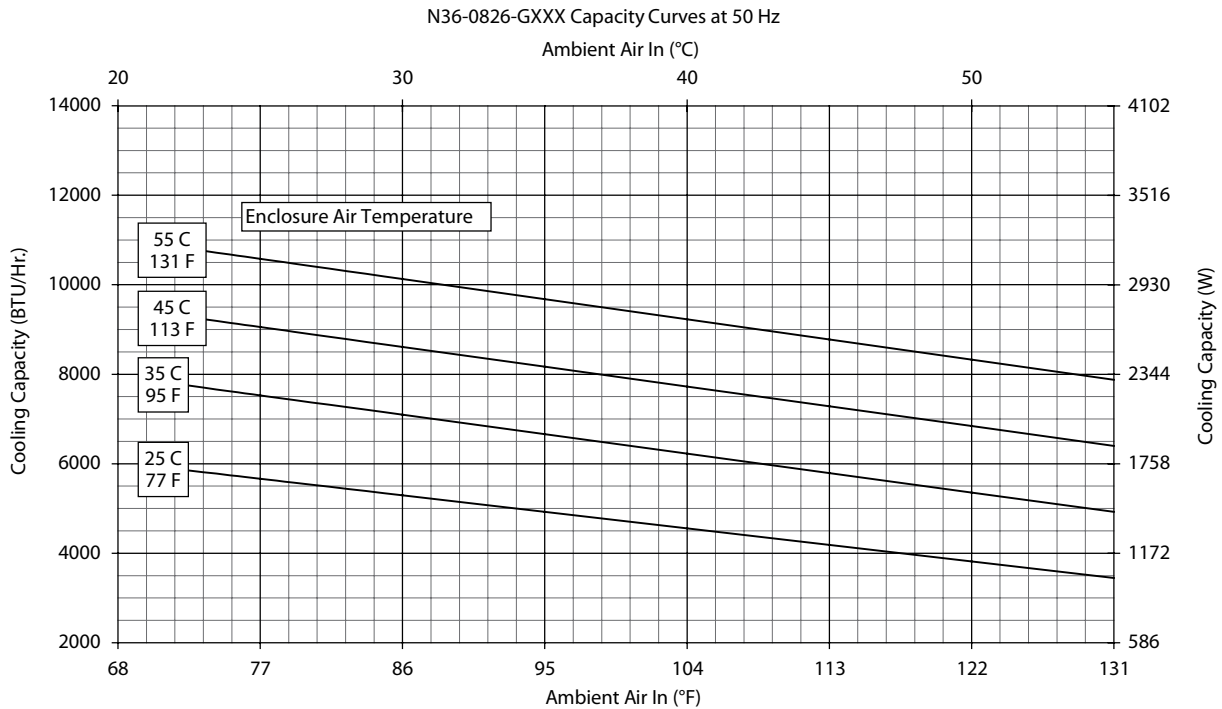
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Cage Code 385Y5

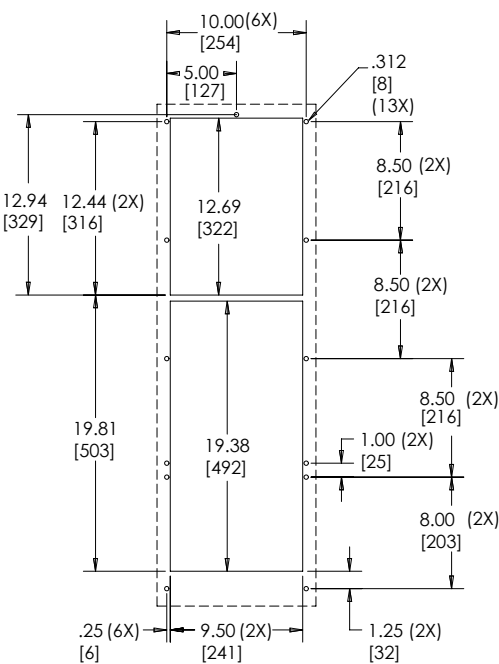
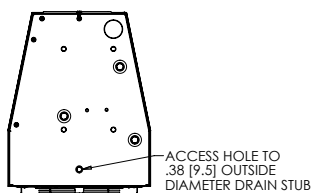
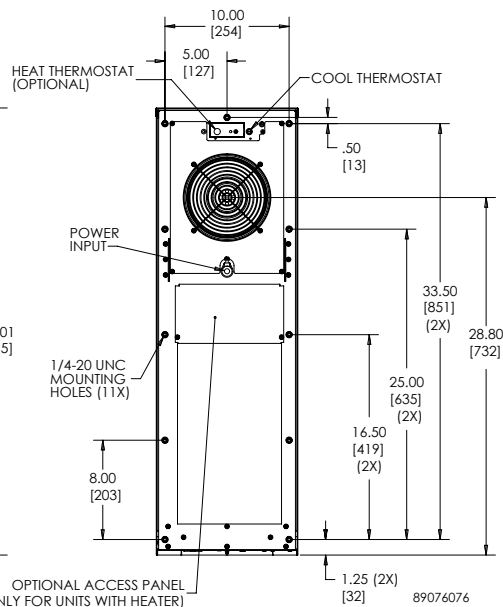
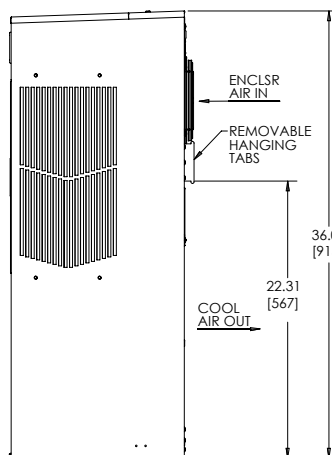
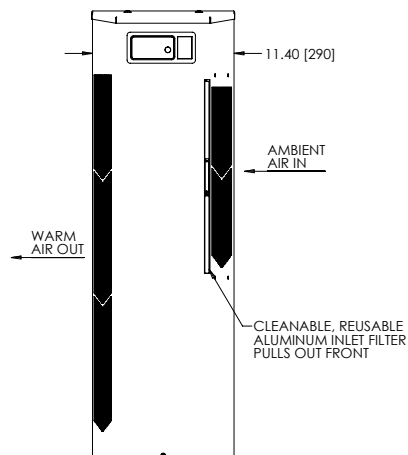
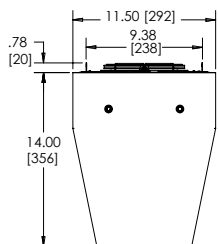
Performance Curves for N36 Models 8000 BTU/Hr. (2344 Watt)



Performance Curves for N36 Models 8000 BTU/Hr. (2344 Watt)



N36 6000/8000 BTU/Hr. (1758/2344 Watt)



Cutout Dimensions



Commander II Series

The Powerful Difference

Manual

Product Compliance



RoHS

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Manual Version 1.1

Release Date: 30 JUL 2022

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M-CMDRII 063022

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1 ADMONISHMENTS

The admonishments are the symbols and wording used in this manual to alert readers to specific dangers and instructions. The meanings of the various admonishments are explained as follows:

Warning	= risk to life or personal injury and equipment damage
Caution	= risk of equipment damage.
	= risk of electrical shock potentially causing death or injury.
	= alert of risk potentially causing death or injury.
	= risk of burn injury from hot surfaces
	= an alert that must be understood and undertaken.
	= instruction of mandatory reading of product manual.
	 = risk of electrostatic damage to components. Proper precautions must be taken.
	= access for children prohibited.
	= restricted access area.
	= tip over hazard.

2 SAFETY

		All installation and maintenance must be carried out by suitably qualified personnel.
		For your protection, the product manual should be read and thoroughly understood before unpacking, installing and using the equipment.
		The energy manager contains static sensitive components that require careful handling and proper precautions to be taken. A grounding strap should be worn.
		The equipment is intended only for use in a restricted access area. The equipment is not suitable for use in locations where children are likely to be present.

3 RECEIVING INSTRUCTIONS

NewMar provides all equipment to the delivering carrier securely packed and in perfect condition. Upon acceptance of the package from NewMar, the delivering carrier assumes responsibility for its safe arrival. Once the equipment is received, it is the recipient's responsibility to document any damage the carrier may have inflicted, and to file the claim promptly and accurately.

NOTE: the period to make a claim against damage by a transport carrier can be short, a matter of days, and varies by transport method, the transport contract, and local laws.

3.1 Package Inspection

Examine the shipping crate or carton for any visible damage: punctures, dents and any other signs of possible internal damage.

Describe any damage or shortage on the receiving documents and have the carrier sign their full name.

3.2 Equipment Inspection

Open the crate or carton and inspect the contents for damages. While unpacking, be careful not to discard any equipment, parts or manuals. If any damage is detected, call the delivering carrier to determine the appropriate action. They may require an inspection.

NOTE: Save all the shipping materials for the inspector to see.

After the inspection has been made, if damage has been found, contact NewMar. We will determine if the equipment should be returned to our plant for repair or if some other method would be more expeditious. If it is determined that the equipment should be returned to us, ask the delivering carrier to send the packages back at the delivering carrier's expense.

If repair is necessary, we will invoice you for the repair so that you may submit the bill to the delivering carrier with your claim forms.

It is your responsibility to file a claim with the delivering carrier. Failure to properly file a claim for shipping damages may void warranty service for any physical damages later reported for repair.

3.3 Handling

Handle the equipment with care. Do not drop or lean on front panel or connector. Keep away from moisture.

3.4 Identification Labels

Model number and serial number are clearly marked on all equipment. Please refer to these numbers in all correspondence with NewMar. Ideally provide a photograph of the product label for reference.

4 SCOPE

This manual covers essential information for the installing and commissioning of the NewMar Power System Commander II (CMDRII) and Commander II+ (CMDRII+) where the significant difference between the systems is the number of rectifier shelves and the presence of a DC-DC converter shelf, respectively.

NOTE: System set-up for the controller, power modules and other ancillary devices are provided in separate manuals. Where appropriate these are supplied with the system.

IMPORTANT: this is a generic manual. The Commander II & II+ systems can be configured with a wide range of options. Should this manual not cover any part of the functionality of your system please contact your NewMar representative or sales@poweringthenetwork for further information as required.

5 SYSTEM OVERVIEW

The Commander II range is designed to allow a customized DC power solution with all the benefits of a standard "off the shelf" system.

The system is intended to be a complete power system in a box with no connections needed to be made internally. The system is designed to be extremely simple to install and set up.

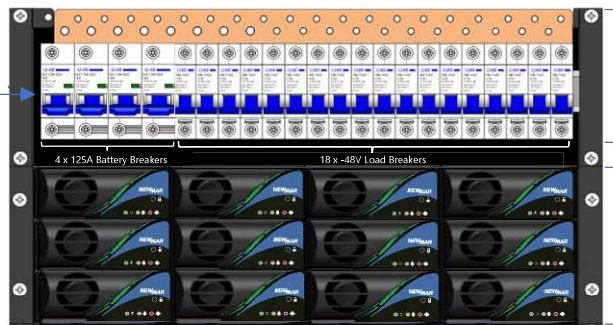
All the AC and DC connections are made from the front of the unit. Alarm connections are also accessible from the front by opening the hinged front cover.

By adding smart distribution modules, the system can be customized to suit most requirements whilst maintaining a robust and smart user experience.

NOTE: the system is supplied with the AC and DC earths connected. The standard system output has the DC Common in the positive side of the circuit (+ve earth system).



EM4x Controller Hinged Front Panel



Commander II

DC Distribution

- 4x 125A Battery MCBs (standard)
- 18 x -48V Load MCBs (standard)
- Load & Battery Common Terminals
- 500A/50mV Battery Shunt
- 500A LVD
- AC Input Terminals (at rear)

Up to 12 x 3kW Rectifiers

- 36kW/720A max

Note: These systems feature multiple configuration options. Consult the factory or your NewMar representative for additional options



EM4x Controller Hinged Front Panel



Commander II+

DC Distribution

- 4x 125A Battery MCBs (standard)
- 18 x -48V Load MCBs (standard)
- Load & Battery Common Terminals
- 500A/50mV Battery Shunt
- 500A LVD
- AC Input Terminals (at rear)

Up to 8 x 3kW Rectifiers

- 24kW/480A max

Up to 8 x 600W DC to DC Converters (12v or 24V)

- 4.8kW/320A max

5.1 Power System

5.1.1 Standard Features

The base unit is supplied with the following standard options:

- AC Input: Single Phase, 240VAC input
- DC Output: Nominal voltage: 48V DC (contact NewMar for other voltage options)
- EM4x energy manager system controller (fully integrated in the system)

- Battery Low Voltage Disconnect 500A rating
- CTO Configuration:
 - AC input MCB with surge protection device, type 2
 - 4 x DIN style 27mm battery MCBs
 - 18 x DIN style 18mm load MCBs (max 12 when fitted with 4 battery breakers)
 - Low voltage battery disconnect (LVBD) and low voltage load disconnect (LVLD)

5.1.2 Current Capacities

- Commander II system capacity is up to 720A with a maximum of 12x RM3048HE power modules. The Commander II+ system capacity is up to 480A with a maximum of 8x RM3048HE and a maximum of 8 DC-DC converters with 12V or 24V output at 40A and 43A, respectively.

5.1.3 Additional Features

- AC input MCB with surge protection device, type 2
- I/O board
- AC monitoring including voltage, frequency and current
- Fan control
- Battery control monitoring
- Battery fuse fail
- Site monitoring

5.1.4 Physical Dimensions and Weights

Table 1: Commander II & II+ dimensions and weights

Model	Commander II	Commander II+
Depth (Total)	380mm	380mm
Width (Total)	483mm (19" mount)	483mm (19" mount)
Height	267mm (6U)	311mm 7U
Weight without rectifiers	22.7kg	22.7kg
Weight with max. rectifiers	38.3kg	46.7kg

5.2 Energy Manager

5.2.1 EM4x-01 Interface

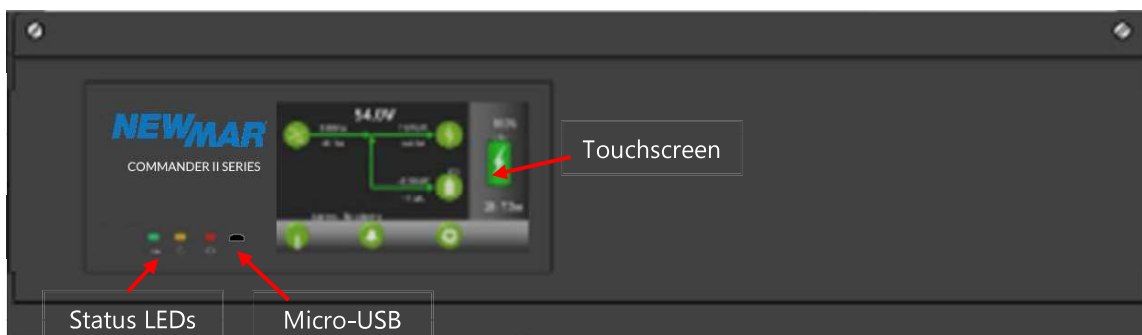


Figure 2: EM4x-01 Front Panel Interface

IMPORTANT: all system and module documentation can be accessed via the micro-USB port on the front panel of the energy manager.

5.2.2 Alarms and Status Indicators

- Status LEDs:
 - Red LED Urgent alarm state.
 - Orange LED Non-Urgent alarm
 - Green LED DC power is connected to the unit; Energy Manager is functioning

NOTE: The LED mapping can be user modified.

- The energy manager is fitted with an audible buzzer which can be configured to alert to any alarm depending on the alarm mapping.

NOTE: To disable the buzzer when active, tap the screen.

- Micro-USB Connector: can independently power the EM4x and provides access to the Web UI

5.2.3 Energy Manager Touchscreen

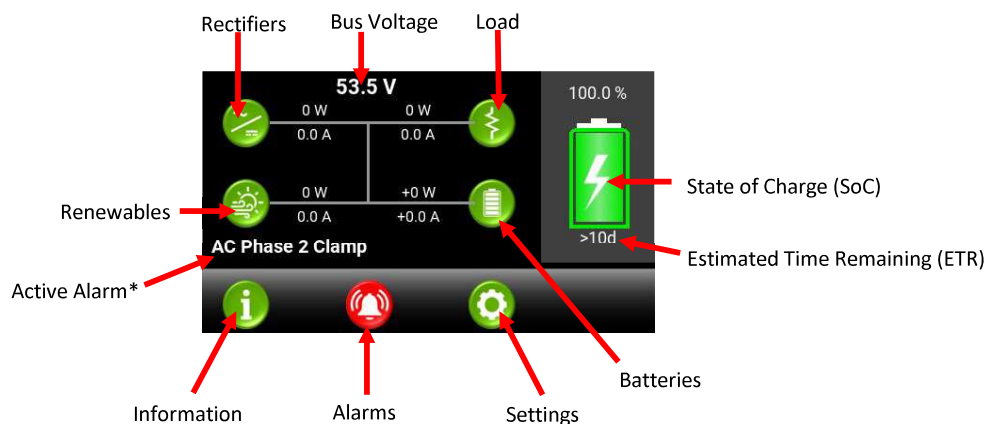


Figure 3: Energy Manager Touchscreen

*NOTE: when there are multiple alarms raised the Active Alarm display cycles through the list. The complete list can be viewed by tapping Alarms.

Tap the touchscreen to navigate through the menus.

NOTE: the EM4x-01 has the option to PIN lock function change through the front screen interface. See the EM4x manual for details.

5.2.4 EM4x Features

The EM4x microcontroller-based DC system energy manager provides the control and monitoring functions for all NewMar Energy's power systems. With an appropriate communications connection third party lithium battery can also be managed.

The EM4x monitors all power system conditions including DC voltage, rectifier current, battery current, battery temperature, distribution failure and battery pack status. It has an in-built web-based configurator allowing setup of system parameters, monitoring, updating and download of logs using a web browser as well as a front panel interface through which key parameters are also configurable. Visual notification of alarm conditions is given by LEDs and a display mounted on the front of the EM4x, with remote notification being enabled by relay contacts, RS232 or TCP/IP (using SNMP).

The EM4x utilizes a USB communications port which allows for local monitoring of system operations as well as pre-commission and power down configuration of the Web UI.

The EM4x also incorporates the following features:

- Support for NewMar's battery modules with optimized battery backup functions
- Support for third-party external batteries, both lead-acid and lithium based
- Support for AC-DC rectifiers (24V and 48V Outputs)
- Support for DC-DC converters (12V, 24V and 48V Outputs)

- Control of up to two low voltage disconnects (magnetically latched contactors) per I/O board*
 - Network connectivity (web access)
 - System voltage metering for primary system DC supply. (e.g., 48V primary DC output)
 - Load, battery and rectifier current metering and alarms
 - Active rectifier and converter current share
 - Automatic system voltage control
 - Effectively unlimited alarm thresholds as standard, for use with multiple DC outputs
 - Advanced monitoring, display and logging of battery packs, and system performance data
 - Advanced hybrid site control and monitoring with patented anti-stall feature for generators.
 - Phase balance controls for multi-phase and single-phase AC input management
 - Sophisticated programmable logic control
 - For lead-acid external batteries -
 - Battery and room temperature metering and alarms (when fitted with optional temperature sensors)
 - Optional complete or battery mid-point monitoring (when fitted with optional battery monitor cards)
 - Temperature compensation of float voltage (when fitted with optional temperature sensors)
 - Manual equalize charging to prolong the life of the batteries
 - Periodic equalize charging to prolong the life of the batteries
 - Fast charging after battery discharge
 - Battery capacity remaining indication
 - Battery testing facility
 - Battery current limit
 - Six user defined General Purpose Inputs ("GPIPs") which can be software configured as either digital or analogue inputs* (up to 10 may be made available under special circumstances)
 - Six relay outputs*
 - I/O Expansion card capability*
 - Expanded serial and CAN communications – up to 5 I/O boards can be connected to a single EM4x *
- Note: the addition of an I/O Expansion card to the EM4x allows for analogue inputs and increases the number of digital inputs and relay outputs available. The controller allows for these new inputs/outputs to be logically combined allowing a degree of control of peripheral functions. E.g., a temperature triggered room fan or humidity detection.

5.3 Rectifier Modules



Figure 4: RM3048HE Rectifier

The RM3048HE is a telecommunications grade rectifier with the following features:

- High efficiency
- Hot pluggable
- Forced air cooled
- Thermally protected

- Power factor corrected
- Wide input AC voltage
- Constant power output limit
- Input/Output voltage and current protected
- Active load sharing
- Serial alarm and control interface
- Microprocessor controlled

There are 3 LED indicators on the front panel which indicate the operational state of the rectifier:

Red LED	Urgent alarm state.
Yellow LED	Non-Urgent alarm.
Green LED	DC power is connected to the unit. This LED flashes during power save mode.

6 INSTALLATION



WARNING All upstream AC, Load and Battery breakers must be switched OFF prior to installation. The system must be completely de-powered.

All circuit breakers in a NewMar power system must be in their OFF position prior to installation.



WARNING Use extreme care when fitting batteries & their connections. Remove all conductive materials from yourself such as watches, jewelry and rings prior to commencing the installation. DO NOT short terminals when working on them.



WARNING Use extreme care when fitting solar panel connections. DO NOT short terminals when working on them.



CAUTION Avoid resting cables on sharp edges (cold-creep)



The energy manager contains static sensitive components that require careful handling and proper precautions to be taken. A grounding strap should be worn.

6.1 Required Tools

Insulated M6 or 1/4", M8 or 5/16" pozi Screwdriver, insulated 0.6mm x 2.5mm diameter flat head screwdriver, Insulated M10 or 3/8" bolt wrench/ratchet set and as required depending on set up available.

6.2 Suitable Racks

Recommended rack size is 19" and minimum 600mm deep.

6.3 Unpacking

Upon unpacking, check that the unit is not damaged, and that you have the required number of modules and blank panels (if and as appropriate for your system).

NOTE: Do not fit rectifier modules until the Commander power system has been installed into the rack.

6.4 Installing the Commander System

STEP 1: Remove the Drip cover from the system by removing the 3 thumbscrews. Retain for reuse.

STEP 2: Mount the system in the cabinet or rack as appropriate.

STEP 2: Connect the AC supply.

Terminate the cables to the input circuit breakers and the terminal blocks for Earth and phase to phase (or L1 to L2) (see AC wiring options for Commander II series).

NOTE: the AC terminals accept up to 1/0 AWG/55mm² cables.

NOTE: the AC earth terminal is connected directly to the system chassis.

NOTE: AC and DC EARTHING - This system has a built-in AC to DC earth connection. No extra AC to DC earth link cable is required. However, an additional grounding point has been provided to ensure the unit meets any additional requirements. Removing this link will void the warranty. Please check with NewMar should this link be required to be removed.



Figure 5 Top Cover



Figure 6: AC Termination

STEP 4: Connect the Load.



Figure 7: AC Earth Termination



Figure 7A: External Earth Termination

Load Common (+ve): all load common connections are made to the connectors placed behind the circuit breakers. 2 sizes of common terminals are available, up to 4AWG/25mm² and 2 AWG/35mm².

NOTE: cables smaller than 6mm² (10 AWG) should be terminated to the 4AWG/25mm² connectors to make sure of adequate clamping force.

Load Live (-ve): Load Live cables are connected directly to the terminals at the top of the circuit breakers. Load breaker terminals are sized to accept cables up to 4AWG/25mm².

Load distributions that include a secondary load LVD (LLVD) are split into 2 sections to allow prioritization of the connected loads. Non-priority loads are removed from circuit prior to the primary battery LVD operation to extend the time of operation of the priority loads. Load distributions in systems without the secondary LLVD are all removed from circuit together at the battery LVD disconnect point.

Please refer to the specification of the system to determine which breakers are priority and non-priority loads (if optioned).

NOTE: make sure all incoming cables have adequate strain relief.

STEP 5: Connect the Batteries

Battery Common (+ve): All Battery Common connections are made to the busbar located placed behind the Circuit breakers. Accepts cables up to 1/0 AWG/55mm².

Battery Live (-ve): Battery Live cables are connected directly to the terminals at the top of the circuit breakers. Battery breaker terminals are sized to accept cables up to 1/0 AWG/55mm².

NOTE: make sure all incoming cables have adequate strain relief.



Figure 8 Connecting the load

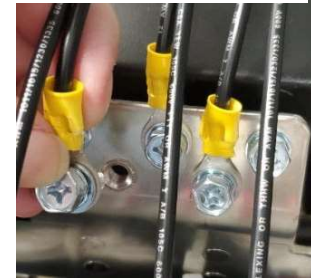


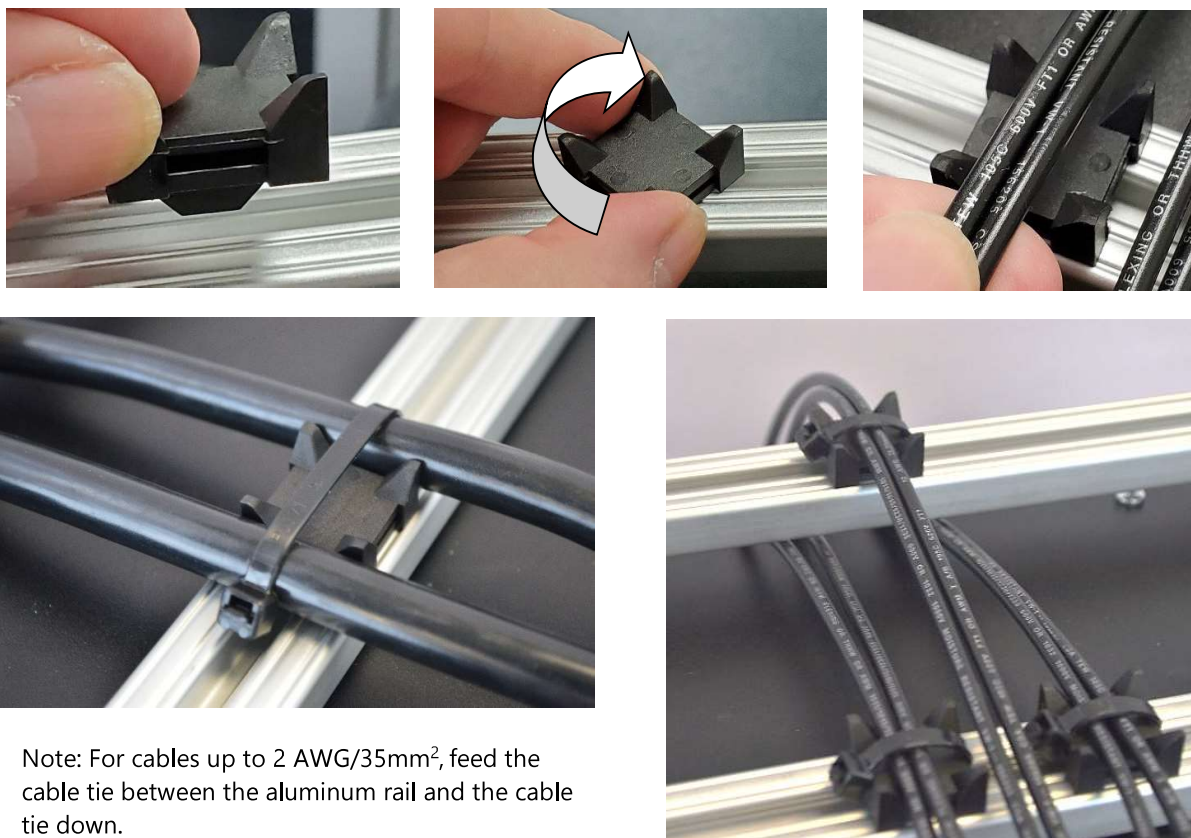
Figure 8A Connecting the load



Figure 9 Connecting the battery

STEP 6: Secure the cables using the Cable Management System

Attached to the top of the unit is the cable management system. The system will accommodate cables up to 2 AWG/35mm². Start by inserting the cable tiedown into the slotted aluminum rail. Rotate clockwise to lock the cable tiedown into place. For cables up to 6AWG/16mm², place the cables across the cable tiedown and secure with a cable tie. For cables up to 2 AWG/35mm², place the cables on either side of the cable tiedown and secure with a cable tie.



Note: For cables up to 2 AWG/35mm², feed the cable tie between the aluminum rail and the cable tie down.

Note: Alternate and stagger the cable tie downs to maximize the available space.

Figure 10 Cable Management

STEP 7: Affix the Battery Temperature Sensor

Uncoil and affix the battery temperature sensor in the center of the middle battery string.

NOTE: The purpose of battery temperature sensor is to monitor the ambient temperature of the batteries over long periods of time and adjust the rectifier output (float) voltage accordingly.

NOTE: Refer to the specifications supplied by the battery vendor for battery operational temperature requirements.

STEP 8: Affix the Ambient Temperature Sensor

Uncoil and affix the ambient temperature sensor in a position that will give an indication of average cabinet/room temperature.

NOTE: refer to the EM4x energy manager, RM3048HE Rectifier

STEP 9: Terminate External I/O Connections

Terminate external I/O connections if any to the Energy manager. Refer to the EM4X Relay output and digital input sections for mappings in the EM4x Manual. The Monitor layout is as shown in Figure 12.

NOTE: The inputs are normally activated by connecting system positive (usually system common) to the input.

NOTE: Route and secure Alarm Extension Loom away from AC and DC cables

NOTE: For full EM4x functionality and operation information, refer to the EM4x Manual.

STEP 10: Secure the Drip Cover

Secure the drip cover to the top of the unit with the thumbscrews

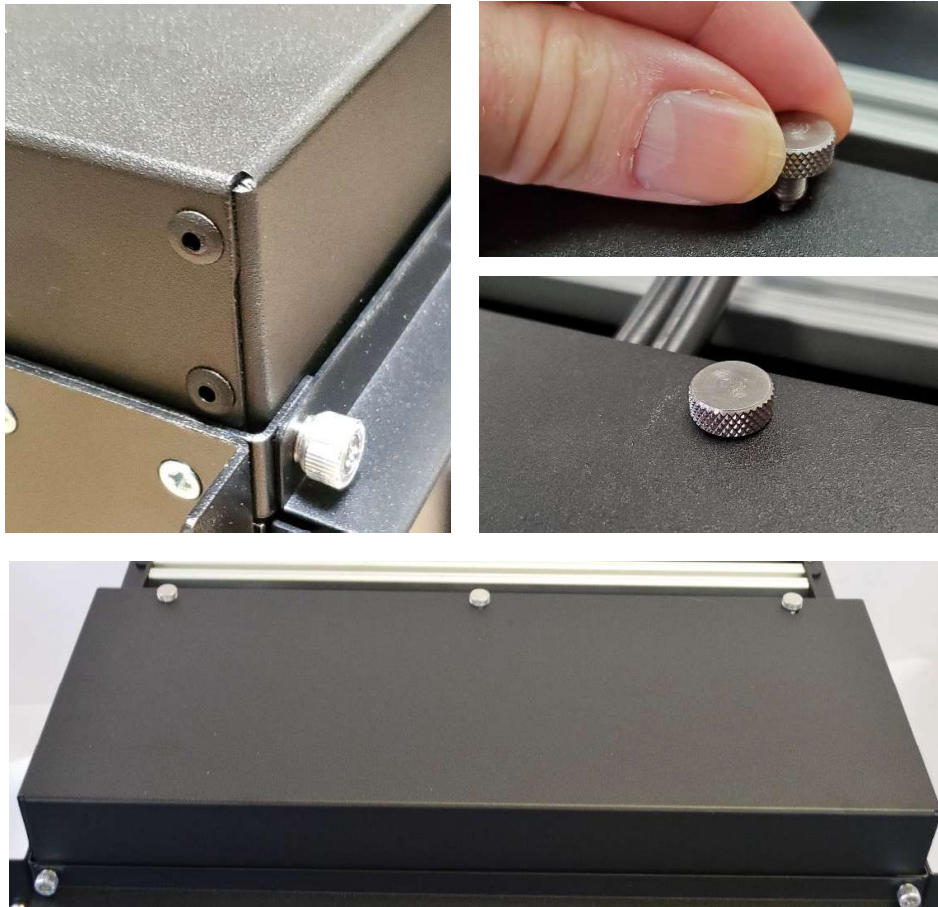


Figure 11 Securing the drip cover

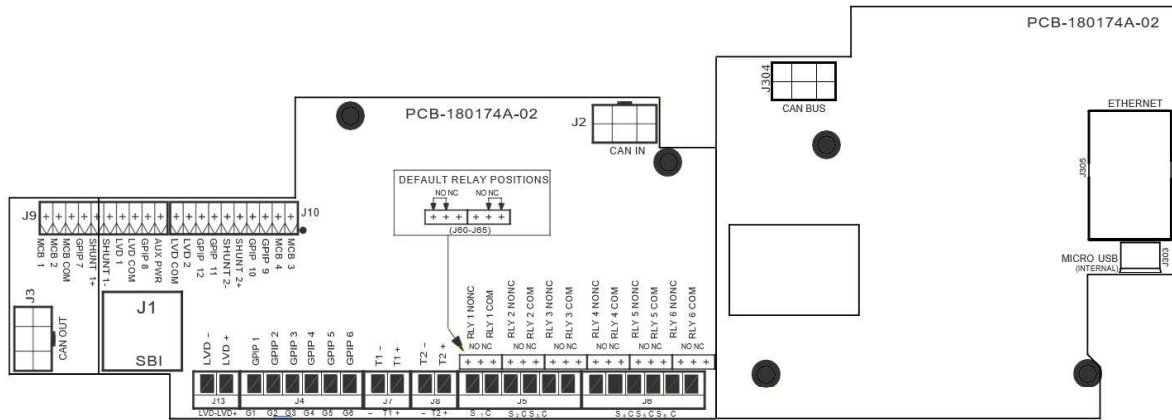


Figure 12: Controller Layout

6.5 Rectifier Module Insertion and Removal



Figure 13: RM3048HE Front Panel

Rectifier modules are shipped separately. They must be plugged in to the system prior to power-up. The rectifier modules are designed for “hot plug-and-play”. It is safe to insert and remove modules at any time, even when the system is loaded. The rectifier modules are self-addressing, meaning that no setup is required for the EM4x controller to determine rectifier addressing.

IMPORTANT: if a rectifier is removed from the system and then plugged into another rectifier slot, you must wait for the red LED to extinguish (this clears the address setting in the EPROM).

When inserting the module, ensure that it is pressed hard into the system. The locking button should click. See Figure 14.

To remove the module, press the locking button while pulling on the “handle” that is integrated into the front panel. See Figure 15. Check that any blank rectifier slots have the rectifier blank panel inserted to prevent air back-flow.



Figure 14: Inserting a Rectifier

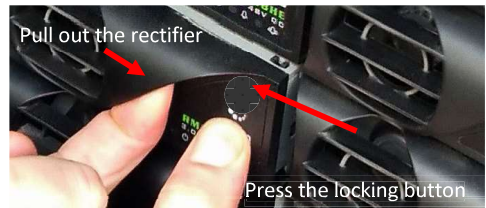


Figure 15: Removing a Rectifier

6.6 Ventilation

The performance of the rectifier or other power modules can be limited if the ventilation is restricted. The rectifier is cooled by drawing air into the front of the unit with a single fan. This air passes through the rectifier cooling the electronics and exiting the rectifier at the rear. For efficient airflow:

- Check the air at the front of the rack is at ambient temperature and not being heated by other equipment.
- That the rectifier shelf has at least 3"/75mm clear horizontal space behind it. This space must be clear of cables and any other components that may restrict air movement.
NOTE: if multiple rectifier shelves are installed then there should be at least 3"/75mm clear horizontal space per shelf.
- Check the free space in the rack continues vertically to the exhaust point at the top of the rack, without impediment.
- Check the hot exhaust air does not re-circulate to the front of the rack as this will be drawn into the rectifiers again, in effect raising the apparent ambient temperature.
- Check the operating environment is low dust and fiber.



Pay particular attention to the quality of rectifier air intake. Insects, sand, and other extraneous matter ingress seriously impacts the performance of the rectifiers.

7 ENERGY MANAGER CONNECTIVITY AND THE WEB UI

The energy manager is configured via a web browser-based user interface (Web UI).

There are two methods to access the Web UI:

1. Ethernet connection from the J305 ethernet connector
2. Front panel micro-USB local connection

7.1 Access Levels

There are 3 access levels for the Energy Manager Web UI:

- enaguest* : can only view status of system
- enabasic* : reduced privilege, can view settings and system status
- enaadvanced* : this user has normal full control access of the system

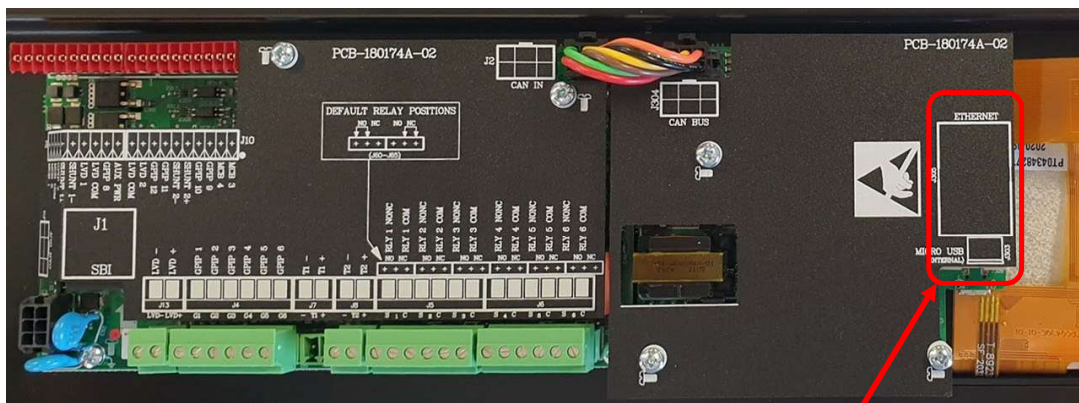
The default password for all levels = ena123

7.2 Ethernet Port Connection



The energy manager contains static sensitive components that require careful handling and proper precautions to be taken – an electrostatic discharge protection device must be worn.

Figure 16: Energy Manager Ethernet Port



Ethernet Port

1. Connect the communicating device to the J305 Ethernet port inside the energy manager.
 2. Open an internet browser such as Edge, Chrome, Firefox or similar on the device.
 3. Enter the Ethernet default IP address into the internet browser.
- NOTE: the energy manager IP address can be located from the front panel LCD menu under: Settings>Networking>Ethernet.
4. The energy manager log in page appears.
 5. Enter the user name and password. See [7.1 Access Levels](#).

7.3 USB Connection

Figure 17: 3U EM4x-01 Front Panel micro-USB



1. Connect the communicating device to the micro-USB port on the front of the energy manager. See Figure 17.
A driver installation prompt appears.
- | | | | | |
|--|--|--------------------|-----------------------|----------|
| | Enatel Linux Products USB Installer (32-bit) | 20/05/2018 9:46 PM | Windows Installer ... | 1,188 KB |
| | Enatel Linux Products USB Installer (64-bit) | 20/05/2018 9:46 PM | Windows Installer ... | 1,556 KB |
2. Double-click the appropriate USB driver (32bit or 64 bit).
 3. Follow the installation wizard instructions to install the driver.
 4. Open an internet browser such as Edge, Chrome, Firefox or similar.
 5. Enter the USB default IP address into the internet browser: 172.31.250.1
 6. The energy manager log in page appears.
 6. Enter the username and password. See [7.1 Access Levels](#).

Note: USB connection to the energy manager is possible without AC, battery or other external power supply. The EM4x operates drawing power through the USB port. However, USB supply does not power the IO Board.

In this scenario there is a set of alarms that display depending on the system configuration relating to the nonoperation of the IO board.

For example:

Relay Logic Error

IOBoard 1 Missing

Battery Temperature Faulty

Ambient Temperature Low

Input and Relay...

IO Board

Battery

General Alarms

For information on the use of the energy manager Web UI please refer to the Energy Manager Installation and Operation Manual.

7.4 Energy manager & IO PCB Alarm Output Configuration

For full EM4x functionality and operation information, refer to the EM4x Installation and Operation Manual.

7.4.1 EM4x LED Alarm Mappings

Refer to the Alarm Configuration>Alarm Configuration page of the Web UI to see the priority setting of each alarm.

Refer to the Relay/Output page Configure Relay section of the Web UI to understand the how the Alarm Configuration is mapped to the EM4x LEDs.

7.4.1.1 EM4x Red LED Urgent Alarm Mapping

Yellow LED - non Urgent alar
m
Monitor Yellow LED

Red LED - Urgent alarm
Monitor Red LED

Rly 2 Rectifier Urgent
IO Board 1 Relay 2

Rly 3 Ambient Temp High
IO Board 1 Relay 3

Rly 4 Battery Discharge

Configure Relay

Relay Name
Red LED - Urgent alarm

Relay/Output
Monitor Red LED

Logic Mode
☒ Simple ☐ Advanced

(Any Critical Alarm)

Any Critical Alarm

(For reference only. Actual system alarm mapping may vary)

7.4.1.2 EM4x Yellow LED non-Urgent Alarm Mapping

Yellow LED - non Urgent alarm Monitor Yellow LED	-
Red LED - Urgent alarm Monitor Red LED	-
Rly 2 Rectifier Urgent IO Board 1 Relay 2	-
Rly 3 Ambient Temp High IO Board 1 Relay 3	-
Rly 4 Battery Discharge IO Board 1 Relay 4	-
Rly 5 Generator Running IO Board 1 Relay 5	-
Rly 6 Generator Start IO Board 1 Relay 6	-

Configure Relay

Relay Name:

Relay/Output:

Monitor Yellow LED

Logic Mode: ☒ Simple ☐ Advanced

(Any Minor Alarm OR Any Major Alarm OR Any Warning Alarm)

Any Minor Alarm

OR

+

-

Any Major Alarm

OR

+

-

Any Warning Alarm

OR

+

-

(For reference only. Actual system alarm mapping may vary)

7.4.2 EM4x Main PCB Alarm Mappings

Alarms can be mapped to any of the voltage free output relays fitted to the EM4x. Output states of either Normally Open or Normally Closed can be selected (NO and NC states are for the de-energized relay). A jumper is fitted to nominate the required output state, ensure the jumper is placed in the correct configuration for installation requirements.

If an alarm is programmed for the relay to be normally energized (such as a low voltage alarm where loss of power will put the alarm into its “active” state), then be sure to connect the remote wiring appropriately. Table 2 lists alarm assignment for the EM4x controller as matches the relay outputs shown in Figure 18.

Figure 18: EM4x Relay Outputs

Table 2: IO Board 1 Relay Alarm Assignments

Relay Output	Relay Label (In NewMar Config.)	Alarms Mapped to Relay/Output (All multiple states “OR-ed”)
Relay 1	CPU Fail	
Relay 2	Non-Critical Alarms	Orange LED

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Relay 3	Critical alarms	Red LED
Relay 4	Spare	
Relay 5	Spare	
Relay 6	Spare	
Buzzer		Red LED

7.4.3 EM4x Main PCB Digital Input Alarm Mappings

General purpose inputs allow the Commander II & II+ system to monitor any external equipment that includes relay or auxiliary outputs. The GPIB inputs are activated by connecting the system positive (common) to the input terminal (configuration setup in the EM4x can allow activation by connecting to system live).

General purpose inputs can also be configured as analogue inputs for purposes such as battery midpoint monitoring and voltage monitoring.

These inputs may be assigned to contribute to alarm states within the monitor. The state mapping is defined in the configuration file. Alarm mapping should be completed using the EM4x software. Please refer to the EM4x manual for detailed information.

The inputs are normally activated by connecting system positive (usually system common) to the input.

7.4.4 Circuit Breaker Fail Monitoring

Comment: Main circuit breakers (MCBs) are monitored electronically via a diode to a digital input on the EM4x. The digital input will trigger an alarm when it is pulled to the system common (positive) rail. The Breaker Fail alarm will only operate if a load is connected to the output to provide a return circuit for the sense wire. Therefore, for breakers that do not have a load connected, the breaker can remain in an OFF position without causing a false alarm.

The battery circuit-breakers, however, use voltage sense to detect tripping or whether they are turned off. This is because when a battery breaker is tripped, there may be very little voltage difference across the breaker, making electronic fail detection problematic. Hence, if no battery is connected, the breaker must be ON to clear the Battery Breaker Fail alarm.

8 LVD OPERATION

The primary Low Voltage Disconnect contactor is located in the battery side of the DC distribution. A secondary Load Low Voltage Disconnect can be optionally included in a section of the load side of the DC distribution.

The LVD contactor is a bi-stable, magnetically latching contactor. This means that failure of power or removal of the EM4x from a live system will not cause the contactor to change state. Periodic pulsing of the LVD control signal allows the monitor to ensure the contactor remains in the correct state. The contactor is monitored by the EM4x to allow an alarm to be generated when the contactor is open.

The EM4x energy manager unit is powered from both the rectifier side of the LVD contactor and direct from the battery source. Following an extended AC outage and the low output voltage threshold being reached, the primary LVD disconnects the battery from the system live bus and the EM4x will lose voltage sense (as voltage sense is measuring system live bus voltage) yet still maintains operation for system monitoring. The LVD contactor will not re-engage until rectifier input supply is restored (i.e., until the DC bus voltage is re-established). LVD adjustments/settings are all made in the supervisory module.

9 MAINTENANCE

As NewMar power systems are state of the art electronic systems, little routine maintenance is required.

9.1 System

- During normal operation the cable entries to the MCBs may loosen over time due to movement in the cable strands. To avoid damage to the MCB's and cable entries due to heat build-up and arcing, it is recommended that the retaining torque is periodically checked at least annually.
- MCB's should be maintained at a torque of 2Nm.
- All other connections should also be checked at this time.

9.2 EM4x Controller

- The controller can give a good indication of the condition of the system. Alarm logs can show issues with the system and rectifiers and should be regularly checked.
- As a minimum, check that the float voltage and load current is as expected.
- If the batteries are fully charged, check the battery current is zero or near to zero amps, and check that the amp-hours remaining is 100%.

9.3 Rectifiers and Converters

- During normal operation some dust will build-up on the front of the rectifiers. This should be kept to a minimum by regularly wiping the rectifiers to avoid accumulation within the rectifiers and blocking the airflow to the units. The positioning of the system and surroundings will determine the regularity of this requirement.
- In extremely dusty positions it is recommended that the units are removed and cleaned with compressed air to prevent airflow blockages.
- Check the air flow front and back to the rectifiers is unimpeded by cables or otherwise.
- Check nothing has entered the rectifiers such as insects or geckos.

9.4 Batteries

- Battery maintenance depends on the individual manufacturer's specification, please contact the battery supplier for recommendations.
- Periodic discharge tests may be beneficial to ensure reliable system operation and may be recommended by the battery manufacturer.



CAUTION The user must be aware of the consequences of battery State of Health (SoH) with regards their specific load requirements and implement their own policy regards the end of life of the batteries.

9.5 Ventilation Maintenance

Check that there has been no change in the required airflow space or environment that impacts the ventilation. Refer to [6.6 Ventilation](#) for the required details.

10 TROUBLE-SHOOTING AND SERVICING

If the red 🔔 LED is alight:

- Unplug the rectifier and re-engage.
- Check AC power to the rectifier.
- Check for rectifier alarms in the monitor Urgent Alarm list.
- If symptoms persist, contact a service agent.

If the yellow 🔔 LED is alight:

- Check the monitor Non-Urgent Alarm list.

10.1 Servicing



DANGER Do not operate the rectifiers, converters or other power modules if the covers are damaged or removed in any way.



WARNING The rectifiers, converters or other power modules contain voltages that may be lethal even after the input supply has been removed.



WARNING The rectifiers, converters or other power modules contain components at high temperature that may burn if touched

To isolate a rectifier or converter from the power supply, unplug it from the shelf.
The power modules contain no user serviceable components. Do not disassemble the modules.
If a power module has an operational fault or is damaged in any way, an authorized service center should service it immediately.

11 ESSENTIAL SYSTEM SET-UP PARAMETERS

The following steps are system settings that must be checked at the time of commissioning for each system installed. You can print this section and fill it out for each site commissioned.

NOTE: these steps are battery chemistry dependent. Follow the appropriate section.

11.1 Systems with Lead Acid Batteries

Failure to correctly follow the items below may cause incorrect system functionality and in some cases ruin your battery (without the ability to claim battery replacement under warranty).

NOTE: Any values shown below are indicative only. If the values in your system differ from those shown here, write in the values relevant to your system.

Refer to the EM4x energy manager manual for more details.

11.1.1 Check the Battery Type

The system MUST be configured to the correct battery type.

EM4x Web UI page [Battery>Battery Settings](#)

Battery Type

Lead Acid Basic Li Energypak Modular Li ↻

Done ☐

11.1.2 Check/Set Float Voltage

Consult battery manufacturer's data for proper setting.

The Float voltage is for 25°C reference temperature in NewMar systems.

EM4x Web UI page: [Control](#)

Example:

Float Voltage

54	V	↻	✓
----	---	---	---

Site Setting:

Float Voltage

Done ☐

11.1.3 Set Battery Temperature Compensation

Toggle temperature compensation On.

EM4x Web UI page: [Battery>Battery Settings](#)

Rectifier Compensation

On

Off

You must consult the battery manufacturer's data to obtain the correct Slope setting. Note that in many Hybrid applications where the battery is constantly being cycled, having temperature compensation enabled may not be necessary as the voltage on the battery is constantly changing anyway.

EM4x Web UI page: [Battery>Battery Settings](#)

Example:

Maximum Temperature	55	°C	↺	✓
Minimum Temperature	0	°C	↺	✓
Number Of Cells	24	cells	↺	✓
Temperature Slope	-3	mV/°C/cell	↺	✓

Site Settings:

Maximum Temperature		°C	↺	✓
Minimum Temperature	0	°C	↺	✓
Number Of Cells		cells	↺	✓
Temperature Slope		mV/°C/cell	↺	✓

Done ☐

If you choose not to enable Temperature Compensation, then set the Rectifier Float Voltage to that required by the battery manufacturer for the average long-term temperature you anticipate your system to operate at.

11.1.4 Set Battery Capacity

Consult the battery manufacturer's data for correct battery capacity settings.

For the EM4x to set the correct Battery Current Limit current, it is essential that this is filled out correctly.

These figures are also used for estimating the Battery Time Remaining during a discharge.

For Telecom applications, the 10-hour rate is usually the name-plate rating of the battery. However, once again, check the battery manufacturer's data sheets as some manufacturers state the 20-hour rate (which is usually a little more "optimistic").

The second rate is required specifically for the time-remaining algorithm. A 4-hour rate is usually a good one to use. This information is available from the battery manufacturer's data sheet.

The Battery SoC adjust can be used at the time of installation (or for testing purposes) in case the installed battery is not initially fully charged. If you think the battery is only 80% charged, then simply enter that value. The value displayed here will correct itself once the battery has been on charge for some time or gone through a few charge/discharge cycles.

Battery Recharge Efficiency considers the ohmic and any other losses in the battery charge/discharge cycle.

The effect is that more energy (Ah) needs to be put back into the battery than was taken out. With the efficiency set to 96%, then 4% more Ah is needed to be returned to the battery before the EM4x will register that the battery is at 100% SoC.

The Battery Discharge Threshold is a buffer to prevent false triggering of discharge notification and is usually related to the size of the battery shunt. A larger shunt requires a larger discharge threshold.

EM4x Web UI page: [Charge](#)

Example:

10h Rate Battery Capacity	650	Ah	↺	✓
Secondary Capacity Rate Time	4	h	↺	✓
Secondary Capacity	500	Ah	↺	✓
Battery Recharge Efficiency	96	%	↺	✓
Battery State Of Charge	64.5	%	↺	✓
Battery Discharge Threshold	-3	A	↺	✓

Site Settings:

10h Rate Battery Capacity		Ah	↺	✓
Secondary Capacity Rate Time		h	↺	✓
Secondary Capacity		Ah	↺	✓
Battery Recharge Efficiency		%	↺	✓
Battery State Of Charge		%	↺	✓
Battery Discharge Threshold		A	↺	✓

Done ☐

NOTE:

Both the 10 hour and secondary battery capacity hour rates should be set at the same time. The EM4x compares rates to ensure the battery data is accurate and may not accept the setting if an inaccuracy is detected.

11.1.5 Set Battery Current Limit

Consult battery manufacturer's data for maximum battery recharge current settings.

The Battery Current Limit is set as a percentage of the 10-hour rate entered above.

It is recommended this value is set at the highest rate allowable to ensure the battery is recharged as fast as possible.

In some systems, especially larger systems, this may require limiting further because of the number of rectifiers available, rather than the maximum setting.

EM4x Web UI page: [Battery>Battery Settings](#)

Enable Battery Current Limit by clicking on the tick icon beside the field.

Battery Charge Current Limit	☒	Disabled	%	↺	✓
------------------------------	-------------------------------------	----------	---	---	---

Example:

Battery Charge Current Limit	☒	20	%	↺	✓
------------------------------	-------------------------------------	----	---	---	---

Site Settings:

Battery Charge Current Limit	☒		%	↺	✓
------------------------------	-------------------------------------	--	---	---	---

Done ☐

For telecom settings, this limit is often set to 10% (or 0.1C10, i.e., a 10A current limit for a 100Ahr battery). This is more typical of a design parameter than the need for the setting to be at this level but a setting higher than this level should be considered to enable the fastest recharge possible without exceeding the battery manufacturer’s maximum value.

Ensure sufficient rectifier capacity is available to cover battery recharge and load requirements.

11.1.6 Low Voltage Disconnect Settings

The LVD disconnect set points are usually a customer generated setting.

As the discharge time increases, the higher the end voltage should be set. For a discharge of <1hr, this may be as low as 1.75Vpc (42.0V for a “48V” battery), or for an 8-hour discharge, it may be 1.85Vpc (44.4V for a “48V” battery).

Note that if only one LVD is fitted, LVD2 and LVD3 thresholds are set outside of possible tripping voltages. This avoids any confusion over which LVD signal is being used by the EM4x energy manager.

EM4x Web UI page: [IO Configuration>IO Boards](#)

Toggle LVD latching On

LVD Latching

On

Off

Example:

LVD1 Disconnect	43	V	↺	✓
LVD1 Reconnect	48	V	↻	✓
LVD2 Disconnect	12	V	↺	✓
LVD2 Reconnect	15	V	↻	✓
LVD3 Disconnect	12	V	↺	✓
LVD3 Reconnect	15	V	↻	✓

Site Settings:

LVD1 Disconnect		V	↺	✓
LVD1 Reconnect		V	↻	✓
LVD2 Disconnect		V	↺	✓
LVD2 Reconnect		V	↻	✓
LVD3 Disconnect		V	↺	✓
LVD3 Reconnect		V	↻	✓

Done ☐

11.2 DC System Lead Acid Battery Commissioning Check-List

This section is for a more detailed commissioning process than the Essential Set-up Parameters. It may be printed out separately and filed for record keeping.

DC System Lead Acid Battery Commissioning Check-List

Site Name:_____ Date:_____

Tests Without Batteries Connected	Value	Results
Check Float Voltage	Meter:_____	_____ V ✓ / ✕
Check Load Current	Meter:_____	_____ A ✓ / ✕

Alarms

Voltage thresholds can either be checked using an external power supply, or by adjusting the EM4x float voltage 0.1V above (or below for the low voltage alarms). It is recommended to have the batteries disconnected.

1. Adjust the supply/float voltage to 55.7V & observe the "High Float" alarm.
2. Adjust the supply/float voltage to 57.7V & observe the "High Load" alarm.
3. Adjust the supply/float voltage to 52.7V & observe the "Low Float" alarm.
4. Adjust the supply/float voltage to 46.9V & observe the "Low Load" alarm.

High Load Volts (urgent)	57.6V	_____ V	✓ / ✕
High Float Volts (non-urgent)	55.6V	_____ V	✓ / ✕
Low Float Volts (non-urgent)	52.8V	_____ V	✓ / ✕
Low Load Volts (urgent)	47.0V	_____ V	✓ / ✕

Depending on the test load available, it may be necessary to adjust the High Load Current alarm threshold down to suit. For example, with 40A test load, adjust the Load Current High Setpoint threshold (Web UI page Alarm Configuration>System Alarms) to 35A. Then simply apply the 40A load and observe the alarm change state.

Once the test is complete, be sure to rest the Load Current High Setpoint to its previous value (or check with the customer for the correct value they require).

Load Current High Setpoint	_____ A	✓ / ✕
----------------------------	---------	-------

Temperature alarm tests are performed by heating up (using a heat gun or other source) and cooling down (using an aerosol can of freeze, or a tub of ice) the temperature sensors.

Battery Temperature High (urgent)	_____ °C	✓ / ✕
Battery Temperature Low (non-urgent)	_____ °C	✓ / ✕
Room Temperature High (non-urgent)	_____ °C	✓ / ✕
Room Temperature Low (non-urgent)	_____ °C	✓ / ✕

When an AC Monitoring PCB is not fitted at system level (as in most cases), the AC Fail alarm is generated from the rectifiers. The rectifiers sense if AC is present, and extend an AC fail alarm to the EM4x. Therefore, to test this alarm, simply turn off the rectifier AC breakers. To allow the controller to continue to read alarms there must be DC present on the output of the system.

As this causes the rectifier output to cease, a Rectifier Fail alarm is also generated. To generate the Urgent Rectifier Fail, turn off the required number to make this occur (usually set to 2, but check via the EM4x Web UI for the setting (Control page>Rectifier Urgent Fail Threshold).

AC Fail (urgent)	Urgent	✓ / ✕
Rectifier Fail (non-urgent)	Non-urgent	✓ / ✕
Urgent Rectifier Fail (urgent)	No. Modules: _____	✓ / ✕

To check Load MCB fail, connect a load, but with no load turned on. Then switch the breaker to its off position and turn on some load (any amount will do). This will cause the alarm to occur as the load side to the circuit will be taken to system common voltage. Turn off the load, and then return the breaker to its on position.

Load MCB Fail (urgent) ✓ / ✕

Tests with Batteries

- Turn off Battery Breaker/s
- Connect battery/batteries
- Check the correct Battery Capacity (Ahrs) has been entered (EM4x Web UI Battery>Battery Settings). This is the total capacity, so for example 100Ahr strings in parallel, this should be 200.
- Go to EM4x Web UI Battery>Battery Settings>Battery Charge Current Limit. Check Battery Charge Current Limit (BCL) is set to desired level (usually $0.25C_{10}$, (25%)). This means that for a single 100Ahr battery, the BCL will be 25A, or if two 100Ahr batteries are connected in parallel, the BCL will be 50A.
- Connect load (but turn off).
- Check V_f is set to 54.0V. (Web UI Control>Float Voltage)
- Turn on Battery Breaker/s

Check Battery current is positive if charging ✓ / ✕

For systems fitted with Battery Monitoring (BCM) cards:

Go to EM4x Web UI Battery>Battery Status. Check cell voltages are approximately the same, at about 2.25V (or 13.5V for 12V monoblocs). ✓ / ✕

If any are out by a large amount, then check the BCM sense wiring is correct.

Set load to required level (e.g., 30A), Check operates ✓ / ✕

Initiate a Battery Test.

Click the Start Battery Test button on EM4x Web UI Charge page.

Check Battery Current is negative (discharging). Note the overview data in the header of the Web UI. ✓ / ✕

Check Battery Current Meter: _____ A ✓ / ✕

After several minutes, or until the battery voltage has dropped below approx. 47V, click the Stop button at the top of the Web UI Charge page.

During this time the Battery Condition Monitor (if fitted) is logging.

Battery Current Limit (BCL)

Check that the battery recharge current is limited to the Battery Current Limit level (usually $0.25C_{10}$, (25%)). See Web UI Battery Settings>Calculated Charge Current Limit for Amp value.

Note: as the BCL is based on fine voltage control of the system bus, the BCL make take one or two minutes to "settle", i.e., you

_____ %

may observe a brief excursion of the battery recharge current beyond the BCL setting.

Check Manual Equalise (if configured). Click the Start Manual Equalise button on the Charge page to initiate a battery equalisation. Click the Stop button at the top of the Charge page to end. ✓ / ✕

A Battery MCB Fail alarm is generated from the voltage measured across the battery MCB.

Therefore, to check a Battery MCB Fail alarm, simply open one of the battery MCB's. If batteries are connected to the system at this time, the alarm may take a few moments to activate. Once test is complete, turn breaker back on.

Battery MCB Fail (urgent) ✓ / ✕

Temperature Compensation

Check Temperature Compensation is enabled. ✓ / ✕

Web UI Battery>Battery Settings>Rectifier Compensation>On.

Apply heat or cold to the Battery Temperature Sensor/s. Check the float voltage moves up or down as expected. ✓ / ✕

If actual measurement is required, apply a known heat or cold to Temp. ____ °C the sensor. Allow it to fully come to temperature and record the amount of voltage movement. Voltage offset: ____ V OK? ✓ / ✕

Check Alarm Relay Contacts

To generate these alarms, refer to the procedures described earlier in the Commissioning Checklist.

Spare relays will not be able to be tested unless an alarm is mapped to them. As these are tested in the factory, it is not essential to test them at time of commissioning.

On main EM4x PCB

Relay 1 (Monitor Fail) ✓ / ✕
(pull out the RJ45 lead connecting the monitor to the system rectifier shelf – this simply de-powers the monitor)

Relay 2 (Summary Non-urgent) ✓ / ✕

Relay 3 (Summary Urgent) ✓ / ✕

Relay 4 (Spare) ✓ / ✕

Relay 5 (Spare) ✓ / ✕

Relay 6 (Spare) ✓ / ✕

NOTE: *Prior to leaving the system after it has been commissioned, check all AC, DC and battery circuits are off. If it is required that the system is to be left on (to power load equipment, ensure rectifiers are left in their powered-up state, and batteries are in circuit. This will prevent anyone leaving the batteries only powering the load (in which case the batteries go flat).*

11.3 Systems with Lithium Batteries

The term lithium batteries include a wide range of chemistry types. Regardless of the chemistry used the energy manager differentiates lithium (and other non-lead acid batteries) by whether the battery BMS can be communicated to via Modbus RTU or not. These 'smart' batteries are termed modular, where the energy manager is receiving information on alarms and status from the battery internal electronics.

Failure to correctly follow the items below may cause incorrect system functionality and, in some cases, ruin your battery (without the ability to claim battery replacement under warranty).

NOTE: Any values shown below are indicative only. If the values in your system differ from those shown here, write in the values relevant to your system.
Refer to the EM4x energy manager manual for more details.

11.3.1 Check the Battery Type

The system MUST be configured to the correct battery type.

EM4x Web UI page [Battery>Battery Settings](#)

Battery Type

Lead Acid Basic Li Energypak **Modular Li** ↺

Done ☐

11.3.2 Modular Smart Lithium Battery Selection

If the system is connected via Modbus RTU to a battery BMS check the correct specific battery is selected from the Product drop down list and mapped to the correct address. EM4x Web UI page: [IO Configuration>Modbus Master>Device Map](#)

1 Address SLB48 ▼ Product

Done ☐

11.3.3 Check/Set Float Voltage

Consult the battery manufacturer’s data for the proper setting. Note that the float voltage directly impacts the state of health of batteries after multiple cycles. The consequences of the float voltage setting must be understood. The Float voltage is for 25°C reference temperature in NewMar systems.

EM4x Web UI page: [Control](#) Example:

Float Voltage

54 V ↺ ✓

Site Setting:

Float Voltage

V ↺ ✓

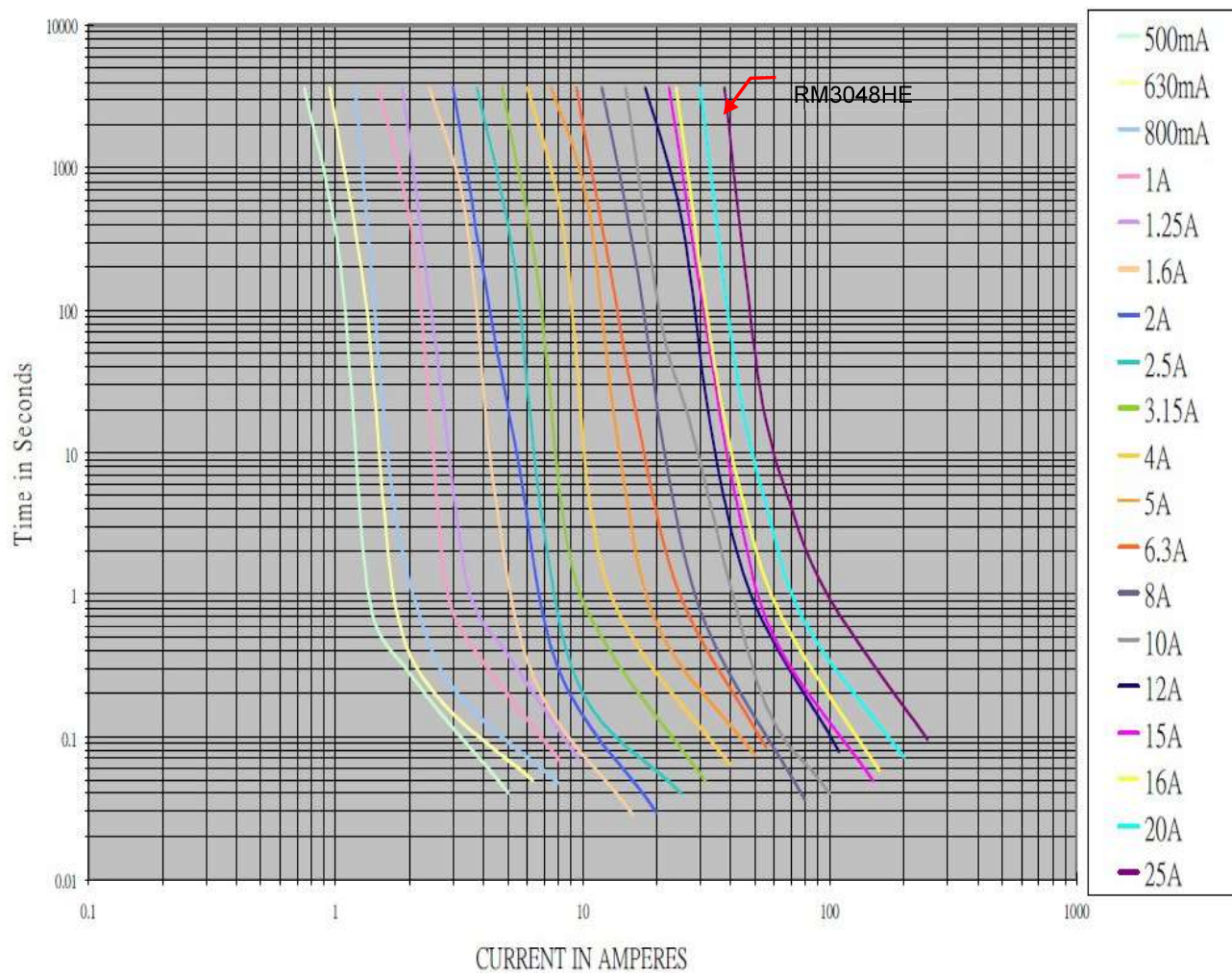
Done ☐

Appendix I RECTIFIER FUSE AND FRONT PANEL BEHAVIOUR

I.A Rectifier Input Fuse Characteristics

The NewMar RM3048HE rectifier uses two Conquer UDA-A 025 fuses in its input, one on each phase/line of the AC input. NOTE: The curves are for average value, for reference only.

Figure 19: Rectifier Input Fuse Tripping Curves



I.B RM3048HE Front Panel Indications

There are three LED indicators on the front panel to indicate the operational state of the rectifier.

- ① This green LED indicates that input power is connected to the unit and that the primary stages of the rectifier are operating.



This yellow LED indicates a non-urgent alarm/notification state within the rectifier.

This could be caused by the following:

- rectifier in output power/current limit
- rectifier over temperature
- fan failed
- rectifier soft starting



This red LED indicates an urgent alarm state within the rectifier.

This could be caused by the following:

- rectifier failed
- the AC input voltage is outside the operating range.
- rectifier shut down due to output over-voltage or over-temperature.

I.C C3C-12-40-48 or C3C-24-25 Converter Front Panel Indicators



There are 3 LED indicators on the front panel indicate the operational state of the converter.

The green LED indicates that input power is connected to the unit and that the primary stages of the converter are operating.



The yellow LED indicates a non-urgent alarm state within the converter.

This could be caused by the following:

- Converter in output power/current limit
- Converter over temperature
- Fan failed
- Converter soft starting



The red LED indicates an urgent alarm state within the converter.

This could be caused by the following:

- Converter failed
- The DC input voltage is outside the operating range
- Converter shut down due to output over-voltage or over-temperature

Appendix II AC INPUT TRANSIENT PROTECTION

Information to assist the installer for AC input protection is detailed in this section.

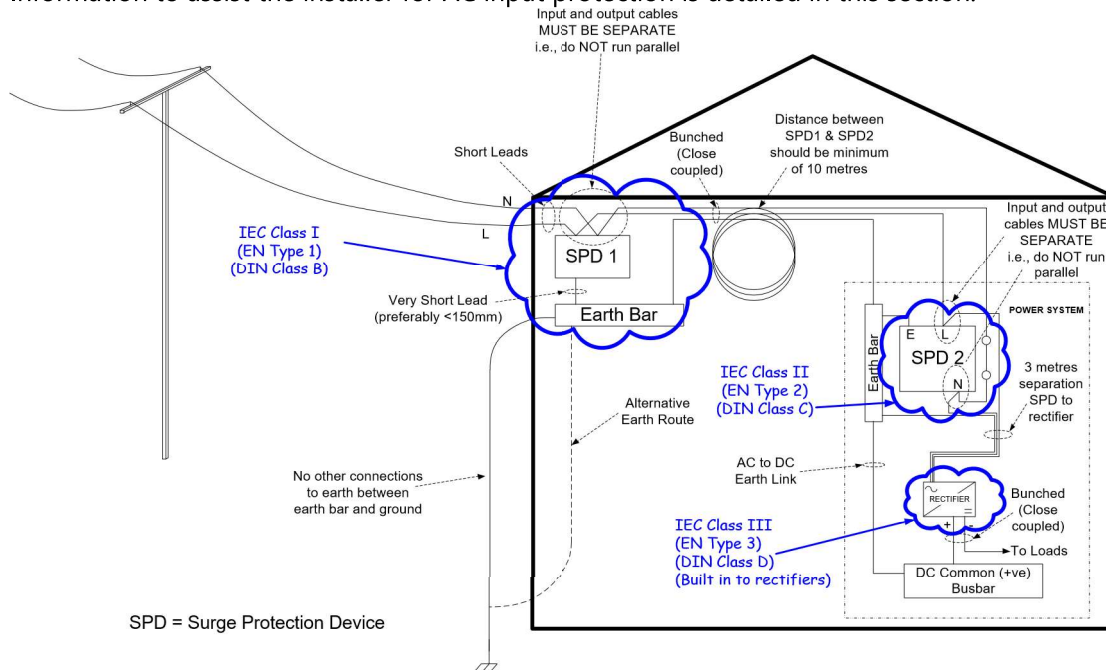


Illustration A: Surge Protection Installation

Illustration A shows the surge protection installation principles, utilizing the 3 stage protection zone concept.

The Type 1 (SPD1) surge arrester, fitted in the installation's main incoming electrical switchboard, is capable of diverting the energy of a direct lightning strike. This is the first stage of the electrical network's protection. It is important that upstream Type 1 protection is provided on site. Although the actual surge capability of the device used can vary depending on the severity of lightning in any particular installation, the typical maximum discharge current of a Type 1 surge suppressor will be in the order of 50kA to 100kA (10/350µs impulse)

The 10/350µs current wave as shown below is the standardized current waveform which passes through equipment when subjected to an overvoltage due to a direct lightning strike.

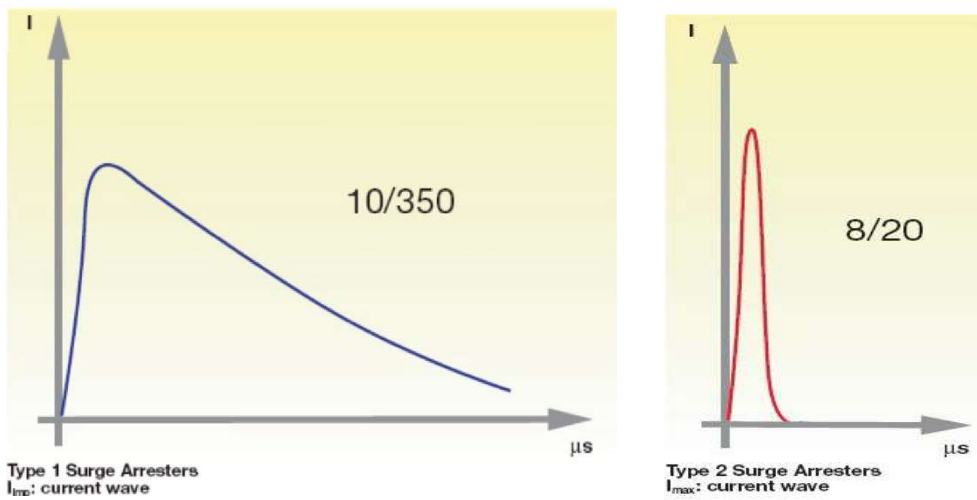


Illustration B: Surge Protection Types

A Type 2 surge arrester (SPD2) should be used in coordination with the incoming Type 1 surge arrester. This is the second stage of protection. The Type 2 Surge arrester is designed to run-off energy caused by an overvoltage comparable to that of an indirect lightning strike or an operating overvoltage (this is effectively the “left-over” surge from the Type 1 protection device). To provide sufficient de-coupling between the Type 1 and Type 2 devices, impedance is required. This is typically stated to be 10m of cable (approximately 10 μ H). This cable may be looped if the distance available is too short. Alternatively, various manufacturers have devices which act as filter elements or provide active spark ignition for applications where 10m of cable is not practical (such as outdoor enclosures).

Note: NewMar Rectifiers are compliant with EN61000-4-5, Level 4 without any external/upstream surge suppression. To maintain a coordinated approach to surge suppression, Type 2 SPD should be installed upstream if not fitted in the system.



WARNING The fitment of a Type 2 AC Surge Suppression Device is mandatory. If a Type 2 SPD is NOT fitted, the warranty is void.

II.A Upstream Over-Current Protection

There are three considerations to take into account when selecting an appropriate fuse/circuit breaker:

- Firstly, the upstream protection should protect the downstream cable from overload situations,
- Secondly, discrimination should be maintained with the downstream device fuses, and
- Thirdly, protection of the surge suppression devices should be taken into account.

II.B Cable Rating

The maximum current drawn by this DC power system is 52.5A per phase (at minimum input voltage of 185V PhPh and full output power). The upstream protection device must be able to supply this load under all conditions without tripping. Therefore, typically at least 20% headroom is allowed for in the protection device, making its minimum rating 63A. As a result, typically 63A device is used. Therefore, the cable used to supply the system must be rated at the upstream protection device rating. Please see your local wiring regulations for exact requirements, as cable sizes can vary depending on these regulations and on the material the cable's insulation is made from.

As a comment on rectifier AC feed cable sizes: each rectifier is fed by one set of cables from the AC input terminals.

Although in theory it may appear that this smaller wire is unprotected, in fact it is protected on two accounts. Firstly, it is protected by the rectifier input fuse (which is only a short distance away). Secondly, the rectifiers are power-limited on their input. Therefore, they can never be overloaded. As a result, the wire can never be over-loaded by the rectifier – it can only see fault current.

II.C Discrimination

Discrimination ensures that the upstream circuit breaker or fuse does not blow if a rectifier input is faulty (in a short circuit manner). Therefore, it is important to ensure the upstream protection discriminates with the internal fuse of the rectifier. The fuse used in the RM3048 is a slow-blow 25A fuse.

Preferably use either a 50A, D-curve, or a 63A, C or D curve breaker. If a fuse is used upstream, then any BS88 or NH g style fuse will discriminate above 50A. A minimum circuit breaker to use for this system is a 50A.

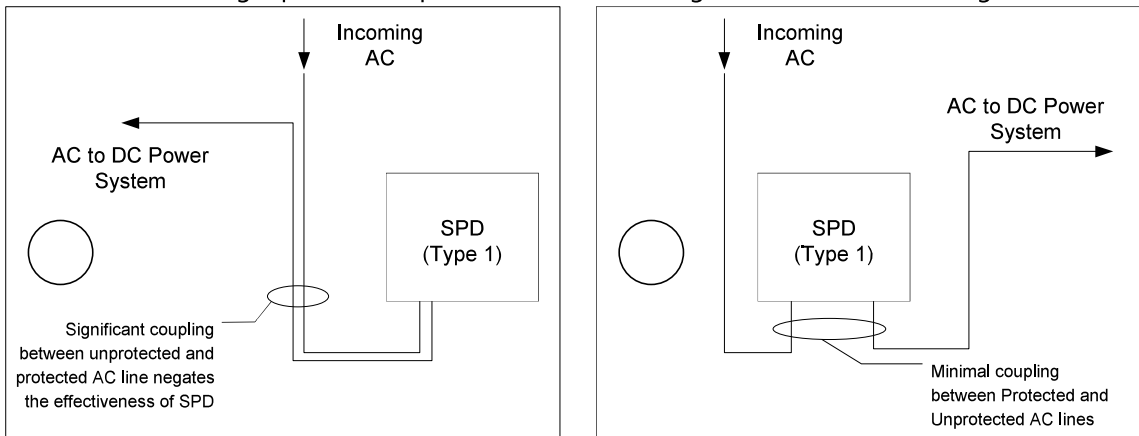
II.D Surge Suppression Device Protection

It is recommended to have Type 2 Surge Protection Devices (s) (as defined by IEC 61643-11) upstream to the supplied cabinet. These devices are rated for repeated strikes of 20kA (8/20 μ s waveform), and single shot protection of 40kA. It is important that upstream Type 1 protection is also provided on site. To ensure correct operation of the s, at least 10m of AC feeder cable is fitted between the Type 1 and Type 2 protection. If the distance between the AC incoming distribution board and the DC Power System is less than 10m, then loop the cable until at least 10m of cable is used. This ensures correct de-coupling of the devices.

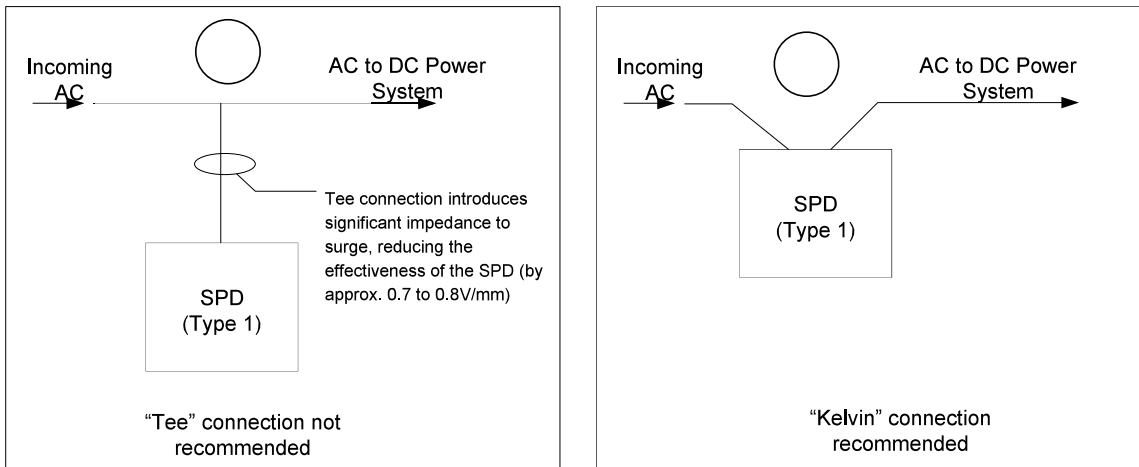
II.E AC cable installation and surge protection

The following precautions MUST be adhered to when installing AC cabling.

1. Avoid running input and output cables from AC Surge Protection Devices together:



2. Avoid "T" Connections:



Appendix III NEWMAR ENERGY STANDARD LIMITED WARRANTY POLICY

NewMar warrants that its products shall be free from defects of material or workmanship under use consistent with correct installation and commission, normal operation, product specifications, NewMar's written instructions, and regional standards compliance, for a period of one (1) year from the start date. The start date shall be defined as (a) the date the product is

shipped from NewMar's factory; or (b) in the case of resale by an authorized NewMar reseller, whichever is the lesser of i) the date on the sales invoice or ii) ninety (90) days after original shipment by NewMar factory.

The warranty provides for repairing or replacing, at NewMar's sole discretion, those products deemed defective by NewMar after inspection of its products returned by the customer to the factory or other NewMar authorized location within the warranty period. Replaced product provided by NewMar under the terms of this warranty does not extend the original warranty, replacement product assumes the warranty of the original product. Repaired product or component thereof has a warranty period of ninety (90) days or the remainder of the unexpired term of the original product warranty, whichever is greater.

III.A Warranty Exclusions and Restrictions

Products or parts may be excluded from warranty coverage for reasons including, but not limited to: if the hardware or software has been altered or repaired by an unauthorized party; is defective due to misuse, negligence, accident, mechanical damage, improper installation or maintenance; inappropriate on-site conditions such as high humidity, dust, power surges, out-of-range temperatures, animal or insect damage, water or other liquid damage; where serial numbers or identification marks are removed or defaced in any way; Force Majeure event; has cosmetic shortcomings which do not affect normal operation; inappropriate electrical stress; for suspected fraud or abuse of NewMar's warranty policy; the account has breached or is in dispute of NewMar's commercial terms and conditions.

Note NewMar warranty does not cover data loss, regular back-ups to separate storage is required.

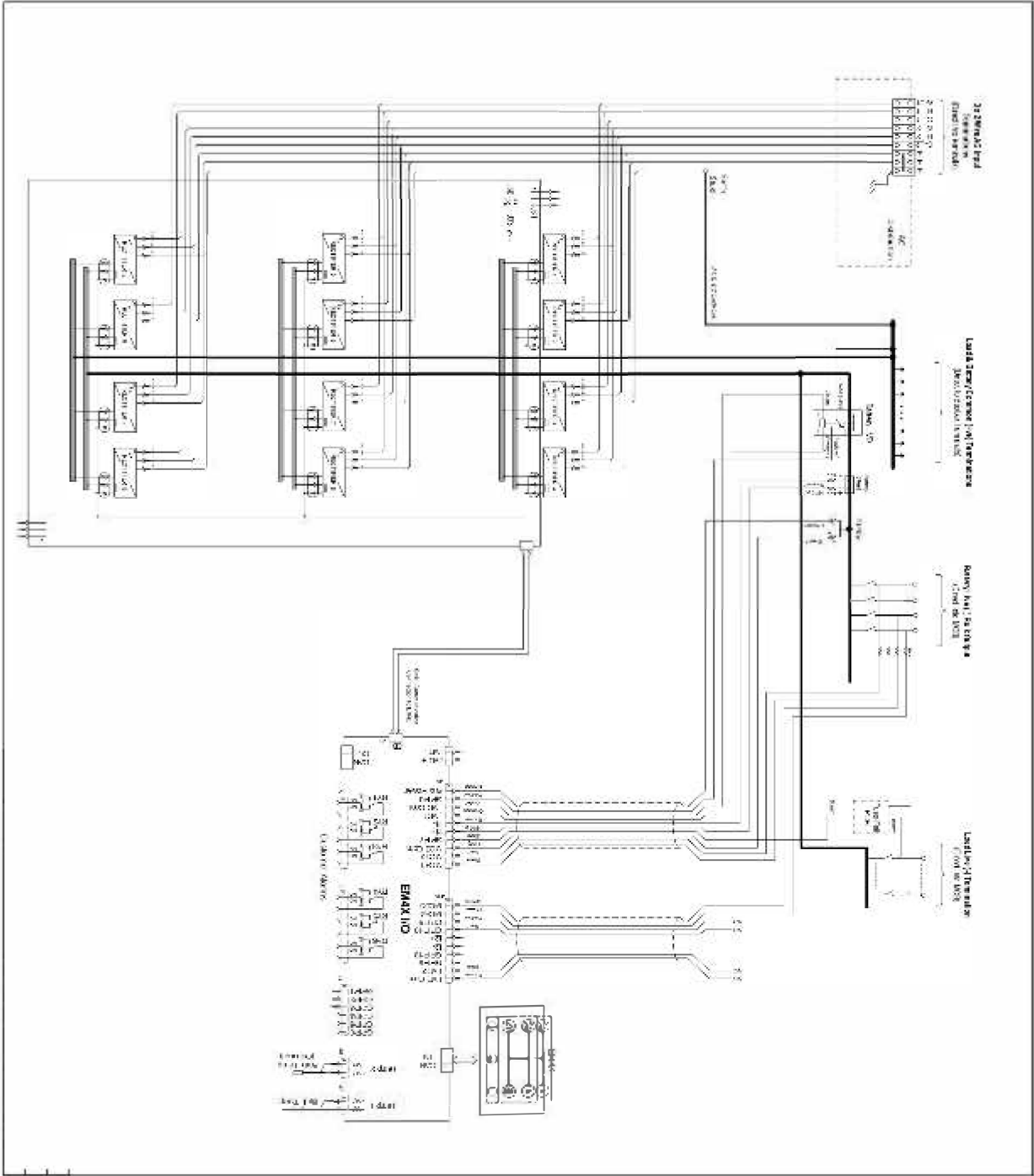
III.B Battery Warranty

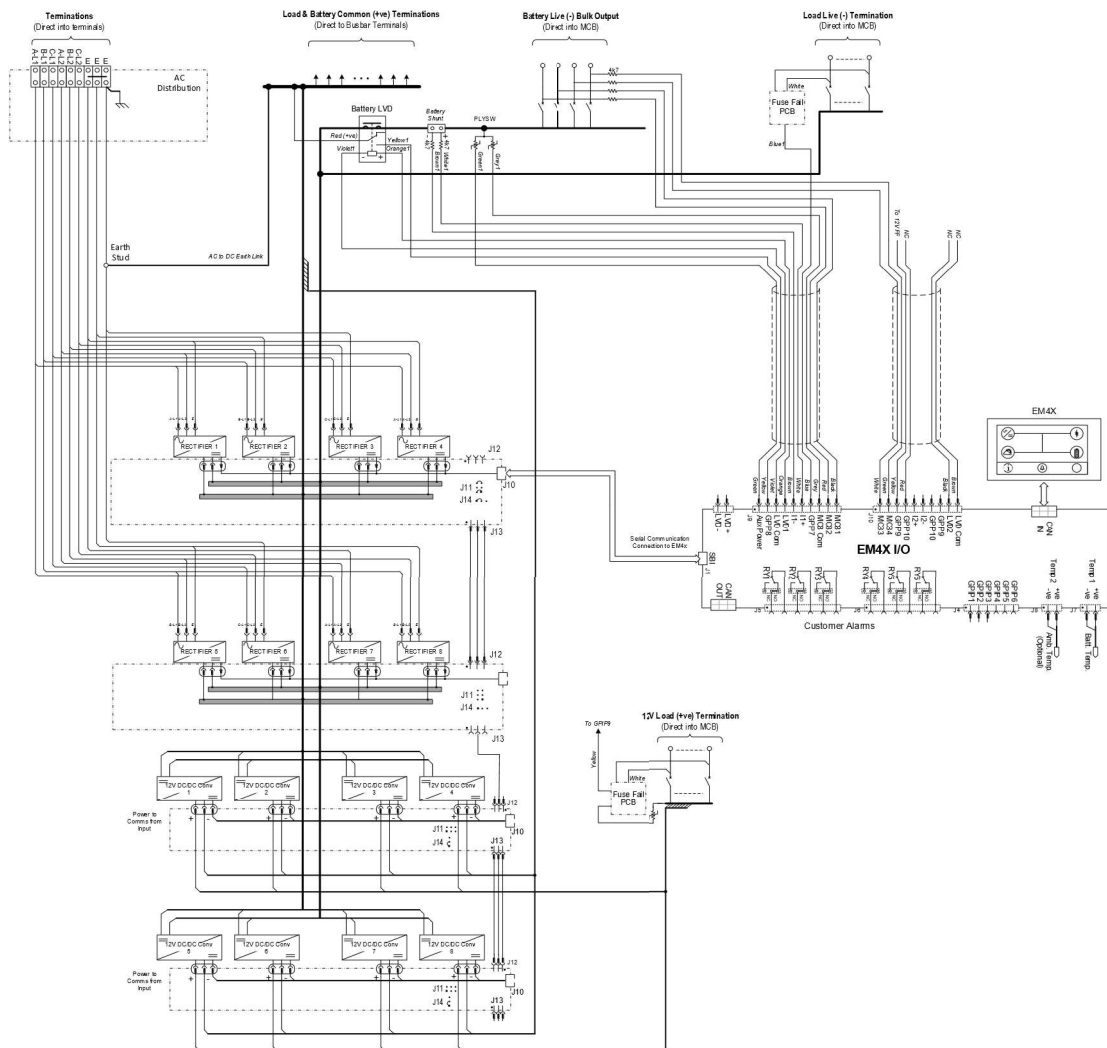
Battery warranty is NOT covered under this warranty. Where NewMar supplies batteries a separate warranty statement shall govern the battery warranty, or where an NewMar battery warranty is not provided the authorized battery vendor's warranty shall be assigned to the batteries.

Note that batteries' operational limits are typically more constrained than NewMar manufactured equipment, need specific care during storage and maintenance, and requirements typically vary for each battery type and vendor. NewMar product warranty is voided should improper care of associated batteries be the cause of product defect.

Unless stated otherwise in the terms and conditions of sale warranty for peripherals, attachments or apparatus not manufactured by NewMar shall be excluded from this warranty.

Appendix IV SYSTEM SCHEMATIC
Commander II

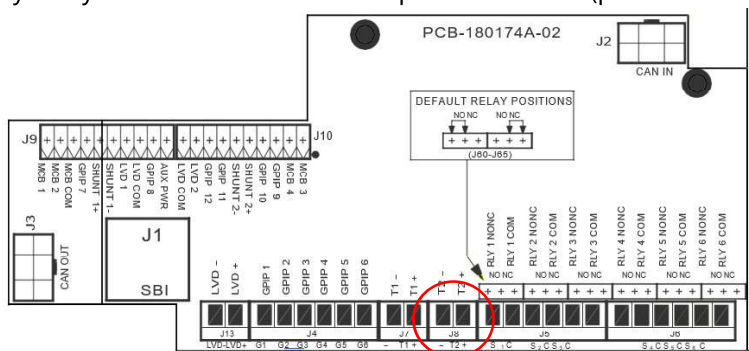




Appendix V Enabling the Ambient Temperature Sensor

To enable the Ambient Temperature Sensor

- Physically connect the ambient temperature sensor (purchased separately) to T2 on the EM4x controller IO board



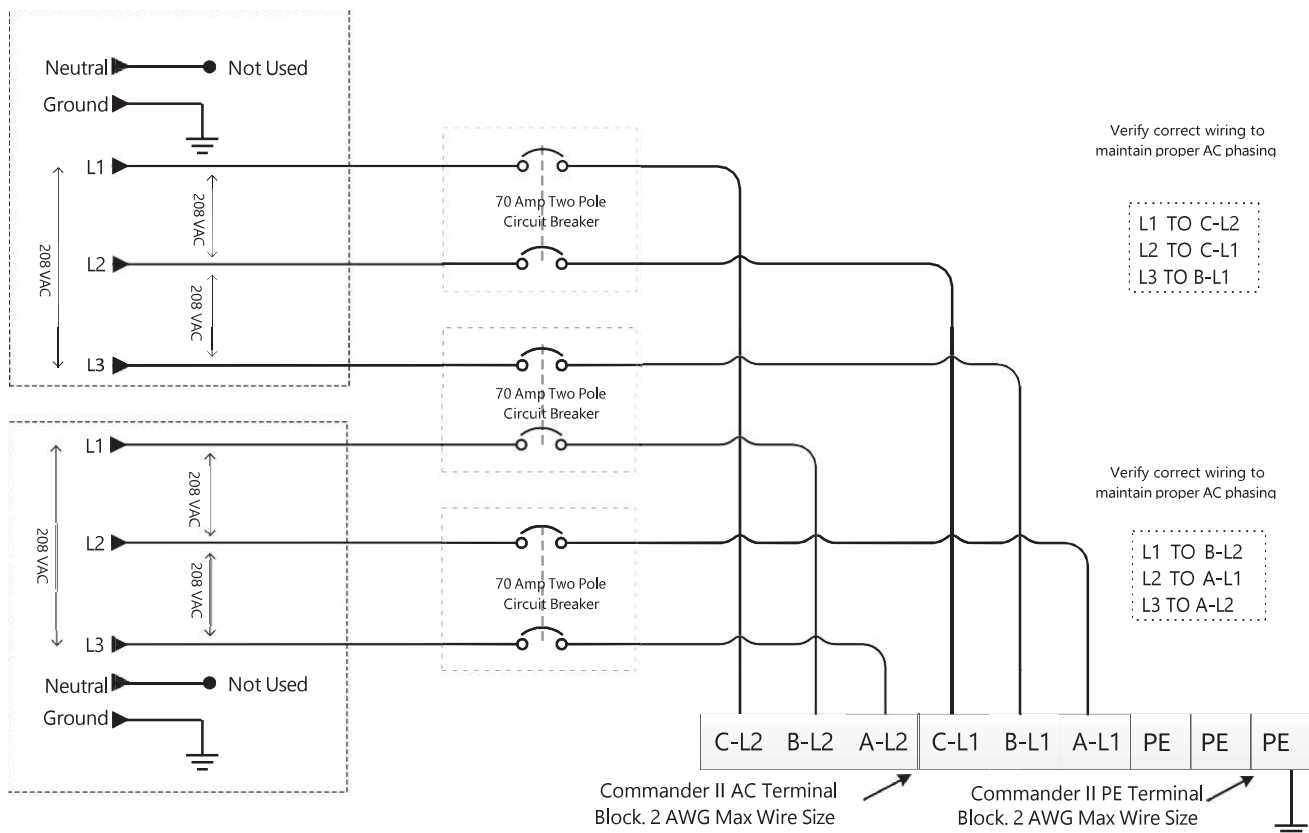
- Login to the controller via the web GUI
- Navigate to the **Input Logic** page, after the last entry press the  icon to add a logic expression
- From the 1st drop down menu, select **Measurement and Controls > Input > Ambient Temperature**
- From the 2nd drop down menu, select **Measurement and Controls > IO Board > IO Board 1 Temperature 2**
- Press the Save button to implement changes
- Navigate to the **Alarm Configuration > Alarm Configuration > General Alarms**
- Expand the **General Alarms** by selecting the +
- Enable the **Ambient Temperature Faulty, Ambient Temperature High, and Ambient Temperature Low** alarms
- Press the Save button to implement changes
- This addition can be accomplished with power to the system enabled. Exercise extreme caution when working with energized equipment. It may be necessary to refresh the browser after completion.

This addition can be accomplished without power to the system by utilizing the USB connection on the front of the controller. Upon completion of the programming, the ambient temperature sensor will show a fault. This is normal as the IO board does not receive power when programmed from the USB without power enabled.

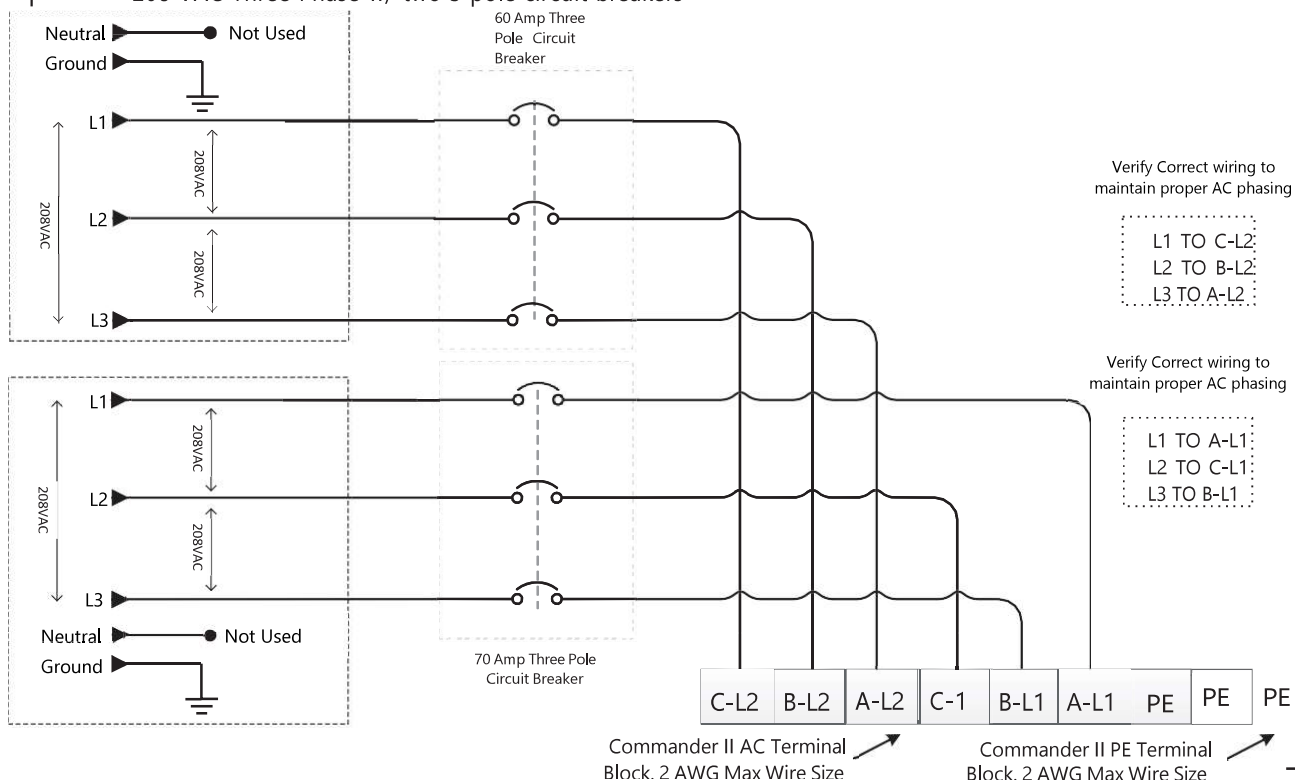
Commander II Series AC Input Wiring Options

Note: AC wiring should only be performed by qualified electrician or technician familiar with AC wiring practices and local electrical code.

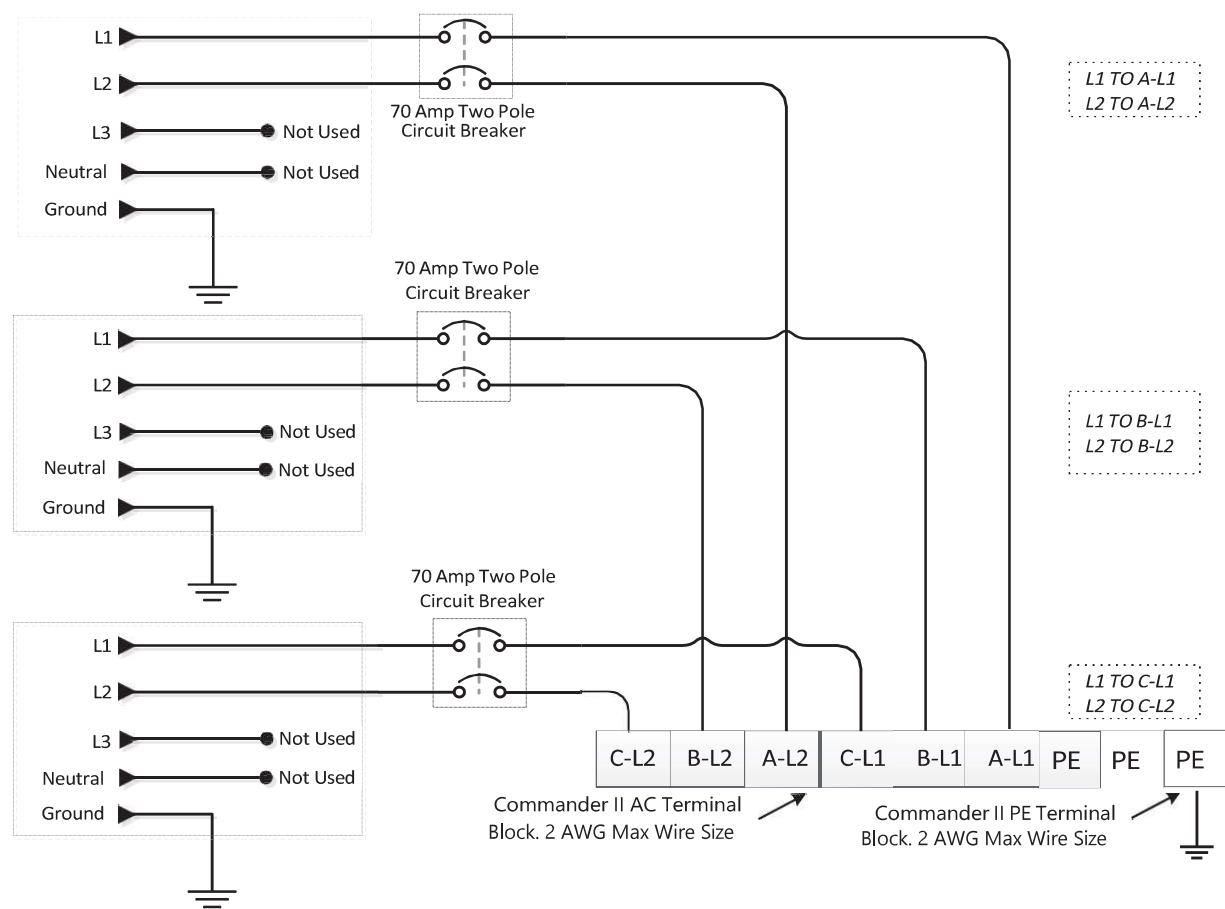
Option 1: 208 VAC three Phase w/ three 2 pole circuit breakers



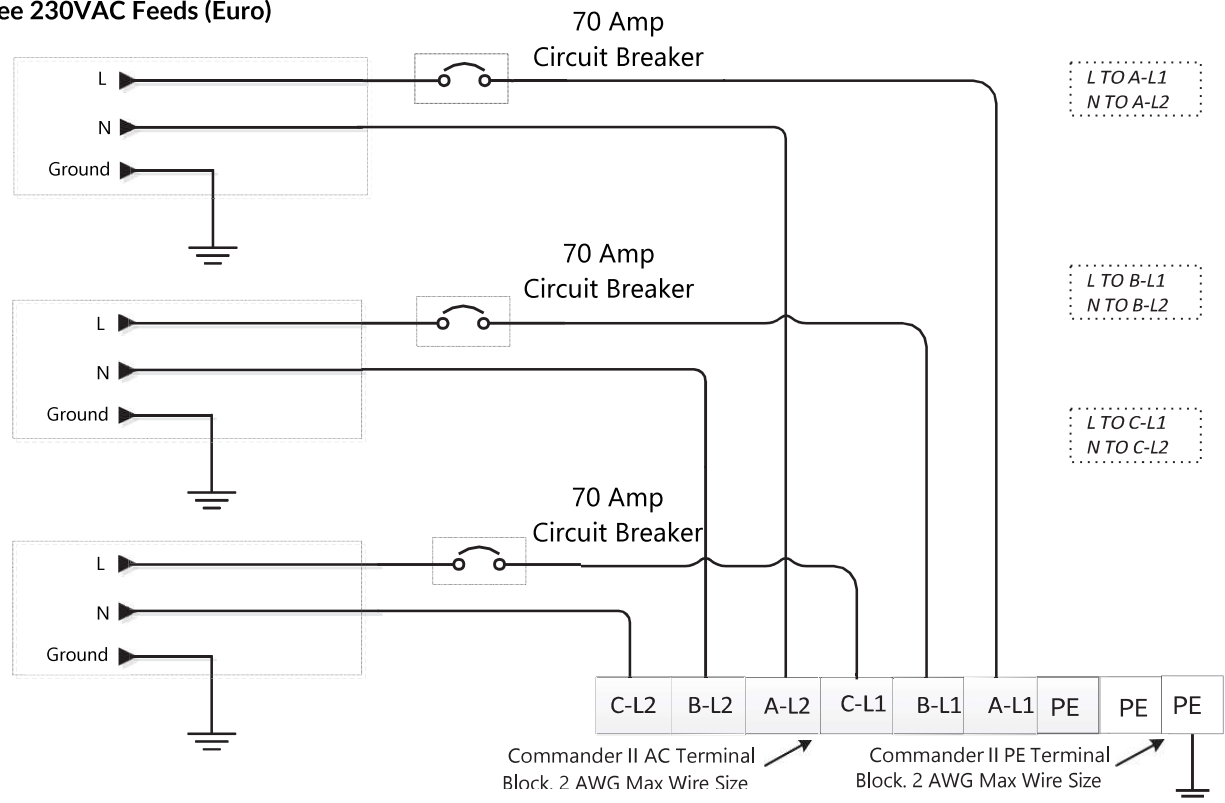
Option 2: 208 VAC Three Phase w/ two 3 pole circuit breakers



Option 3: Three 230VAC Single/Split Phase Feeds



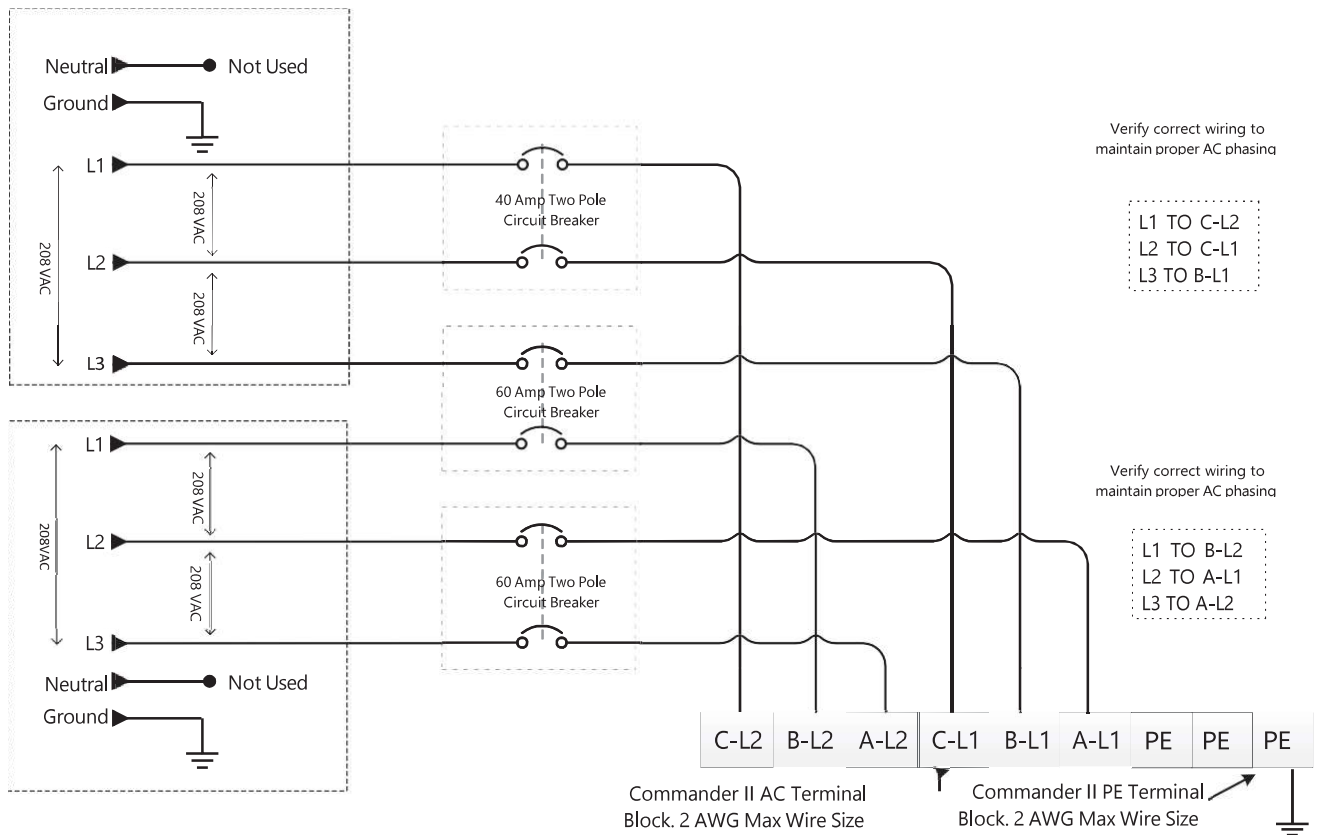
Option 4: Three 230VAC Feeds (Euro)



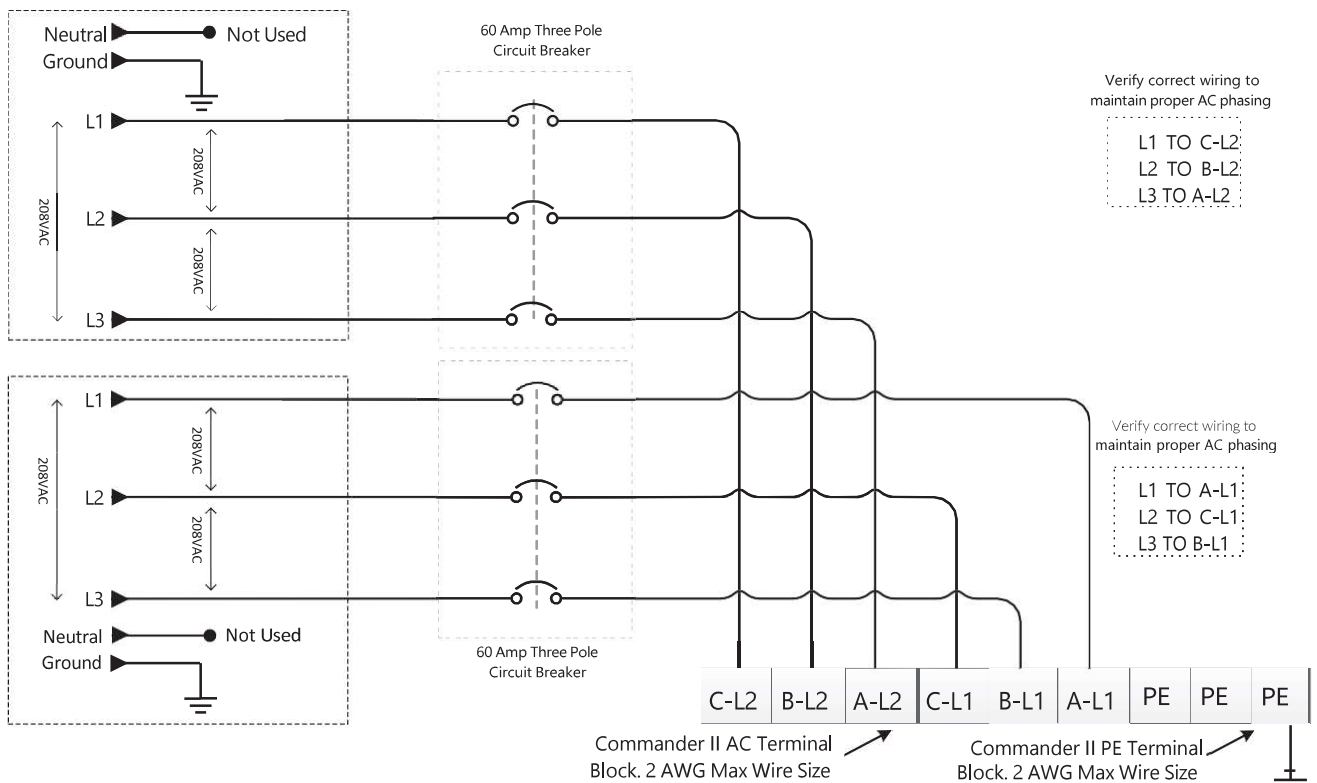
Commander II+ Series AC Input Wiring Options

Note: AC wiring should only be performed by qualified electrician or technician familiar with AC wiring practices and local electrical code.

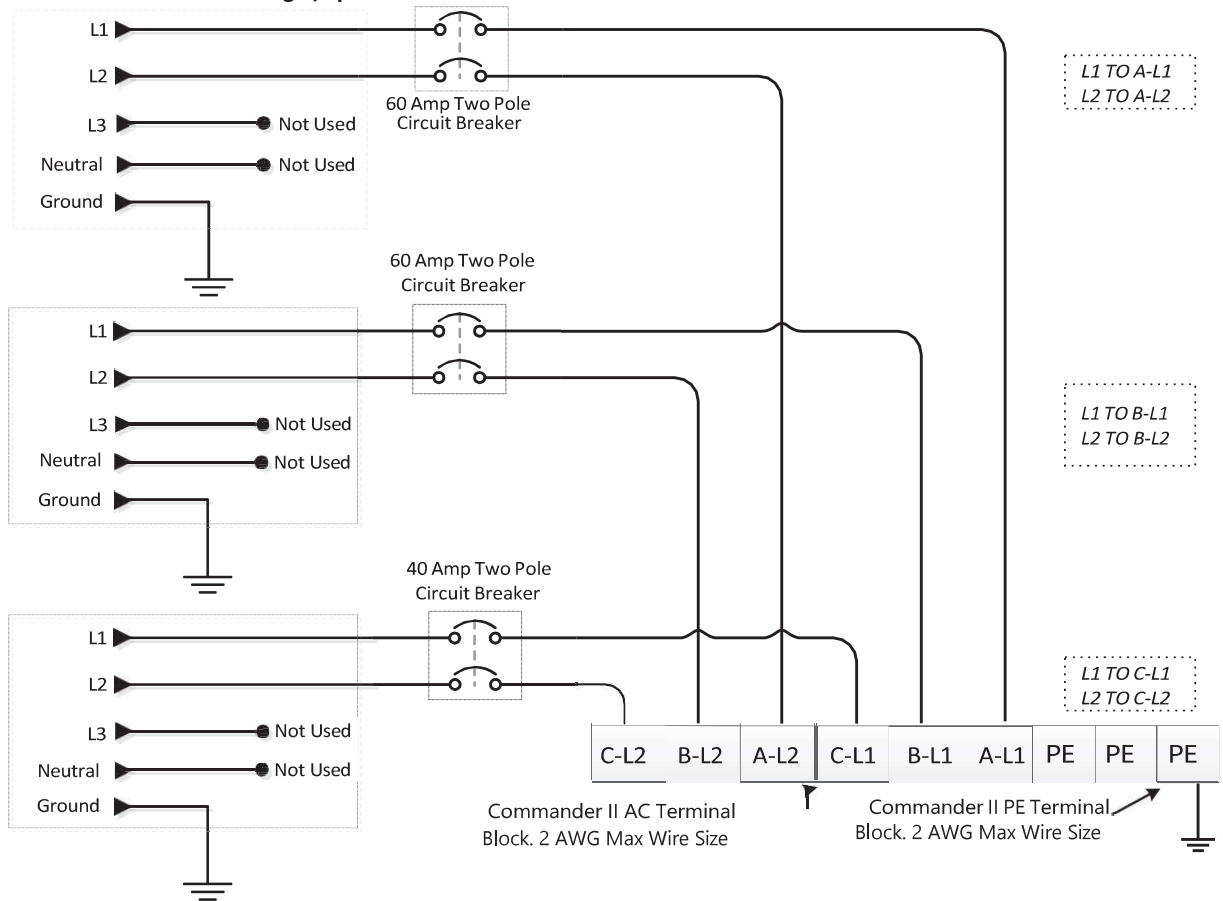
Option 1: 208 VAC three Phase w/ three 2 pole circuit breakers



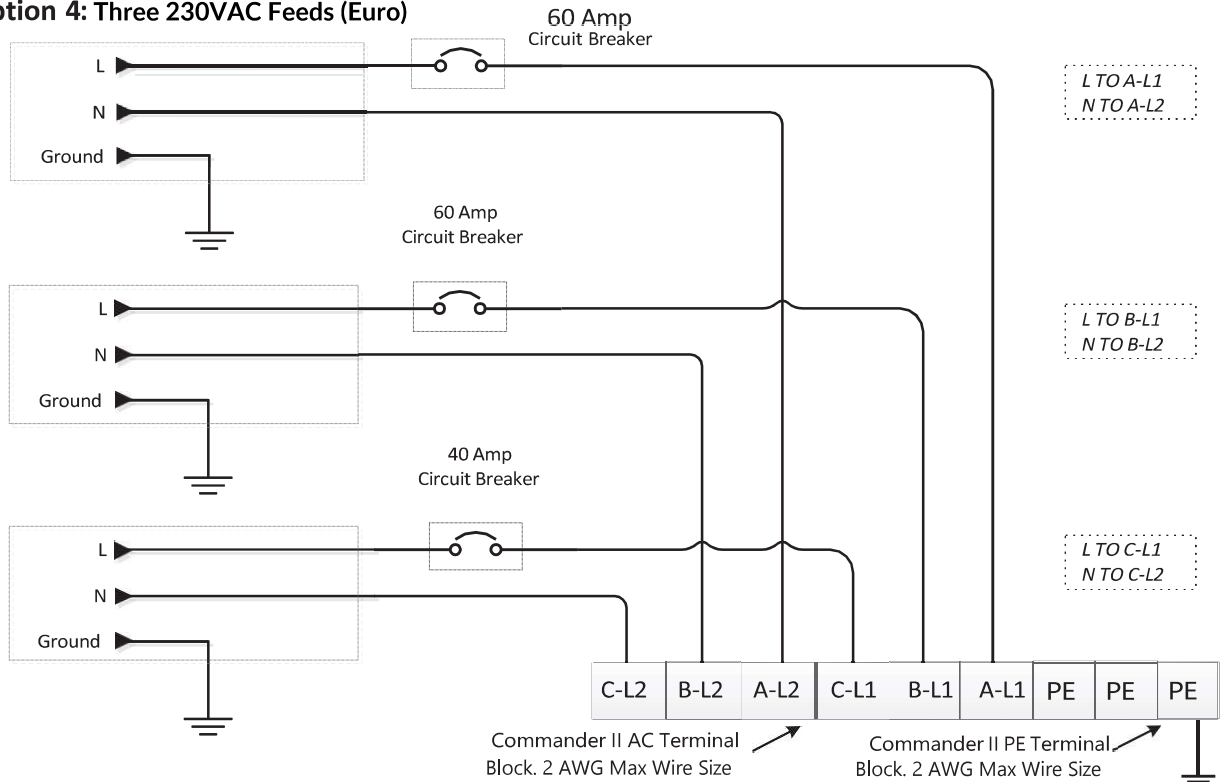
Option 2: 208 VAC Three Phase w/ two 3 pole circuit breakers

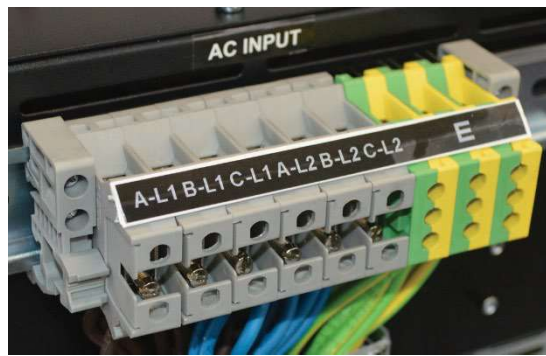


Option 3: Three 230VAC Single/Split Phase Feeds



Option 4: Three 230VAC Feeds (Euro)





AC Input Terminals

COMMANDER II SERIES SHELF (FRONT)

EACH PAIR OF AC INPUT TERMINALS (L1/L2) FEEDS FOUR RECTIFIER BAYS (COMMANDER II) OR THREE RECTIFIER BAYS (COMMANDER II+). BAYS HIGHLIGHTED IN GREEN ARE ACTIVE.

COMMANDER II

1	2	3	4
5	6	7	8
9	10	11	12

1	2	3	4
5	6	7	8
9	10	11	12

1	2	3	4
5	6	7	8
9	10	11	12

3KW RECTIFIER CURRENT DRAW: @208VAC
= 15.3A @230VAC = 13.9A

COMMANDER II+

A-L1/A-L2
Input

DC-DC
CONVERTOR BAYS

1	2	3	4
5	6	7	8
A	B	C	D
E	F	G	H

B-L1/B-L2
Input

DC-DC
CONVERTOR BAYS

1	2	3	4
5	6	7	8
A	B	C	D
E	F	G	H

C-L1/C-L2
Input

DC-DC
CONVERTOR BAYS

1	2	3	4
5	6	7	8
A	B	C	D
E	F	G	H



Commander II Series

The Powerful Difference

Manual

Product Compliance



RoHS

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Manual Version 1.1

Release Date: 30 JUL 2022

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M-CMDRII 063022

SECURESYNC 2400

Resilient Time and Frequency Synchronization Platform



Resilient Timing for Evolving Requirements

Resilient Timing depends on securing the time reference acquisition and timescale keeping, in the face of GNSS interference. Government recommendations, like the Executive Order in the US or the Cybersecurity Act in European Union, pave the way for future regulations in this domain.

The SecureSync product ecosystem offers a number of solutions to address GNSS threats. With a layered-defense approach, each protective layer increases the sophistication required to compromise, minimizing chances for successful attack.

SecureSync relies on the proven Interference Detection Suite, allowing jamming and spoofing detection. Threats are mitigated by high-performance internal oscillators, or through strong modularity and choice of input interfaces, building redundancy into the timing system architecture.

Whatever your industry, there is a cost-effective SecureSync configuration that keeps your time distribution accurate and available.

- Multi-GNSS synchronization (GPS, Galileo, GLONASS, BeiDou, QZSS)
- GPS jamming and spoofing detection option
- Internal precision timekeeping via TCXO, OCXO or Rb oscillator
- Supports a wide variety of available input/output signals
- Modular (configure-to-order)
- Exceptional operating temperature range of -20°C to +65°C
- High bandwidth NTP
- PTP v2 Master/Slave
- Dual Gb Ethernet
- Secure network management: Enable or disable protocols for encryption, authentication, authorization and accounting
- REST API management
- Alert notifications via SNMP traps and email alert
- Industry-leading five year limited warranty

Safran Electronics & Defense is with you every step of the way, building in the intelligence that gives you a critical advantage in observation, decision-making and guidance.



Security

SecureSync 2400 is designed with security in mind, combining cybersecurity best practices, including VLAN support account/access management, authentication, encryption, security event logs, network features disabling, as well as regular, secured firmware updates to keep pace with the latest vulnerabilities and protocol improvements.

Networking that Scales

SecureSync 2400 provides strong and scalable networking capability, thanks to higher embedded processing power. Two Gigabit Ethernet ports (one RJ45, one SFP) are available on the base unit enabling flexible network synchronization as a NTP server or PTP slave/master, as a NTP stratum 2 server, or as a PTP slave/boundary clock.

New generation network option cards (1204-49 and 4A) provide additional dual and quad Gigabit Ethernet SFP ports, embedding their own processing capability and offering further capabilities as NTP server and future PTP slave/master. Scaling up network timing distribution or adding timing redundancy in the network becomes easy.

Modularity

For applications that use “physical” timing signals and require multiple interface types, SecureSync 2400 offers unmatched modularity and a choice of more than 40 option cards.

The base unit provides configurable Input/Output timing interfaces (TTL pulse, RS232/RS485, IRIG AM /DCLS), on top of 10 MHz and 1 pps outputs. If more interfaces are needed, the base unit supports either 2 (2402) or 6 (2406) option card slots, enabling whatever combination of frequency, phase, NMEA or Have Quick time codes, and network synchronization is needed.

Reliability

At the appliance level, SecureSync includes an optional, dual (redundant), hot swappable power supply combined with AC, 12 VDC or 24/48 VDC power modules. Modularity enables multiple time reference management as well as redundant time distribution architectures, which is instrumental to system-level reliability. Any failure is identified and reported in real time, reducing periods of unavailability.

Monitoring

SecureSync 2400 embeds local and remote monitoring tools, including detailed event logs, real-time access to health and operation status, timing performance graphs, and alerts. Integration into automated monitoring systems is supported with legacy protocols like SNMP as well as the more recent REST API. Quick, local diagnostics are accelerated thanks to the front panel indicators and OLED display.



Technical Specifications

Specifications

See option card descriptions for additional performance specifications.

10 MHz Frequency Output:

Internal Oscillator	TCXO	OCXO	OCXO LPN	Rubidium	Rub LPN
Accuracy (average over 24 hours when GPS locked)	5x10 ⁻¹²	4x10 ⁻¹²	3x10 ⁻¹²	1x10 ⁻¹²	1x10 ⁻¹²
Medium Term Stability (without GPS after 2 weeks of GPS lock)	1x10 ⁻⁸ / day	5x10 ⁻¹⁰ /day	2x10 ⁻¹⁰ / day	5x10 ⁻¹¹ /month (3x10 ⁻¹¹ /month typ)	
Short Term Stability (Allan Deviation)					
1 sec	2.5x10 ⁻⁹	1x10 ⁻¹¹	1x10 ⁻¹¹	1x10 ⁻¹¹	1x10 ⁻¹¹
10 sec	1x10 ⁻⁹	9x10 ⁻¹²	9x10 ⁻¹²	9x10 ⁻¹²	1x10 ⁻¹¹
100 sec	5x10 ⁻¹⁰	9x10 ⁻¹²	8x10 ⁻¹²	4x10 ⁻¹²	5x10 ⁻¹²
Temperature Stability (peak-to-peak)	1x10 ⁻⁶	5x10 ⁻⁹	2x10 ⁻⁹	1x10 ⁻¹⁰	1x10 ⁻¹⁰
Phase Noise (dBc/Hz)					
@1 Hz	—	-95	-100	-80	-100
@10 Hz	—	-123	-128	-98	-128
@100 Hz	-110	-140	-148	-120	-148
@1 kHz	-135	-145	-150	-140	-150
@10 kHz	-140	-150	-150	-140	-150
Signal Waveform & Levels: +13 dBm Sine into 50 ohm, BNC					

1 PPS Timing Output

	TCXO	OCXO	OCXO LPN	Rubidium	Rub LPN
Accuracy to UTC (locked to GPS, @ 1 sigma)	±50 ns	±25 ns	±15 ns	±15 ns	±15 ns
Holdover (constant temp after 2 weeks of GPS lock)					
After 4 hours	12 µs	1 µs	0.5 µs	0.2 µs	0.2 µs
After 24 hours	450 µs	25 µs	10 µs	1 µs	1 µs
Signal Waveform & Levels: TTL (5 Vp-p), into 50 ohm, BNC					

Timing Signals

10 MHz Sine Output, BNC

SW Configurable Timing Output, BNC

- TTL Output (1 PPS, xPPS [output only], IRIG DCLS, HAVE QUICK)

SW Configurable Timing Input/Output, HD-15

- TTL Input/Output (1 PPS, xPPS [output only], IRIG DCLS, HAVE QUICK)
- RS-232 Input/Output (NMEA, ASCII ToD)
- RS-485 Input/Output (1 PPS, xPPS [output only], IRIG DCLS, HAVE QUICK, NMEA, ASCII ToD)

only], IRIG DCLS, HAVE QUICK, NMEA, ASCII ToD)

- IRIG AM Output

Network Services

Timing

- NTP v2, v3, v4: Conforms with RFC 1305 and 5905. Supports Unicast, Broadcast, Multicast, Symmetric Key Encryption, Peering, Stratum 2
- SNTP v3, v4: Conforms with RFC 1769, 2030, 4330, and 5905
- PTP v2: Conforms with IEEE 1588:2019. Supports Master, Slave, E2E, IPv4/v6, Multicast, Unicast, Hybrid modes
- PTP supported profiles: default, power (IEEE 61850-9-3, IEEE C37.238-2011/2017), telecom (ITU-T G.8265.1, G.8275.2 master only)

Management & communications

- IPv4/IPv6: Dual stack
- VLAN support
- DHCPv4/DHCPv6 (AUTOCONF)/SLAAC: Automatic IP address assignment
- Syslog: Logging
- HTTP(S): Browser-based configuration and monitoring
- REST API configuration and monitoring
- (S)FTP Server: Access to files (logs, etc.)
- SNMP: Supports v1, v2c, and v3 (no auth/auth/priv) with Enterprise MIB
- SMTP: Email

Security Features

- Configurable Password Policy
- Authentication: LDAP, RADIUS, TACACS+
- Enable/Block protocols
- Access Control Lists
- HTTP Strict Transport Security (HSTS) support
- SSL/SSH
- TLS v1.2, v1.3
- SFTP/SCP: Securely transfers files to and from the time server over an SSH session
- SNMP v3: Remotely configure and manage over an encrypted connection
- Alert notifications via SNMP traps and email
- Signed software updates

GNSS Receiver

- Connector: Type SMA with Type N cable adapter, +5V to power active antenna (+3.3V for optional SAASM)
- Frequency: GPS L1 (1575.42 MHz), Galileo E1 (1575.42 MHz), GLONASS L1 (1602.0 MHz), BeiDou B1 (1561.1 MHz), QZSS L1 (1575.42 MHz).
- Satellite tracking: 1 to 72, T-RAIM satellite error management
- Synchronization time: cold start < 15 minutes (includes almanac download), warm start < 5 minutes (assumes almanac downloaded)
- Antenna system: sold separately.

Communications

Network Port

- Dual Gb Ethernet (one RJ-45, one SFP)

Serial Set-up Interface

- RS-232 communications on front panel micro USB, rear panel RJ-45

Front Panel

- LED segments for time display
- OLED menu display and keypad for status and basic configuration
- LED status buttons with one-click menu access

Power

- Fixed 100-240 VAC, 50/60 Hz, 310% from IEC60320 (option 0) connector; power cord included
- Fixed 12 VDC (option 3) or 24/48 VDC (option 4); mating connector and cable clamp included
- Optional dual hot-swap power with load-sharing and failover

Power Draw

- TCXO: 40 W normal (50 W start-up)
- OCXO: 40 W normal (50 W start-up)
- Rubidium: 50 W normal (80 W start-up)

Environmental

	Operating	Storage
Temp	-20 to +65°C (+55°C for Rb)	-40 to +85°C
Humidity	0%-95% RH non-condensing @ 40°C	
Altitude	100-240 VAC up to 13,123 ft (4,000 m)	45,000 ft (13,700 m)
Shock	MIL-STD-810H, 516.8 15g, 11 ms halfsine	
Vibration	MIL-STD-810H, 514.8C-2 cat 4 and 514.8D-11, cat 21 1.1 g rms vertical and 0.8 g rms longitudinal	

Agency Approvals

- CE, TUV, cTUV, FCC part 15 class A, RoHS, REACH, WEEE

Physical & Environmental

Size/Weight

- Designed for EIA 19" rack, 17.1" W x 1.74" H (1U) x 15.17" D (434 mm W x 44 mm H x 385 mm D)
- Weight : 6.0 lbs (2.72 kg) for base unit with AC power supply
- Front rack mount hardware included (assembly required)

Warranty

Five Year Limited Warranty¹

- Oscillator for rubidium option is warranted for two years
- Extended warranty is available

¹The warranty period may be dependent on country.

Ordering Information

Base Units

240w-xyz

Select expansion capability, power, internal oscillator and GNSS options:

w = Expansion	x = Power	y = Internal Oscillator	z = GNSS Reference
2 = 2 Option Slots 6 = 6 Option Slots	0 = AC 3 = 12 VDC 4 = 24/48 VDC 6 = Dual Hot-Swap support ²	0 = TCXO 1 = OCXO 2 = Low Phase Noise OCXO 3 = Rubidium 5 = Low Phase Noise Rubidium	3 = Multi-GNSS

² Dual Hot-Swap requires ordering at least one power module (see power module options below), on top of power option 6 for the base unit .

Example

A SecureSync with 6 slots base unit with fixed AC power, OCXO internal oscillator, and GPS as the primary reference is Model Number 2406-013. Order option modules for additional input/ output functions.

A SecureSync with 2 slots base unit, with Dual Hot Swap AC power supplies, rubidium internal oscillator and GPS as the primary reference requires Model Number 2402-633 and the addition of 2 power supply module 2400-HS-A1

Optional Upgrade

SS-OPT-BSH: GPS Jamming and Spoofing Detection

Option Modules

Up to 2 or 6 option modules can be accommodated per unit.

See Option Module Card datasheet for details.

Power Modules

Up to 2 power modules, from below list, shall be ordered with the Dual Hot-Swap power option 6:

- 2400-HS-A1: 100-240 VAC.
- 2400-HS-D1: 12 VDC Hot Swap Power module.
- 2400-HS-D2: 24/48 VDC Hot Swap Power module.

Accessories

- I/O timing signals breakout cable enables conversion from single HD-15 connector to individual BNC and Sub-D connectors
- SFP (copper, FO Single Mode, FO Multi-Mode)
- Ancillary kit, rugged installation

**POWERED
BY TRUST**

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Analog Simulcast over IP: Integrated Voice & Paging Solution



TaitNet AS-IP analog simulcast networks are IP-based analog systems that are specifically designed to provide conventional simulcast analog communications over wide geographic areas.

AS-IP networks can stand-alone, or an analog simulcast overlay can be added to new or existing Tait P25 networks, for analog voice and paging applications.

TaitNet AS-IP networks deliver a lower total cost of ownership by providing advanced functionality with less equipment, better coverage on a single frequency and investment protection for your future needs.

Advanced Functionality

The TaitNet AS-IP system architecture is composed of a master base station with multiple satellites to form a channel. A console gateway can be added to connect to a dispatch solution. This system can be improved with the Tait Enable suite applications or other standard 3rd party analog equipment.

Integrated Equipment

Using significantly less equipment than a typical analog simulcast network, TaitNet AS-IP incorporates voting and site control into the cleverly designed TB9400 base station for efficiency and increased resiliency.

Better Coverage

Simulcast transmission provides a means of achieving wide-area coverage with multiple transmitters utilizing a single frequency for voice and paging solutions.

Investment Protection

The Tait AS-IP network portfolio is based on the latest 9400 Tait products, providing a compact solution that can grow with your customer's needs for both Analog and P25 solutions.

Easy Migration Path

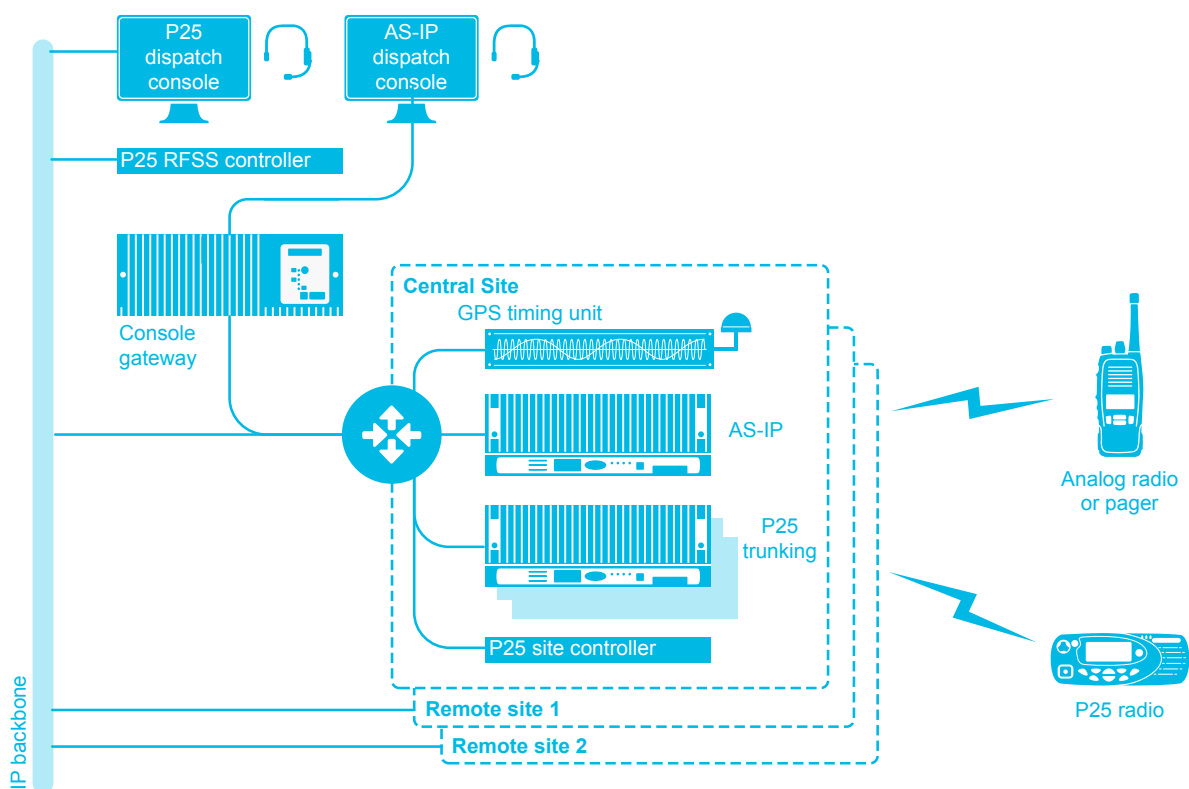
The TaitNet AS-IP network utilizes the latest Tait 9400 products that are also utilized in Tait P25 networks for Phase 1 and Phase 2 operation. This allows for full re-use of our AS-IP hardware platform and licences when customers are ready to migrate to a P25 solution.





TaitNet AS-IP Analog Simulcast overlay on P25 trunking networks.

AS-IP trunking can complement a P25 network by adding an analog simulcast overlay to a P25 trunking solution, allowing analog voice and paging applications or legacy analog radio users such as mutual aid channels.

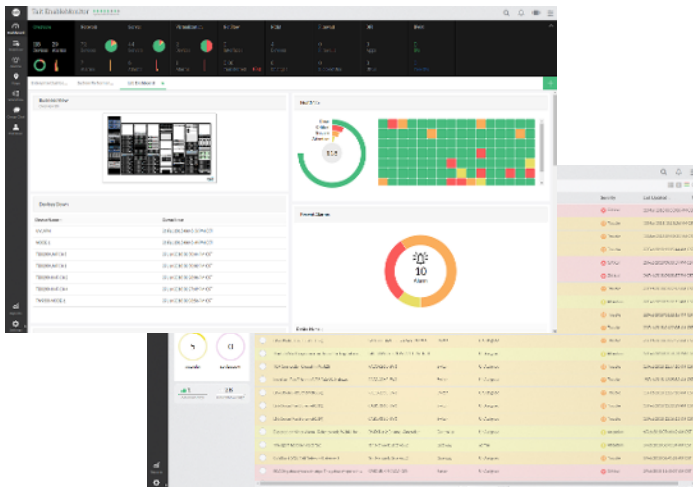


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Overseeing your network health

Real-time monitoring gives assurance that your network is operating as expected, and allows you to minimize impacts if problems occur.



KEY FEATURES

- Real-time system health status that helps you diagnose issues early, and reduce your network downtime
- Proof that your network is operating efficiently
- Reporting on your IT network availability and infrastructure
- Alerts and alarms when there is an issue
- Standards-based technology for interoperability
- Automatic discovery and configuration for simplified setup
- Secure access to performance data anywhere, anytime
- Redundancy options for guaranteed performance
- Support for peace of mind



FEATURES AND BENEFITS

Real-time system health status for early issue diagnosis

EnableMonitor shows real-time status information about your network, including latency and packet loss. This information enables you to quickly identify potential issues and resolve them before they affect your communications system, reducing your network downtime and maximizing your return on investment.

Proof that your network is operating efficiently

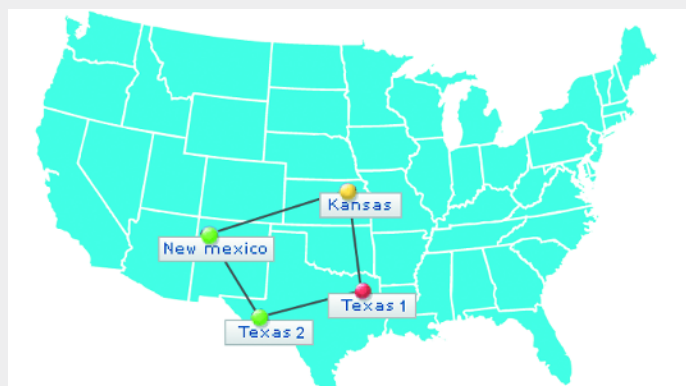
It has never been easier to see what is happening on your Tait radio network. EnableMonitor has configurable viewing and reporting options to suit your specific network application, including topological maps, schematic diagrams and lists of devices.

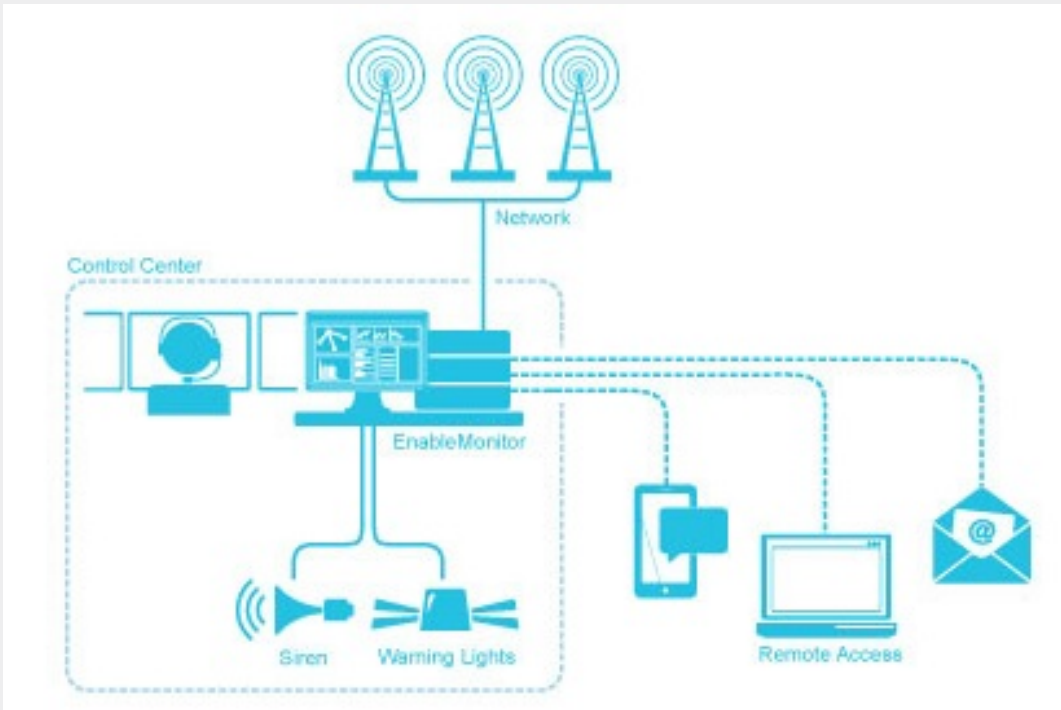
Reporting on your IT network availability and infrastructure

EnableMonitor can also report on the health and availability of infrastructure on your IT network. Each object in your network is represented by an icon that changes color as its status changes. Operators can quickly scan the list of objects and easily determine where problems are occurring and what the problems are.

Alerts and alarms when there is an issue

Network administrators can set up email or SMS notifications for specific alarms, or flashing lights and sirens if there is a major problem, so you can quickly identify and isolate the cause of a problem and resolve it.





FEATURES AND BENEFITS cont.

Standards-based technology for interoperability

EnableMonitor uses Internet standards such as SNMP, ICMP and Windows Management Instrumentation (WMI) to monitor and communicate with devices attached to the network.

For a complete view of your network, EnableMonitor can also be configured to communicate with non-SNMP devices through a protocol mediator and devices from third-party suppliers.

Automatic discovery and configuration for simplified setup

EnableMonitor uses automatic discovery to quickly identify and configure the Tait-supported devices on your network.

Secure access to performance data anywhere, anytime

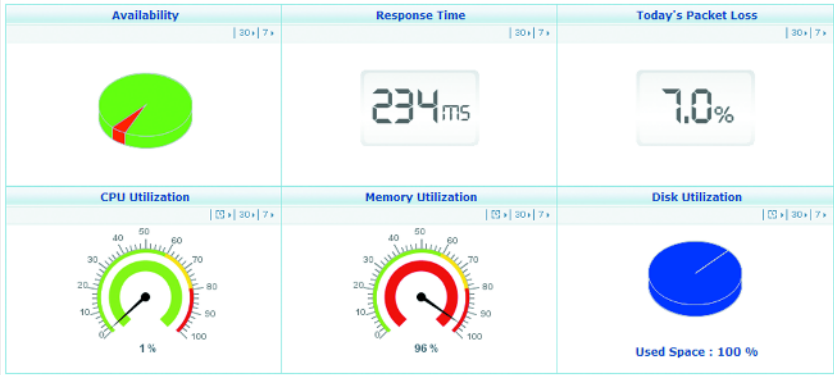
EnableMonitor can be securely accessed via the web, including from smartphones, so that you can remotely view network alarm and monitoring information whenever and wherever you need to.

Redundancy options for guaranteed performance

A secondary or standby server can automatically start monitoring the radio network if a primary server fails. The standby server also triggers an alert about the failure, and once the primary server is restored, it automatically returns to standby mode.

Support for peace of mind

Tait engineers and support staff work alongside you to provide a comprehensive and clear commissioning process. Tait also provide installation and managed services for the Tait Enable suite.



GENERAL

Delivery Options	EnableMonitor is delivered as a complete hardware and software solution, configured and installed for ease of use.	
Minimum Hardware Requirements	Essential Architecture - one server Enterprise-class Distributed Architecture - minimum of two servers Dell R220 Server	
Licensing Options	100 or 250 Interfaces	500, 1000, 2500 Interfaces
Processor	2.0 GHz	Dual Core 3.5 GHz
Memory	4GB	4GB
Free Hard Disk Space	20GB	40GB
NIC	10 Mbps	100 Mbps
Video Display Resolution	1024 x 768 or higher	1024 x 768 or higher
Operating Systems Supported	Windows Server 2012 R2, Operating System 64-bit	
Recommended Browsers	IE 11 and above Firefox 18 and above Chrome 24 and above	
Accessories	Ontrack ADU208 Control Relay	
Supported Protocols	SNMP SNMP Trap WMI Syslog Ping/ICMP Telnet/SSH http/https	
Support Devices	Tait TB8200, TB9100, TB9300 & TB9400 Tait TN8271, TN8291, TN9300 & TN9400* Tait TD9300 GridLink Tait EnableProtect Key Management Facility Tait EnableReport Cassidian Site and RFSS Controllers Spectracom SecureSync timing unit Zetron ACOM consoles AVTEC Scout consoles Cisco switches and routers Lantronix switches Moxa switches Mimomax NDL NetGuardian (420)	

*Support for monitoring of operating system and server status.

TAIT COMMUNICATIONS

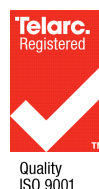
Our clients protect communities, power cities, move citizens, harness resources and save lives all over the world. We work with them to create and support the critical communication solutions they depend on to do their jobs.

Digital wireless communication forms the central nervous system of everything we do. Around this resilient, robust core we design, develop, manufacture, test, deploy, support and manage innovative communication environments for organizations that have to put their total trust in the systems and people they work with. We've worked hard to develop genuine insight into our clients' worlds, and have pursued engineering, operational and services excellence for more than 40 years. This understanding, and our belief in championing open standards technology, means we can give our clients the best possible choice and value to achieve the human outcomes they're driven by.

Tait has taken every care in compiling this specification sheet, but we're always innovating and therefore changes to our models, designs, technical specification, visuals and other information included in this specification sheet could occur. For the most up-to-date information and for a copy of our terms and conditions please visit our website www.taitradio.com. The word "Tait" and the Tait logo are trademarks of Tait International Limited.

Tait International Limited facilities are certified for ISO 9001:2015 (Quality Management System), ISO 14001:2015 (Environmental Management System) and BS OHSAS 18001:2007 (Occupational Health and Safety Management System) for aspects associated with the design, manufacture and distribution of radio communications and control equipment, systems and services. In addition, all our Regional Head Offices are certified to ISO 9001.

Authorized Partners



High performing, multi-mode base stations for mission critical networks.

The Tait TB9400 "High level" base station is a multi-mode platform for analog conventional, MPT, DMR and P25 systems.

It provides both digital frequency and time division multiple access for FDMA and TDMA operations.

The TB9400 offers a spectrally efficient solution, enabling migration path between modes, with greater capacity and thus future proof your investment. It delivers operational efficiency through features such as internal voter capability, Linear Simulcast Modulation (LSM) and remote network management.



KEY FEATURES

- Multi-mode platform supporting Analog Conventional, AS-IP (Analog Simulcast over IP), MPT, DMR Conventional and Trunking, P25 Conventional and P25 Trunking modes
- Simple change of mode through the web interface, or program complex operations with TaskBuilder
- Dual mode automatic switching between Analog and P25 conventional
- Dual mode automatic switching between Analog and DMR Tier 2 (single repeater)
- P25 and analog conventional simplex and DFSI support for ease of migration
- Adherence to P25 standards Phase1 and Phase2 (ultra-narrowband 6.25 kHz) for interoperability
- Tait DMR Access and Express solution compatible
- Simulcast and Voting in AS-IP, DMR and P25 networks
- DMR fallback into single site operation
- Linear Simulcast Modulation (LSM) to increase P25 coverage efficiency
- Migration capability from Tait AS-IP to P25 Conventional network, with dual mode, simplex and DFSI capabilities or to Tait DMR simulcast
- Analog line (supporting 4 wire E&M) in analog mode for RF linking connection and local console support
- Efficient system infrastructure scalability based on IP network connectivity
- Extensive range of remote management and monitoring capabilities with a security focus
- Built-in basic spectrum analyzer provides on-site diagnostics
- Modular structure offers variety of build options to satisfy serviceability or space constraints
- Designed to military standard MIL-STD-810G

FEATURES AND BENEFITS

Delivering on operational needs

- Flexible network design through IP connectivity and linking
- TB9100 channel group compatibility mode
- Transfer data and voice across a packet-switched infrastructure using standard IP communications
- Robust design provides mission-critical voice communications
- P25/DMR Voice over IP (VoIP) support
- Cornerstone of a Tait P25 software-upgradable system
- Quality of Service (QoS) assignments for voice and signalling to allow optimal network packet routing
- Simulcast and Voting solutions for analog conventional, DMR Tier 2 and Tier 3, P25 conventional and trunking systems
- Built-in optional central voting facility selects the best quality signal for transmission
- LSM support means digital P25 simulcast networks require fewer sites
- C4FM simulcast operation
- Multi-DFS support with full control or audio connectivity only in P25 and analog conventional modes
- Simplex support with antenna relay management in P25 and analog conventional modes
- Analog line support in analog conventional mode for console and system connectivity as well as relay and RF linking configurations
- Built-in Continuous Wave Identification (CWID) generation meets FCC call-sign requirements
- Remote software downloads with no impact to operations
- Built-in basic spectrum analyzer provides on-site diagnostics, by way of plotting signal level
- Control, customize, and enhance base station operations with TaskBuilder, by creating rules that extend the functionality of the base station. Rules can control channel changes, digital outputs, timers, and alarms, based on events and external signals

Resiliency to manage risk and enhance safety in challenging environments

- Dual software image support for fast rollback
- Dual diversity not required due to Simulcast and automatic macro diversity
- Integrated Web https secured application to remotely monitor, diagnose and configure
- Tait smart power supply with auto change from AC to DC for easy battery back-up
- Rated for continuous full output power at 60°C ambient
- Rugged construction with efficient heatsinks and front-to-rear fan-forced cooling
- Meets relevant MIL-STD-810G test methods

Designed to support effective deployment

- Compact modular design to minimize rack space and improve serviceability
- Migration paths between analog/ P25 conventional/ P25 trunked networks with extensive re-use
- Migration paths from analog/ MPT networks to DMR with extensive re-use
- Front panel user interface to set device IP address, where required

Delivers on Public Safety

- Benefit from the spectral efficiency, multi-vendor interoperability, security, migration and data capability demanded by P25 standards
- Designed and tested with the DMR Tier 2 Conventional and Tier 3 Trunking standards to provide customers with choice of vendor and equipment
- 6.25 kHz equivalent 2-slot TDMA for both voice and data offers spectral efficiency operation
- Ongoing communications during an outage with failsoft
- Tested using the CAP certification program, providing confidence of multi-vendor interoperability

Efficient management with a focus on security

- Remote network management utilizing built-in secure https web server and SNMP V3 support
- Detailed alarm monitoring and reporting of critical base station/repeater parameters
- 12 digital inputs to monitor external equipment
- Inbuilt diagnostics to allow technicians to remotely confirm optimal operation and identify network faults
- Enhanced security through password protection and access level control on web server
- Multiple user accounts
- System logs to provide audit records
- Ability to configure 4,000 channels to allow single configuration across sites

Future-proofed to protect your investment

- Software configurable, including mode and feature upgrades through software licenses as required
- Software upgradeable to add new features and functionality to ensure that your analog, DMR, or P25 solution is maintained and updated with the ever-changing needs of your market and environment

Wide range of configuration options available

- Configurable as a single channel 100W or 50W unit, or a dual channel 50W unit, with a range of DC and AC power supply options

This document refers to the TB9400 range, including the TB9415, TB9435, TB9444, TB9460, and TB9465.

For more details on these products, please see the TB9400 Catalog.

FREQUENCY BANDS

Frequency	Range	Tait Band	Configuration
VHF	136-174MHz	B1	50W & 100W
UHF	378-420MHz	HH	50W & 100W
	400-440MHz	H1	50W & 100W
	440-480MHz	H2	50W & 100W
	470-520MHz	H3	50W & 100W
700/800MHz	Tx: 762-870MHz*, Rx: 794-824MHz	K4	50W & 100W

* The actual Tx frequency coverage in this band is 762-776MHz, and 850-870MHz

REGULATORY

	P25, Analog FM	DMR
USA (CFR 47)	B1, HH, H1, H2, H3, K4	B1, H1, H2, H3, K4
Canada (RSS-119)	B1, HH, H1, H2, K4	B1, H1, H2, K4
Europe (EN300-113, EN300-086, EN301-489)	B1 ^{1,2} , H1, H2 ¹ , H3	B1 ^{1,2} , H1, H2 ¹ , H3
Australia/New Zealand (AS/NZS4768)	B1 ^{1,2} , H1, H2 ¹ , H3	B1 ^{1,2} , H1, H2 ¹ , H3

¹ CE EN300086 Wideband Approved

² EN301929 Marine Wideband Approved on 100W B1 model

GENERAL

Radio specifications

Frequency stability	±0.5 ppm
Channels	4,000
Channel spacing	12.5 kHz and 25kHz** in analog Phase 1 - FDMA channel is 12.5kHz, and Phase 2 - 2 TDMA voice channels is 6.25 kHz equivalent in P25
Frequency increment/channel step	VHF 2.5kHz/3.125kHz, UHF 5kHz/6.25kHz, 700/800MHz 5kHz/6.25kHz
External frequency reference	10 MHz/12.8 MHz (auto detect)

Physical specifications

Dimensions (HxWxD)	7 x 19 x 15.8 in (177 x 483 x 400 mm) 4U rack space
Weight	Single 100 W: 46.5 lb (21.1 kg) Dual 50W : 54.7lb (24.8kg) Single 50W 43.2lb (19.6kg)
Operating temperature	-22°F to +140°F (-30°C to +60°C)

Power specifications

Power Supply	
DC	12V, 24V, 48V, PMU (+ve or -ve earth)
AC	88-264V (with Power Factor Correction)

Power consumption* (UHF)	120VAC	230VAC	12VDC	24VDC	48VDC
Standby (Single 50 and 100 W)	0.370A, 30W	0.510A, 31W	2A, 24W	0.975A, 23W	0.480A, 23W
Tx @ 50W Single	1.9A, 235W	1.1A, 220W	18A, 216W	9A, 216W	4.2A, 202W
Tx @ 100W	3.3A, 395W	1.7A, 375W	32A, 385W	15.5A, 370W	7.4A, 355W

* Note Transmitter: These figures are specific to UHF, for other bands consult the product specification manual.

** When P25/AS-IP capable firmware is loaded (not available with DMR/Analog firmware)

MILITARY STANDARDS 810G

Applicable MIL-STD	Method	Procedure
Low pressure (Altitude 15,000ft (4,572m))	500.5	2
Humidity	507.5	2
Vibration	514.6	1
Shock	516.6	1

ANALOG LINE

	Input	Output
Audio interfaces	600Ω Balanced	600Ω Balanced
Audio interface level	-30dBm to 0dBm nominal (300Hz to 2,550Hz)	-30dBm to 0dBm nominal (300Hz to 2,550Hz)
Frequency response	+0.5/-2.0dB rel. 1kHz (300Hz to 3,000Hz)	
Passband ripple	-3 ~ +1dB	-3 ~ +1dB
Audio distortion	<3% typical (line to RF)	<3% typical (RF to line)

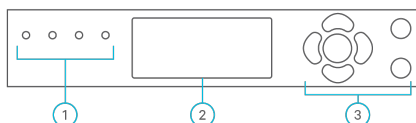
TRANSMITTER

Modulation types	FM, C4FM, LSM, H-DQPSK, FFSK, 4FSK
P25 Modulation fidelity (TIA-102)	<2%
Adjacent channel power	-60dBc (ETSI) and -67dBc (TIA-102)
Conducted spurious emissions	
VHF	<-36dBm 9kHz to 1GHz and <-30dBm 1GHz to 4GHz
UHF	<-36dBm 30MHz to 1GHz and <-30dBm 1GHz to 4GHz/12.75GHz
700/800/900MHz	<-20dBm to 9GHz
Output power	
50W	Programmable 5-50W
100W	Programmable 10-100W
Duty cycle	100%

RECEIVER

Modulation types	C4FM, H-CPM, Analog FM, FFSK, 4FSK
Radiated spurious emissions	<-57dBm EIRP to 1GHz
Conducted spurious emissions	<-90 dBm to 1GHz
P25 (TIA102)	
Sensitivity	0.22μV (-120 dBm) @ 5% BER
Intermodulation response attenuation	85dB
Adjacent channel rejection	60dB
Co-channel rejection	9dB
DMR	
Unfaded sensitivity ETS 300 113	
Typical	-119dBm (0.25μV) @ 1% BER
Selectivity ETS 300 113	
@ 1% BER	≥82dB (VHF), ≥79dB (UHF)
Intermodulation response attenuation	≥78dB @ 1% BER unfaded
Blocking rejection	
> 1MHz	100dB @ 1% BER
Analog	
Sensitivity	-120dBm @ 12dB SINAD (0.22μV)
Selectivity (EIA-603)	85dB (VHF & UHF), 79dB (700/800MHz)
Intermodulation	80dB
Spurious response attenuation	≥100dB (ANSI/TIA) and ≥90dB (ETSI)
FM hum and noise	
VHF/UHF	45dB (ANSI/TIA), 50dB (ETSI)
700/800/900MHz	43dB (ANSI/TIA)

FRONT PANEL



1. Status LEDs
2. 20-character 4-row LCD Display
3. Keypad
4. Flow through ventilation fans x 3 (not pictured)

TAIT NETWORK SOLUTIONS

Backed up by our proven radio network expertise, the TB9400 is part of our larger network offering. The Tait network solution consists of radio units, infrastructure, applications, services and integration with third party interfaces to ensure that your organization can reap all the benefits of the DMR or P25 standard in a mission critical environment.

Tait has taken every care in compiling this specification sheet, but we're always innovating and therefore changes to our models, designs, technical specification, visuals and other information included in this specification sheet could occur. For the most up-to-date information and for a copy of our terms and conditions please visit our website www.taitcommunications.com.

The words "Tait", "TAIT AXIOM", "Tait Unified", the "Tait" logo and are trademarks of Tait International Limited.

Tait International Limited offices and facilities are certified for ISO 9001:2015 (Quality Management System), ISO 14001:2015 (Environmental Management System) and ISO 45001:2018 (Occupational Health and Safety Management System) for aspects associated with the design, manufacture and distribution of radio communications and control equipment, systems and services. Tait Managed Services are certified for ISO 27001:2013 (Information Security Management System).

Authorized Partners



Quality Management
ISO 9001



Environment Management
ISO 14001:2015



Occupational Health & Safety
Management
ISO 45001:2018



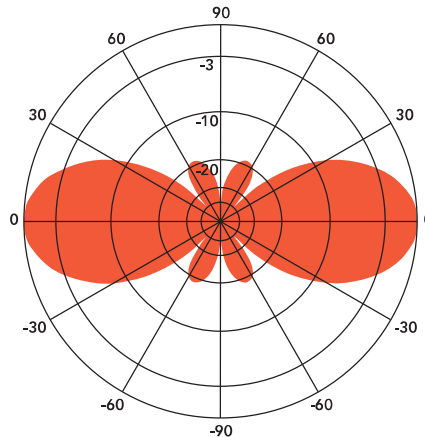
ANT150F2

FIBERGLASS COLLINEAR ANTENNA 2.5 dBd

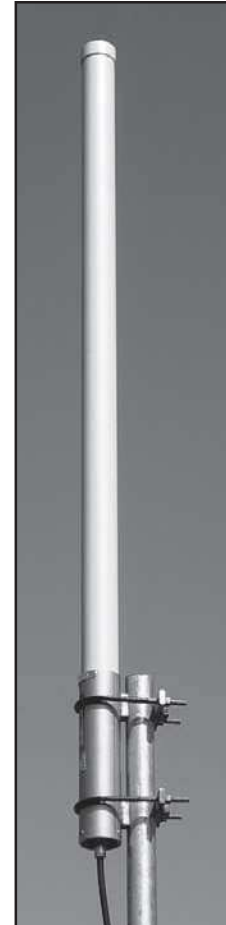
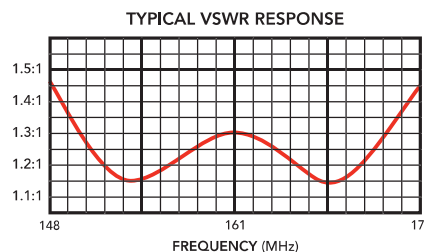
The Telewave ANT150F2 is an extremely rugged collinear antenna, with moderate gain and wide vertical beamwidth. This compact antenna produces 2.5 dBd gain, and is designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, with a path to DC ground for lightning impulse protection.

All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a rugged, high-tech radome to ensure survivability in the worst environments. The "Cool Blue" radome provides maximum protection from corrosive gases, ultraviolet radiation, icing, salt spray, acid rain, and wind blown abrasives.

The ANT150F2 includes the ANTC485 dual clamp set for mounting to a 1.5" to 3" O.D. support pipe, and a 24" removable RG-213 N-Male jumper.



ANT150F2 156 MHz
Vertical Plane
Gain = 2.55 dBd



SPECIFICATIONS

Frequency (continuous)	148-174 MHz	Dimensions (L x base diam.) in.	60 x 2.75
Gain	2.5 dBd	Tower weight (antenna + clamps)	12 lb.
Power rating (typ.)	500 watts	Shipping weight	16 lb.
Impedance	50 ohms	Wind rating / with 0.5" ice	200 / 150 MPH
VSWR	1.5:1 or less	Maximum exposed area	1.3 ft. ²
Pattern	Omnidirectional	Lateral thrust at 100 MPH	50 lb.
Vertical beamwidth	38°	Bending moment at top clamp	67 ft. lb.
Termination	Recessed N Female 7-16 DIN-F opt.	(100 MPH, 40 PSF flat plate equiv.)	

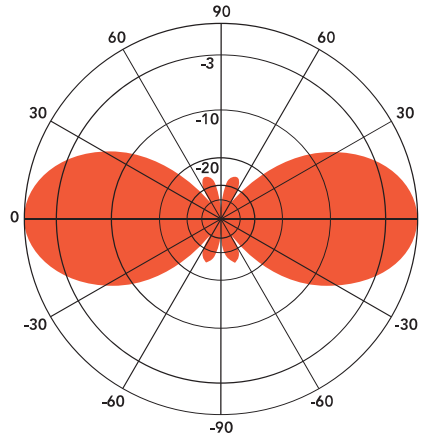
ANT450F2

FIBERGLASS COLLINEAR ANTENNA 2.5 dBd

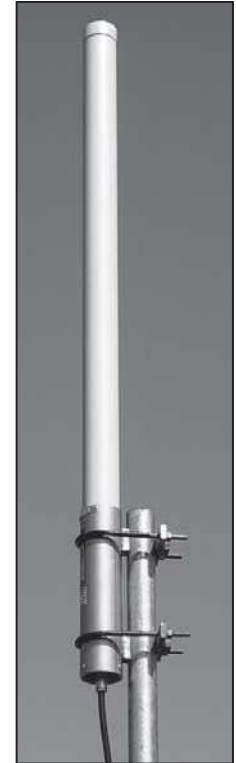
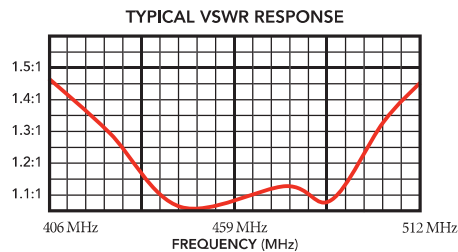
The Telewave ANT450F2 is an extremely rugged collinear antenna, with moderate gain and wide vertical beamwidth. This compact antenna produces 2.5 dBd gain, and is designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, with a path to ground potential for lightning impulse protection.

All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a rugged, high-tech radome to ensure survivability in the worst environments. The "Cool Blue" radome provides maximum protection from corrosive gases, ultraviolet radiation, icing, salt spray, acid rain, and wind blown abrasives.

The ANT450F2 includes the ANT485 dual clamp set for mounting to a 1.5" to 3" O.D. support pipe, and a 24" removable RG-213 N-Male jumper.



ANT450F2 - 459 MHz
Vertical Plane
Gain = 2.54 dBd



SPECIFICATIONS

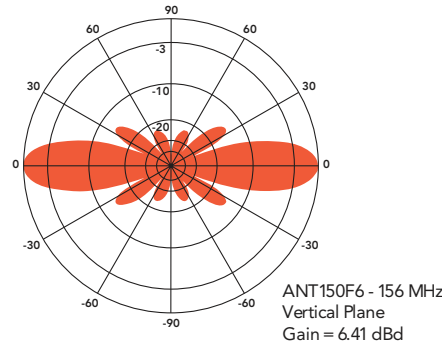
Frequency (continuous)	406-512 MHz	Dimensions (L x base diam.) in.	42 x 2.75
Gain	2.5 dBd	Tower weight (antenna + clamps)	9 lb.
Power rating (typ.)	500 watts	Shipping weight	11 lb.
Impedance	50 ohms	Wind rating / with 0.5" ice	200 / 150 MPH
VSWR	1.5:1 or less	Maximum exposed area	1.0 ft. ²
Pattern	Omnidirectional	Lateral thrust at 100 MPH	38 lb.
Vertical beamwidth	38°	Bending moment at top clamp	30 ft. lb.
Termination	Recessed N Female 7-16 DIN-F opt.	(100 MPH, 40 PSF flat plate equiv.)	

ANT150F6 SERIES

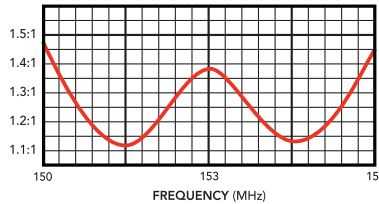
FIBERGLASS COLLINEAR ANTENNA 6 dBd

The Telewave ANT150F6 is an extremely rugged, medium-gain, fiberglass collinear antenna, designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, connected at DC ground potential for lightning impulse protection. All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a high-tech, flexible radome to ensure survivability in the worst environments. IP24

The ANT150F6 includes an ANTC482 dual clamp set for mounting to a 1.5" to 3.5" O.D. support pipe, and a 24" removable RG-213 N-Male jumper. Stand-off and top mounts are also available.



TYPICAL VSWR RESPONSE



FREQUENCY RANGES	
ANT150F6-A	155 - 163 MHz
ANT150F6-B	145 - 151 MHz
ANT150F6-C	151.5 - 157.5 MHz
ANT150F6-D	166 - 173 MHz
ANT150F6-E	165 - 172 MHz
ANT150F6-F	143 - 148 MHz
ANT150F6-G	154 - 162MHz
ANT150F6-SF	153 - 161 MHz
ANT150F6-L	173.1 MHz

FREQUENCY RANGES	
ANT150F6-1	138 - 144 MHz
ANT150F6-2	144 - 151 MHz
ANT150F6-3	150 - 157 MHz
ANT150F6-4	156 - 164 MHz
ANT150F6-5	158 - 166 MHz
ANT150F6-6	161 - 168 MHz
ANT150F6-7	167 - 172.5 MHz
ANT150F6-8	171 - 175 MHz



SPECIFICATION		138-151MHz	150-175MHz	
Frequency (continuous)	138-175 MHz (8 bands)	Dimensions (L x base diam.)	256" x 2.75"	244" x 2.75"
Gain	6 dBd	Tower weight (antenna + clamps)	43 lb.	43 lb.
Power Rating (Type.)	500 watts	Shipping weight	65 lb.	65 lb.
Impedance	50 ohms	Wind rating/ with 0.5" ice	150 / 125 MPH	
VSWR	1.5:1 or less	Maximum exposed area	4.05 ft. ²	4.05 ft. ²
Pattern	Omnidirectional	Lateral thrust at 100 MPH	162 lb.	159 lb.
Vertical beamwidth	20°	Bending moment at top clamp	1090 ft. lb.	1010ft. lb.
Termination	Recessed N Female (7-16 DIN-F opt)	(100MPH, 40 PSF flat plate equiv.)		
Temperature	-40 to 140 Degrees F -40 to 60 Degrees C			

MAX Dispatch

Zetron's IP-based MAX Dispatch console system is designed to meet the varying needs of the dispatch community while providing a low cost of ownership to the customer. Whether it is expanding the positions and interfaces of one system, sharing resources across multiple systems, increasing mobility options for staff or ensuring your control room can interface to legacy and emerging technologies, the MAX Dispatch radio dispatch console provides the customer an easy path on which to move forward.

Features

- **Simpler Operation, Lower Training Cost:** The user interface is designed to focus attention on the incident by reducing screen clutter, improving response times, and therefore reducing user stress. MAX Dispatch requires minimal training and fewer steps to perform tasks and access information.
- **Three workstations** supports standard PC with Media Dock, laptop version, and CommandIQ complete desktop station.
- **Map-based dispatching:** Available for systems that support location services.
- **High reliability:** End-to-end network redundancy keeps the system up and running even if the IP network goes down.
- **Minimize Maintenance Time and Cost:** Configure, troubleshoot and maintain the system from the convenience of the office.
- **Scalable Operations:** The architecture provides scalability for system designs ranging from dedicated LAN network to multi-node, geographically diverse WAN applications.
- Support for PTT/C applications.

MAX Dispatch Standard Console w/ Media Dock:

The MAX Dispatch console is the system element that provides the critical user interface to dispatchers. Each console consists of a Windows®-based client running the MAX Dispatch application software and the optional Media Dock. The console PC is equipped with two, full-duplex Ethernet ports for full network redundancy. If your system has a Media Dock it provides additional audio interfaces and connection points for accessories.

Media Dock Interfaces Support:

- Up to eight speakers.
- Desktop microphone.
- 4-wire or 6-wire headset jackbox.
- PTT and monitor footswitches.
- Four local binary inputs and output that can be used for workstation status.
- Four local relay contact closure outputs.

MAX Dispatch Laptop WorkStation:

The MAX Dispatch Laptop provides the same critical user interface on a Laptop computer running Windows 7 or 10. The application uses the internal speakers and microphone of the laptop. With the laptop you retain full access to your radio, telephone, aux I/O, and paging networks.

CommandIQ for MAX Dispatch

The CommandIQ workstation is a compact, fully functional hardware console option for MAX Dispatch with an embedded PC, internal speaker and microphone, 10.1" touchscreen display, handset, and supports external accessories (e.g., additional speakers, headsets, microphones, footswitches, etc.). Its efficient 15" X 10" x 4.5" footprint saves space on desks, enables it to be stored easily, and is configured to easily wall mount. The CommandIQ workstation provides mobility, flexibility, and adaptability to meet any command center, office, or field work environment while maintaining full access to radio, telephone, auxiliary I/O, and paging networks.



MAX Radio Gateway:

The Radio Gateway serves as the interface point between a radio or base station and the rest of the MAX system. Radio Gateways are available in both analog and digital forms depending on the radio interface requirement.

Supported Features:

- Analog gateways support up to two radio connections.
- Digital gateway supports Ethernet connection to digital base station infrastructure.
- Dual Ethernet ports for network redundancy.
- Analog voice logger output.
- Four binary inputs and outputs for generic site monitoring and control use (analog gateways only). Relay closures available via optional Zetron Model 6080.

Supported Radio Interfaces (Inquire for additional radios supported):

- 2-wire, 4-wire local (PTT/COR).
- Tone Remote Control (per TIA102.BAHA Section 7).
- Analog/conventional radios: Kenwood TK-x180, Motorola XTL 5000 (O5), Harris M7300/XG75, & XG100.
- P25 conventional/trunking radios: Kenwood TK-5x10, Motorola APX 7500 (O5 Mobile), Motorola XTL 5000 (O5 Mobile), Motorola Quantar with DIU-3000 (conventional only), Harris M7300/XG75 & XG100., Viking VM5000.
- Smartnet/SMARTZONE radios: Motorola APX 7500 (O5 Mobile), Motorola XTL 5000 (O5 Mobile), EFJ VM400/600/900.
- EDACS radios: Harris M7300/XG75 & XG100.
- P25 Digital Fixed Station Interface (DFSI) per TIA102.BAHA.
- Kenwood NEXEDGE radios: NX-700/800/900, NX-720/820
- Kenwood NEXEDGE NXR-700/800 Conventional and Trunking Repeaters.
- DMR AIS Tier II and Tier III, Hytera, Tait and JVCKenwood
- MotoTRBO

MAX Infrastructure Gateway (IG):

The IG serves as the interface point between the radio system and the rest of the MAX system. It is server-based and supports both CSSI and DMR Tier III.

Supported Features

- Unit ID Display
- Talkgroup selection
- Group calls (inbound/outbound)
- Inbound emergency group call
- Individual calls (inbound/outbound)
- Inbound emergency alert
- Inbound call alert
- Encryption (non-FIPS, not to console position)
- Manual encryption key load
- KVL encryption key load support
- Static talkpath to talkgroup mapping through console system acceptable
- Long term voice logging support for voice
- Long Term Logging support for Group call source id
- Patching of talkgroups by operator
- Console behavior same as with current radio interfaces providing consistent visual indications for transmit, receive, audio routing, call state
- Console Pre-emption of inbound calls

MAX Central:

The Central is the hardware platform that hosts several software services used in the MAX Dispatch system. These software services provide essential management and control to the system as well as act as a gateway to various third party devices for additional functionality such as telephony gateways, IP voice loggers, MODBUS IP auxiliary I/O devices and Location Services (AVL). It also hosts the service that provides remote console, remote radio gateway and multiple MAX Dispatch site linkage.

Supported Features:

- Dual network connections
- Dual power connections
- Hot standby capability for Z-Node Manager, Telephony Gateway, Portal services and Location Gateway service.
- Long term IP voice loggers supported: Eventide, Exacom, Stancil, CVDS, REVCORD, Higher Ground, NICE, Verint, DSS Corporation.

Specifications:

Hardware

Dimensions (HxWxD)

Media Dock XS: 2.5 x 7.5 x 10 in. (64 x 192 x 254mm)
Central: 1.25 x 7.5 x 10 in. (31.75 x 191 x 254mm)
Radio Gateway: 1.25 x 7.5 x 10 in. (31.75 x 191 x 254mm)

Weight

Media Dock XS: 2.6 lbs (1.2 kg)
Central: 2.5 lbs (1.13 kg)
Radio Gateway: 2 lbs (0.91 kg)

Operating Temperature

Media Dock XS: 0 to 60 °C
Central: 0 to 50 °C
Radio Gateway: 0 to 50 °C

Maximum Power Draw

Media Dock XS: 3W, 200mA (no speakers), 21W (with speakers)
Central: 1.8A @ 10.5 VDC
Radio Gateway: 1A @ 10.5 VDC

Network

Radio Gateway

Payload (per radio): 168 kbps active. Less than 5kbps idle.

Console Workstation

Payload: 84 kbps maximum for each active audio stream (Tx or Rx).
N*84 kbps for simultaneous Tx on N channels.

Packet Loss: < 0.1% (< 1% for non-mission critical).

Packet Delay: < 40 ms for LAN environments; up to 2 seconds for longhaul (long delay) environments.

Packet Jitter: < 20 ms (< 40 ms for non-mission critical).

Network

Infrastructure: 100 Mbps minimum, full-duplex Ethernet.
Switches and routers must be multicast aware.
Mission-critical applications should use a dedicated network.



ZETRON AMERICAS
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(F) +44 1256 880491
(E) uk@zetron.com

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Centre, Stafford QLD 4053,
Australia
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The Power to Respond

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See Zetron price list for option pricing.
Specifications subject to change without notice.

005-1401M December 2018



REQUIRED FORMS

- Bidders Checklist
- Bid Proposal Form
- Bid Schedule Form
- Bid Bond

CITY OF MOSCOW, IDAHO

RADIO SYSTEM UPGRADE PROJECT

February 27, 2024



BIDDER'S CHECKLIST

The Bidder's Checklist is offered to assist the prospective bidder in checking its Bid. This checklist does not relieve the bidder from properly completing its Bid.

Check off when completed:

1. ☒ Are all blank spaces filled out on Bid Form?
2. ☒ Have questions arising from the bidding, contract, specifications or plans been submitted to the proper authority and resolved in the proper manner?
3. ☒ Are Bid amounts shown correctly as well as extensions and totals? Recheck for errors or omissions.
4. ☒ Are authorized signatures properly affixed to the Bid form, giving also title, and Idaho Public Works Contractor license number, evidence of authority to sign, etc.?
5. ☒ Have all plumbing, heating, air conditioning and electrical subcontractors to whom work will be awarded been listed, as well as their Idaho Public Works Contractor license number?
6. ☒ Have all Addenda been received and acknowledged with the proper signature on the Bid Form?
7. ☒ In order for a Bid to be considered, the required attachments must be placed in a properly addressed sealed envelope and delivered to the specified authority prior to the time designated for the bid opening.
8. ☒ Has the Bid Security been enclosed?
9. ☒ Has Bidder performed examinations in accordance with the Instructions to Bidders?
10. ☒ Bidder has carefully studied site conditions, tests, investigations, and technical data which may affect the cost, progress, or performance of the Work.
11. ☒ Has Bidder included Equipment Price Sheet?
12. ☒ Has Bidder included Services Price Sheet?
13. ☒ Has Bidder included Post-Installation Warranty Services Price Sheet?

BID PROPOSAL

TO: Mayor and City Council
City of Moscow, Idaho

Date: February 27, 2024

This proposal is submitted as an offer by the undersigned bidder to enter into contract with the City of Moscow, Idaho as represented by the City Council, hereinafter referred to as the 'CITY' for RADIO SYSTEM UPGRADE PROJECT, (hereinafter "Project"), specified herein and which construction documents are on file with the City Engineer, 504 South Washington Street, Haddock Building, Moscow, Idaho, and which are a condition hereof with the same force and effect as though they were attached hereto. The offer is conditioned on the following declarations as to the facts, intention and understanding of the undersigned and the agreement of the CITY to the terms and prices herein submitted.

1. All Project specifications and drawings examined by the undersigned and their terms and conditions are hereby agreed to.
2. The undersigned certifies that it has received or made itself aware of any and all existing site conditions that may affect the proposed work.
3. It is understood that the contract drawings may be supplemented by additional drawings and specifications in explanation and elaboration of the contract drawings and it is agreed that such supplemental drawings, when not in conflict with those referred to in paragraph 1 above, will have the same force and effect as if attached hereto and that when received they will be considered a part of the contract.
4. The undersigned will furnish separate performance and payment bonds in the full amount of the contract price.
5. The cash, certified check, bid bond, or cashier's check accompanying this proposal shall be forfeited to CITY to the extent of 5% of the amount bid if the undersigned shall fail or refuse to execute the contract, furnish performance and payment bonds, and insurance certificates as required by the specifications within the time limit therein after notification that the said proposal is accepted, all in accordance with the provisions of this proposal and the specifications.
6. The undersigned further agrees that CITY shall have the right to accept or reject any bid which rejection or acceptance is deemed to be in the best interest of CITY.
7. The undersigned agrees to order all necessary equipment and materials within a period of three (3) days after Notice to Proceed has been issued by CITY.

8. The undersigned, as a bidder, acknowledges that Addenda Number 1 through 3, if any, have been delivered to it and have been examined as part of the contract documents.
9. The undersigned agrees to complete all work embraced in the contract within the time limitations set forth in paragraph IB-13 of the Instruction to Bidders.
10. The undersigned holds Idaho Public Work's License Number Pending (See the attached notification from the Idaho DOPL).
11. The undersigned proposes to use the following sub-contractors in the performance of meeting the contract requirements. Information herein must comply with Idaho Code Section 67-2310 and IB-16:

<u>Subcontractors</u>	<u>Trade Specialty</u>	<u>Idaho Public Works License No.</u>	<u>\$ Amount</u>
a. <u>TBD</u>	<u>Electrical</u>		
b. <u>TBD</u>	<u>Concrete Work</u>		
c. _____			
d. _____			
e. _____			

12. The undersigned proposes to furnish labor, materials, equipment and services of all kinds required for RADIO SYSTEM UPGRADE PROJECT as described in the specifications, including all appurtenant work, all as required by the specifications and this proposal for the prices in accordance with the completed schedule contract prices as follows:

BID SCHEDULE

<u>No.</u>	<u>Item Description</u>	<u>Quantity & Unit</u>	<u>Unit Price</u>	<u>Total Price</u>
1.	Radio System Upgrade	1 LS	\$1,934,027.08	\$1,934,027.08

Base Bid Total Price one million nine hundred thirty-four thousand
twenty-seven dollars and eight cents
(Use Words)

13. The undersigned bidder, certifies under penalty of perjury pursuant to the law of the State of Idaho, that the undersigned bidder is an authorized agent to bind the bidder to the terms of this Bid Proposal.

RACOM Corporation
Firm Name of Bidder

201 W. State Street, Marshalltown, IA 50158
Bidders Mailing Address

Pending (See the attached
notification from the Idaho DOPL)
Public Works License No.

Delaware
State of Incorporation if Incorporated

Michael J. Miller

Signature of Bidder

President
Official Title

SEAL (if incorporated)

Dated at February 27, 2024

This 27th day of February, 2024

A copy of the following email exchange is being provided to inform the City of Moscow of our pending Idaho Public Works Contractors License:

RE: Public Works Application

 DOPL Public Works <publicworks@dopl.idaho.gov>
To: Nick Loney; DOPL Public Works

[CAUTION EXTERNAL]

Received, thanks. Please provide password to start my process.

The review of your application may take up to 7-10 business days to process from date of receipt of all requirements. If your license not expired at this time, it would stay in an active status. I appreciate your understanding.

Thanks, Adriana



Public Works Licensing – AB
Office Hours Monday-Friday
7:00–4:00 MST
Building, Construction & Real Estate Bureau
publicworks@dopl.idaho.gov
208-334-4057

11341 W Chinden Blvd.
Building 4
Boise, ID 83714
dopl.idaho.gov

From: Nick Loney <nick.loney@racom.net>
Sent: Friday, February 9, 2024 5:05 PM
To: DOPL Public Works <publicworks@dopl.idaho.gov>
Subject: Public Works Application

CAUTION: This email originated outside the State of Idaho network. Verify links and attachments BEFORE you click or open, even if you recognize and/or trust the sender. Contact your agency service desk with any concerns.

Attached our application for a State of Idaho Public Work Contractors License.

The CC authorization form is password protected and can provide the password by response to the email via reply or phone call.

Also, as our 2023 YE was just completed the only audited financials available is our 2022 report. Our 2023 report will be available in March other we can provide a letter from our bonding company as needed.

Please let me know if anything additional is needed.

Thanks

Nick

Nick Loney
FP&A and Corporate Strategy | Marshalltown, IA
Office: 888-752-1047
Cell: 641-485-6425
nick.loney@racom.net



Document A310™ – 2010

Conforms with The American Institute of Architects AIA Document 310

Bid Bond

CONTRACTOR:

(Name, legal status and address)

RACOM Corporation
201 West State St
Marshalltown, IA 50158

SURETY:

(Name, legal status and principal place of business)

Berkley Insurance Company
475 Steamboat Road
Greenwich, CT 06830
Mailing Address for Notices

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

OWNER:

(Name, legal status and address)

City of Moscow
206 East Third Street
Moscow, ID 83843

BOND AMOUNT: 5% Five Percent of Amount Bid

PROJECT:

(Name, location or address, and Project number, if any)

Radio System Upgrade Project

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this 27th day of February, 2024.


(Witness)


(Witness) Susan Bulman

RACOM Corporation

(Principal)

(Seal)

By: 

(Title) Ryan Veatch, CFO

Berkley Insurance Company

(Surety)

(Seal)

By: 

(Title) Robert F. Laing Attorney-in-Fact

ACKNOWLEDGEMENT OF ANNEXED INSTRUMENT

Acknowledgement by Surety

STATE OF NJ

COUNTY OF Morris

On this 27th day of February, 2024 before me personally came Robert F. Laing who, being by me duly sworn, did depose and say that he/she is an Attorney-In-Fact of Berkley Insurance Company and knows the corporate seal thereof; that the seal affixed to said instrument is such corporate seal, and was thereto affixed by authority of the Power of Attorney of said Company, of which a Certified Copy is hereto attached, and that he/she signed said instrument as an Attorney-In-Fact of said Company by like authority.


NOTARY PUBLIC

CAITLYN J MAGENNIS
Notary Public, State of New Jersey
My Commission Expires Jan 29, 2026

POWER OF ATTORNEY
BERKLEY INSURANCE COMPANY
WILMINGTON, DELAWARE

KNOW ALL MEN BY THESE PRESENTS, that BERKLEY INSURANCE COMPANY (the "Company"), a corporation duly organized and existing under the laws of the State of Delaware, having its principal office in Greenwich, CT, has made, constituted and appointed, and does by these presents make, constitute and appoint: **Susan Bulman-Ditchkus; John P. Hyland; Robert F. Lain; or Thomas J. Henn of NFP Property & Casualty Services, Inc. of Morristown, NJ** its true and lawful Attorney-in-Fact, to sign its name as surety only as delineated below and to execute, seal, acknowledge and deliver any and all bonds and undertakings, with the exception of Financial Guaranty Insurance, providing that no single obligation shall exceed **Fifty Million and 00/100 U.S. Dollars (U.S.\$50,000,000.00)**, to the same extent as if such bonds had been duly executed and acknowledged by the regularly elected officers of the Company at its principal office in their own proper persons.

This Power of Attorney shall be construed and enforced in accordance with, and governed by, the laws of the State of Delaware, without giving effect to the principles of conflicts of laws thereof. This Power of Attorney is granted pursuant to the following resolutions which were duly and validly adopted at a meeting of the Board of Directors of the Company held on January 25, 2010:

RESOLVED, that, with respect to the Surety business written by Berkley Surety, the Chairman of the Board, Chief Executive Officer, President or any Vice President of the Company, in conjunction with the Secretary or any Assistant Secretary are hereby authorized to execute powers of attorney authorizing and qualifying the attorney-in-fact named therein to execute bonds, undertakings, recognizances, or other suretyship obligations on behalf of the Company, and to affix the corporate seal of the Company to powers of attorney executed pursuant hereto; and said officers may remove any such attorney-in-fact and revoke any power of attorney previously granted; and further

RESOLVED, that such power of attorney limits the acts of those named therein to the bonds, undertakings, recognizances, or other suretyship obligations specifically named therein, and they have no authority to bind the Company except in the manner and to the extent therein stated; and further

RESOLVED, that such power of attorney revokes all previous powers issued on behalf of the attorney-in-fact named; and further

RESOLVED, that the signature of any authorized officer and the seal of the Company may be affixed by facsimile to any power of attorney or certification thereof authorizing the execution and delivery of any bond, undertaking, recognizance, or other suretyship obligation of the Company; and such signature and seal when so used shall have the same force and effect as though manually affixed. The Company may continue to use for the purposes herein stated the facsimile signature of any person or persons who shall have been such officer or officers of the Company, notwithstanding the fact that they may have ceased to be such at the time when such instruments shall be issued.

IN WITNESS WHEREOF, the Company has caused these presents to be signed and attested by its appropriate officers and its corporate seal hereunto affixed this 17th day of May, 2022.



Attest:

By

Ira S. Lederman
Executive Vice President & Secretary

Berkley Insurance Company

By

Jeffrey M. Hafter
Senior Vice President

STATE OF CONNECTICUT)

) ss:

COUNTY OF FAIRFIELD)

Sworn to before me, a Notary Public in the State of Connecticut, this 17th day of May, 2022, by Ira S. Lederman and Jeffrey M. Hafter who are sworn to me to be the Executive Vice President and Secretary, and the Senior Vice President, respectively, of Berkley Insurance Company.

MARIA C RUNDBAKEN
NOTARY PUBLIC
CONNECTICUT
MY COMMISSION EXPIRES
APRIL 30, 2024

Maria C. Rundbaken
Notary Public, State of Connecticut

CERTIFICATE

I, the undersigned, Assistant Secretary of BERKLEY INSURANCE COMPANY, DO HEREBY CERTIFY that the foregoing is a true, correct and complete copy of the original Power of Attorney; that said Power of Attorney has not been revoked or rescinded and that the authority of the Attorney-in-Fact set forth therein, who executed the bond or undertaking to which this Power of Attorney is attached, is in full force and effect as of this date.



under my hand and seal of the Company, this 27th day of

February, 2024.

Vincent P. Forte
Vincent P. Forte

BERKLEY INSURANCE COMPANY

STATUTORY BALANCE SHEET

DECEMBER 31, 2022

(AMOUNTS IN THOUSANDS)

Admitted Assets

Bonds	\$ 13,748,920
Common & Preferred Stocks	5,444,146
Cash & Short Term Investments	1,220,600
Premiums Receivable	2,409,952
Other Assets	<u>4,173,176</u>
<u>Total Admitted Assets</u>	<u>\$ 26,996,794</u>

Liabilities & Surplus

Loss & LAE Reserves	\$ 13,487,428
Unearned Premium Reserves	4,200,566
Other Liabilities	<u>978,212</u>
<u>Total Liabilities</u>	<u>\$ 18,666,206</u>
Common Stock	\$ 43,000
Preferred Stock	10
Additional Paid In Capital	2,949,106
Unassigned Surplus	<u>5,338,471</u>
<u>Total Policyholders' Surplus</u>	<u>\$ 8,330,587</u>
<u>Total Liabilities & Surplus</u>	<u>\$ 26,996,794</u>

Officers:

President: William Robert Berkley, Jr.
Secretary: Philip Stanley Welt
Treasurer: Richard Mark Baio
Asst. Treasurer: Bertman Adam Braud, Jr.
Asst. Secretary: Aaron Pearce
Asst. Treasurer: Ted William Rogers

Directors:

William Robert Berkley
(Executive Chairman)
William Robert Berkley, Jr.
Philip Stanley Welt
Richard Mark Baio
Paul James Hancock
Carol Josephine LaPunzina
James Gerald Shiel

CONSENT OF SURETY

Berkley Insurance Company a corporation formed under the laws of the State of Delaware and authorized to transact business in the State of ID hereby consents and agrees that if the accompanying proposal of RACOM Corporation to City of Moscow for Radio System Upgrade Project be accepted and contract awarded to it, the Berkley Insurance Company will become bound, as Surety, and will execute **Performance, Payment and Maintenance** bond(s) in the amount and form called for by the Owner conditioned for the proper and faithful fulfillment of said contract.

Dated this 27th **day** of February, 2024.

Berkley Insurance Company

BY: _____



Robert F. Laing, Attorney-In-Fact

POWER OF ATTORNEY
BERKLEY INSURANCE COMPANY
WILMINGTON, DELAWARE

KNOW ALL MEN BY THESE PRESENTS, that BERKLEY INSURANCE COMPANY (the "Company"), a corporation duly organized and existing under the laws of the State of Delaware, having its principal office in Greenwich, CT, has made, constituted and appointed, and does by these presents make, constitute and appoint: **Susan Bulman-Ditchkus; John P. Hyland; Robert F. Lain; or Thomas J. Henn of NFP Property & Casualty Services, Inc. of Morristown, NJ** its true and lawful Attorney-in-Fact, to sign its name as surety only as delineated below and to execute, seal, acknowledge and deliver any and all bonds and undertakings, with the exception of Financial Guaranty Insurance, providing that no single obligation shall exceed **Fifty Million and 00/100 U.S. Dollars (U.S.\$50,000,000.00)**, to the same extent as if such bonds had been duly executed and acknowledged by the regularly elected officers of the Company at its principal office in their own proper persons.

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RESOLVED, that such power of attorney limits the acts of those named therein to the bonds, undertakings, recognizances, or other suretyship obligations specifically named therein, and they have no authority to bind the Company except in the manner and to the extent therein stated; and further

RESOLVED, that such power of attorney revokes all previous powers issued on behalf of the attorney-in-fact named; and further

RESOLVED, that the signature of any authorized officer and the seal of the Company may be affixed by facsimile to any power of attorney or certification thereof authorizing the execution and delivery of any bond, undertaking, recognizance, or other suretyship obligation of the Company; and such signature and seal when so used shall have the same force and effect as though manually affixed. The Company may continue to use for the purposes herein stated the facsimile signature of any person or persons who shall have been such officer or officers of the Company, notwithstanding the fact that they may have ceased to be such at the time when such instruments shall be issued.

IN WITNESS WHEREOF, the Company has caused these presents to be signed and attested by its appropriate officers and its corporate seal hereunto affixed this 17th day of May, 2022.



Attest:

By

Ira S. Lederman
Executive Vice President & Secretary

Berkley Insurance Company

By

Jeffrey M. Hafter
Senior Vice President

STATE OF CONNECTICUT)

) ss:

COUNTY OF FAIRFIELD)

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MARIA C. RUNDBAKEN
NOTARY PUBLIC
CONNECTICUT
MY COMMISSION EXPIRES
APRIL 30, 2024

Maria C. Rundbaken
Notary Public, State of Connecticut

CERTIFICATE

I, the undersigned, Assistant Secretary of BERKLEY INSURANCE COMPANY, DO HEREBY CERTIFY that the foregoing is a true, correct and complete copy of the original Power of Attorney; that said Power of Attorney has not been revoked or rescinded and that the authority of the Attorney-in-Fact set forth therein, who executed the bond or undertaking to which this Power of Attorney is attached, is in full force and effect as of this date.

Witness my hand and seal of the Company, this 27th day of

February, 2024.

Vincent P. Forte



700-800 MHz Bid Alternative

- System Overview
- Compliance Response
- Pricing

CITY OF MOSCOW, IDAHO

RADIO SYSTEM UPGRADE PROJECT

February 27, 2024



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System Overview



A RACOM-Designed System with
GUARANTEED COVERAGE!



RACOM
critical communications

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P25 Phase 1 Conventional Simulcast System

Proposed System Overview

RACOM is proposing a three (3) site TaitNet ASIP P25 Phase 1 conventional simulcast system consisting of three (3) 700/800 MHz transmit and receive (TX/RX) sites and zero (0) received only (RX) sites. In addition to the simulcast sites there is One (1) standalone VHF TX/RX site with primary and backup station. The three sites are, Well 10, KUID and Moscow Mountain will have five channels.

The sites will be connected using six (6) new microwave links being provided by RACOM using public safety grade linking equipment by Aviat and three (3) existing fiber links used by the City.

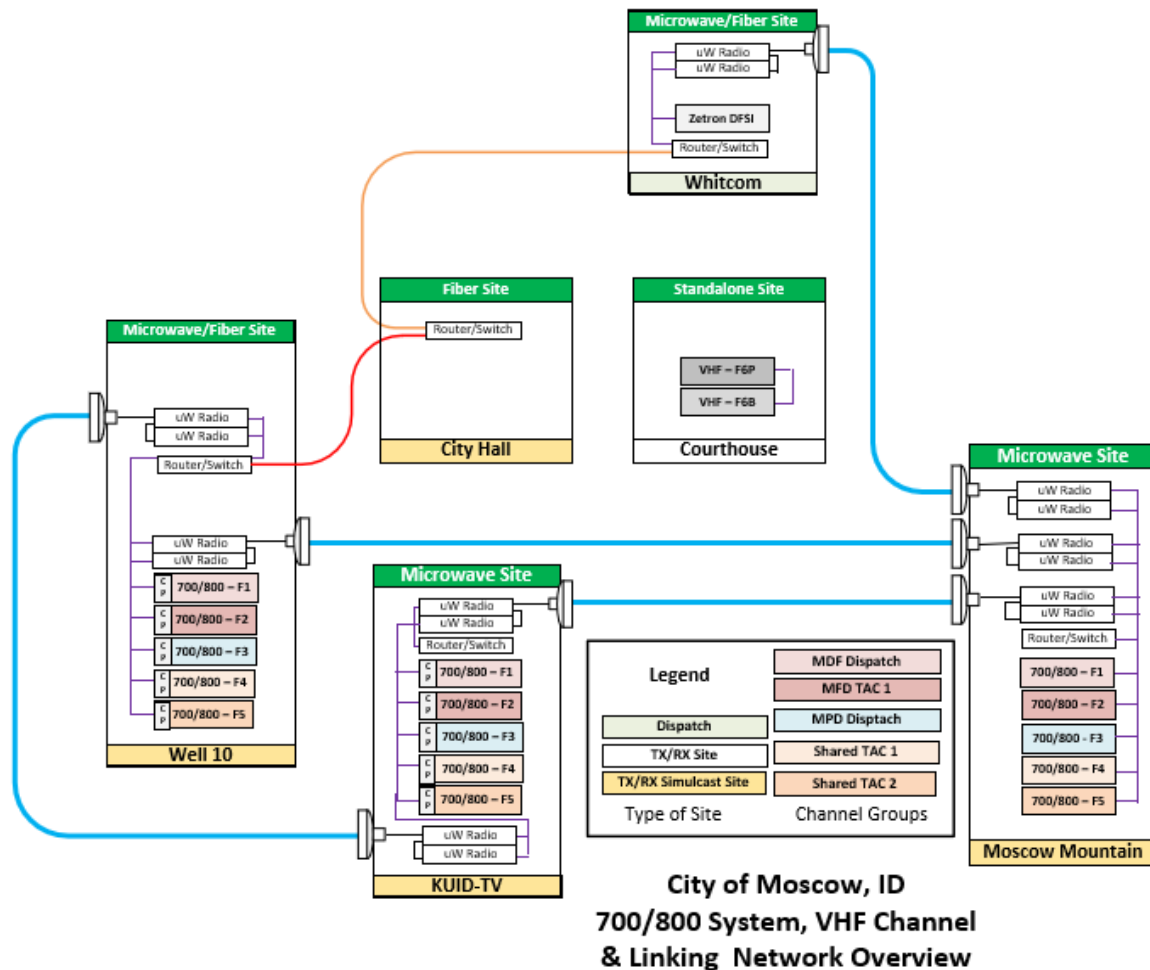
The overall system will be monitored by Tait's Enable Monitor applications. Enable Monitor will provide a single place to view the current status of all the system equipment status and alarms using standard SNMP, syslog and contact closures from the sites.

SIMULCAST SITES

For Public Safety users, Radio Coverage is critical. Our design was built around the coverage requirements outlined in the RFP. RACOM's engineering team has produced a design that meets your requirements. Our design is based on 95% reliability with a 3.4 DAQ for outdoors and in-building coverage. A 95% BAPC within the boundaries provided was the final goal, which was easily met for the area outlined in the RFP along with providing extended coverage within the County and surrounding areas. This simulcast design will help to minimize the number of channels that will be needed to support the system. An outline of the sites being used is in the Coverage section below.

GUARANTEED COVERAGE

Since coverage is important to all our customers, we go above the requirements in our coverage guarantee and not just what is asked for in the RFP, RACOM will commit that each of the agencies outlined coverage matches what we have proposed in each of the areas. If not, we will fix it at our cost.



System Overview

For the Radio System RACOM is proposing a TaitNet ASIP network which is a set of interconnected Tait base stations. Each TB9400 Stations can receive from and transmit to mobile and portable radios, just like any base station/repeater. However, TB9400s also have built-in networking capabilities that enable them to combine to form one or more logical channels (Chanel Groups) with wide area coverage.

For the proposed 700/800 system, RACOM is proposing a three (3) site solution as outlined in the RFP Alternate request. The three sites will have TB9400 base stations.

The connection to the existing Zetron dispatch console will be integrated into the network using the DFSI standard interface.

Proposed 4 Site System

The following outlines the 5-site RACOM is proposing for the project. The table to the left outlines the Type, Channels and Function for each of the sites.

Site	Type	Channels	Funtion
Courthouse	TX/RX - Standalone	1	Primary & Backup
KUID - TV Paradise Ridge	TX/RX - Simulcast	5	Control Point
Moscow Mountain	TX/RX - Simulcast	3	
Well10	TX/RX - Simulcast	5	Control Point
Whitecom	Dispatch	0	DFSI

The Sites are divided up into three different types: TX/RX Simulcast, TX/RX Standalone, and Dispatch.

Some of the sites also include additional capabilities/functions to support the overall operation of the proposed system as requested in the RFP. For the TX/RX site, the function requested was for two stations to be provided, one to be the primary and the other to be the backup.

The simulcast system consists of either TX/RX simulcast or RX only sites. For each Channel Group (the station that share the same frequency across those simulcast sites) have at least one station in the group is configured with a voter and simulcast control capability. This station is commonly referred to as the Control Point (CP). For the City of Moscow's solution, RACOM has included two CPs, a primary and backup for each Channel Group.

Freq	TX	RX	Name
F1	769.29375	799.10625	MFD Main Dispatch Channel
F2	769.56875	799.29375	MFD TAC Channel #1
F3	770.55625	800.55625	MPD Main Dispatch Channel
F4	771.28125	801.28125	Shared TAC Channel #1
F5	771.45625	801.45625	Shared TAC Channel #2

Per the RFP, the channels (frequencies outlined in the table on the right) and the sites they are associated with are as follows: F1, 2, 3, 4, & 5 – Well 10, KUID, Moscow Mountain.

Coverage Analysis

RACOM uses the L3Harris Radio Analysis and Propagation Tool Repository (RAPTR) when designing new radio systems. RAPTR is an advanced propagation and system design tool compatible with TIA TSB88-B and uses the Okumura-Hata-Davidson model for propagation loss, the United States Geological Survey (USGS) Digital Elevation Model (DEM) for terrain elevation data and the USGS National Land Cover Data (NLCD) database for environmental data.

This program is a complete system design tool for the analysis and design of land mobile radio systems. The software incorporates many large databases from the FCC, GIS, Cable Manufactures and Antenna Manufactures to bring together every parameter it takes to design a highly reliable RF system model. RACOM's RF Engineer can adjust numerous critical parameters to achieve the perfect site balance for the predicted coverage the system needs to provide. The RAPTR software is constantly being upgraded and adjusted to stay ahead of technology.

Many considerations are used in determining your coverage for the proposed system. The modeling of terrain and environmental data are just two of the characteristics considered in

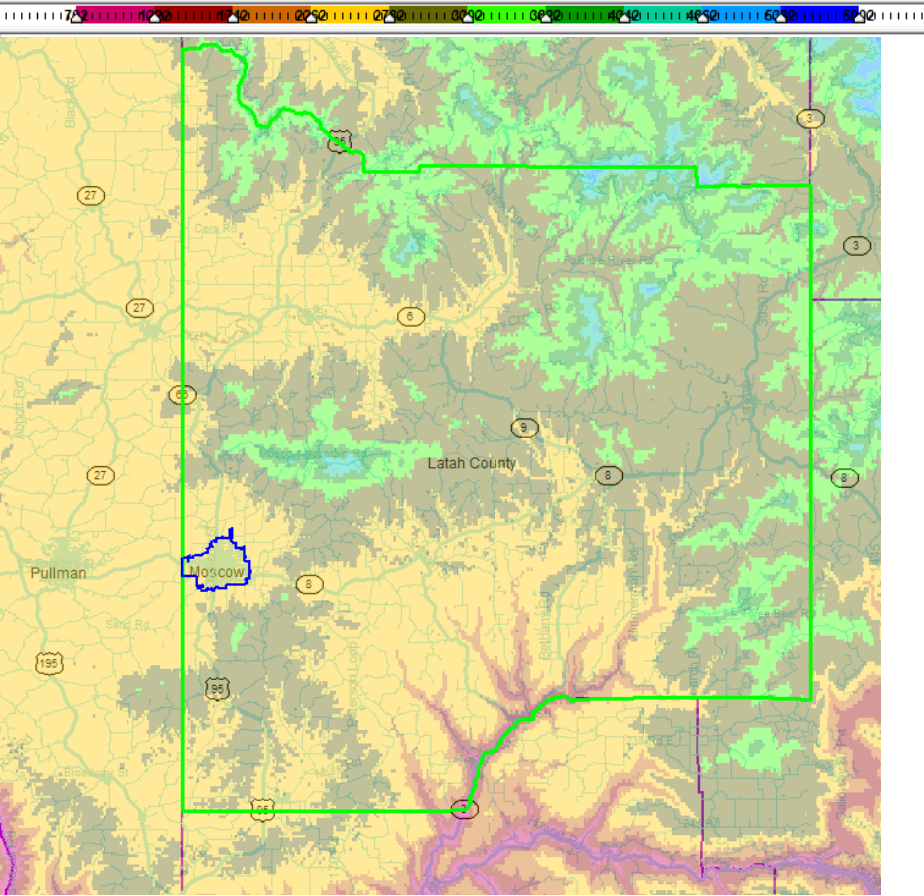
providing the most realistic coverage prediction and solution. The terrain map is a product of the United States Geological Survey (USGS) digital elevation model generated from RAPTR showing the contour of Marion County.

A larger version is at the back of this section, but the levels start at 700' and go es to 6,000' with each color change at 550'. The green boundary is the County and the blue one within the County is Moscow. The elevation changes and the site locations are some of the items that impacted the design.

LULC Color Customization		
Color	Description	
	Water	
	Snow Ice	
	Wetland	
	Open Land	
	Rangeland	
	Transportation	
	Agricultural	
	Residential	
	Forest	
	Mix Urban Buildings	
	Commercial/Industrial	
	High Density Urban	

Environmental data or Land Use Land Clutter (LULC) was used to classify areas based on the way the land is used per NLCD. This allows our coverage model to distinguish areas used for but not limited to agriculture, commercial buildings, residential homes and industrial. This attention to detail ensures that the City of Moscow and its users are getting the most accurate coverage model possible.

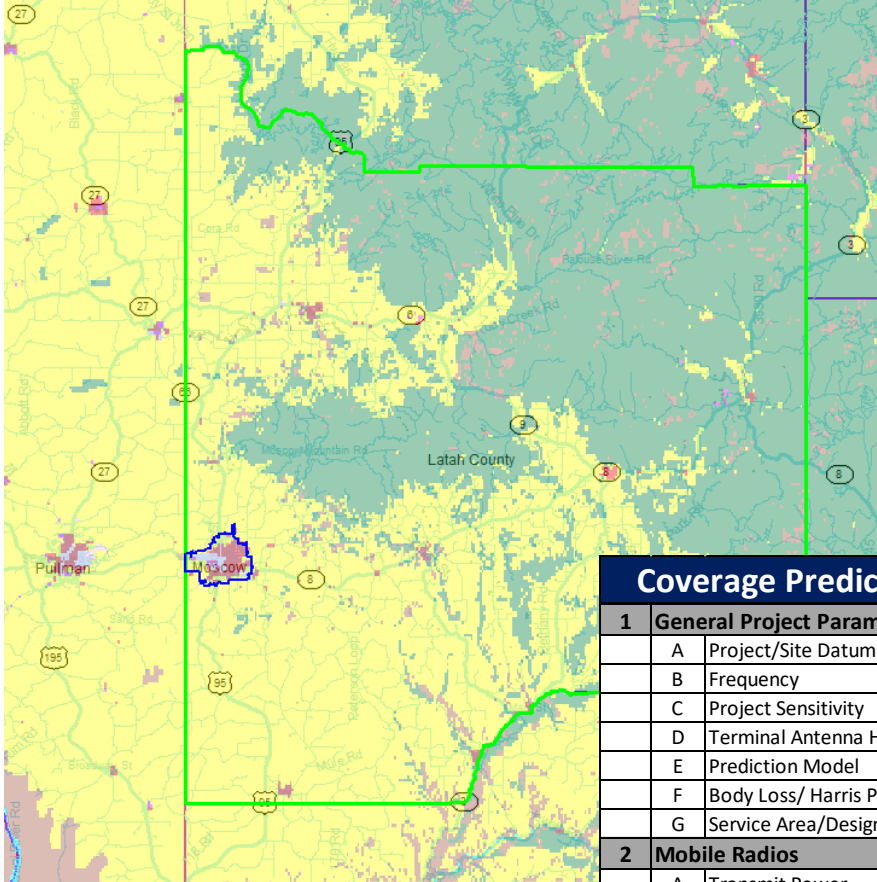
This data is used in two ways when predicting coverage, one way is for additional Clutter Loss. TBS-88 defines these losses to be used based on the type of area. The other is for the loss of buildings within that area for additional inbuilding loss. While Moscow has not asked for any inbuilding coverage in the RF,



City of Moscow Environment Data Used for Maps (dB)				
	Clutter Loss	Street	Default	Type Category
Water	0	0	0	Lakes
Snow & Ice	0	0	0	Snow Pack
Wetland	3	0	3	Non-forested
Open Land	5	0	3	Bare Land
Rangeland	3	0	3	Herbaceous
Transportation	5	0	3	Roadways
Agricultural	7	0	3	Grassland
Residential	12	0	6	Suburban
Forest	15	0	3	Pine (>30')
Mixed Urban/Buildings	15	0	10	Apartment (<4 stories)
Commercial/Industrial	19	0	15	Commercial Services
High Density Urban	28	0	20	Skyscrapers

outdoors only. RACOM has included maps based on the default TSB-88 level outlined. The table outlines what RACOM has used for our maps and the percentage of areas covered information we have included for each. We have included an additional column with an alternative name for the TSB-88 labels for each type, labeled Category, as some people like these definitions of the area better. The more detail area so the LULC levels within the City limits.

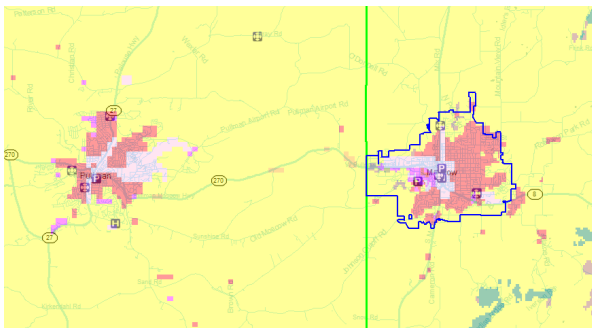
The different classifications of environmental data can include water, agriculture, forest, residential, mixed urban and commercial definitions. Understanding how the land is used allows the RACOM Engineer to concentrate coverage where the radio users will need it most. The map below shows the Land Use Land Clutter data collected for the area in and around the city.



In addition to the environmental and LULC information outlined RACOM has used the additional information outlined for the 700/800 proposed system and the sites as shown in the following tables.

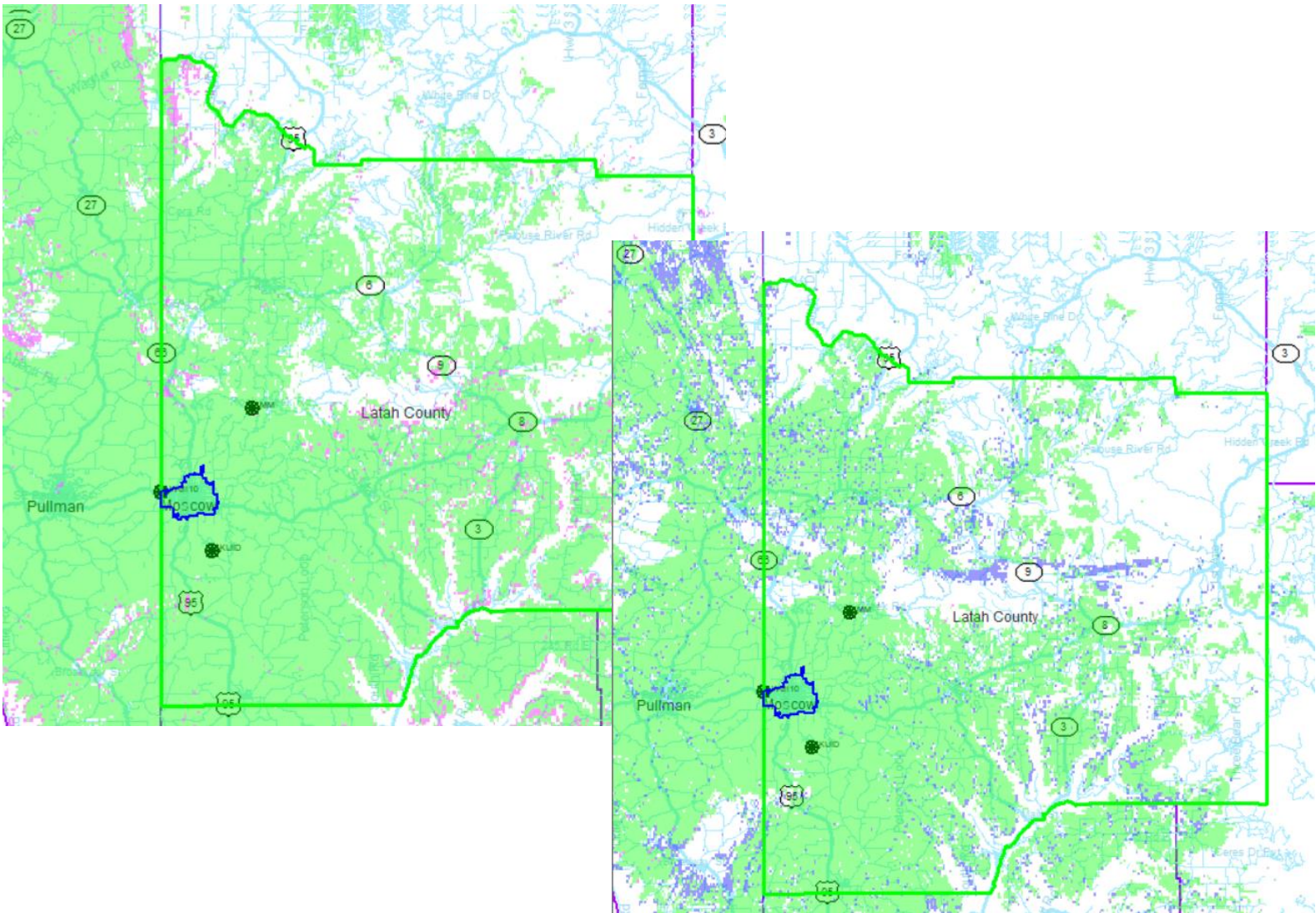
Coverage Prediction Assumptions For City of Moscow

1	General Project Parameters		
	A	Project/Site Datum	NAD83-CONUS
	B	Frequency	764-806 Mhz
	C	Project Sensitivity	a. Mobile -110dBm b. Portable -110dBm
	D	Terminal Antenna Height	a. Mobile 5.0 feet b. Portable 3.5 feet
	E	Prediction Model	Harris Okumura
	F	Body Loss/ Harris Portables	Hip: 10dB Head: 8dB
	G	Service Area/Design Target	Portable 95%/95% Mobile 95%/95%
2	Mobile Radios		
	A	Transmit Power	25.0 watts
	B	Receiver	Noise Figure 10 /-110dBm Faded/0.7uV, 50ohms
	C	Mobile Antenna Gain	-1.0 dB Net Gain (0dB antenna and -1 line/connector)
	D	Vehicle Distortion Margin	(-)1.2dB
	E	Antenna Mounting Position	Center of Roof with a light bar
3	Portable Radios		
	A	Transmit Power	3.0 Watts
	B	Receiver	Noise Figure 10 /-110dBm Faded/0.7uV, 50ohms
	C	Portable Antenna Gain	1/2 wave Unity Gain 0 dB gain
4	Environment		
		Clutter Loss (dB)	Building Loss - TSB 88 (dB)
	A	Water	0 Lakes
	B	Snow & Ice	0 Snow Pack
	C	Wetland	3 Non-Forested
	D	Open Land	5 Bare Land
	E	Rangeland	3 Herbaceous
	F	Transportation	5 Roadways
	G	Agricultural	7 Row Crops
	H	Residential	12 Suburban
	I	Forest	15 Pine (>30')
	J	Mixed Urban/Buildings	15 Apartments (<4 stories)
	K	Commercial/Industrial	19 Commercial Services
	L	High Density Urban	28 Skyscrapers



Site Name		KUID - TV Paradise Ridge	Moscow Mountain	Well10
Site ID		KUID	MM	Well10
Latitude		46° 40' 54.000" N	46° 48' 40.950" N	46° 44' 06.700" N
Longitude		116° 58' 17.000" W	116° 55' 02.940" W	117° 02' 21.700" W
Datum		NAD83	NAD83	NAD83
Site Elevation		3547 ft	4442 ft	2589 ft
Base Station		TB9400-P25 Ph1	TB9400-P25 Ph1	TB9400-P25 Ph1
Frequency Range		764 - 806 MHz	764 - 806 MHz	764 - 806 MHz
Site Transmit	Station Output Power	100.0 W	100.0 W	100.0 W
	Combiner Model	DSCC75 (5 ch.)	DSCC75 (5 ch.)	DSCC75 (5 ch.)
	Tx to Tx Spacing	150	150	150
	Combiner Loss	3.6 dB	4.5 dB	3.6 dB
	Filter/Duplexer Model			
	Filter/Duplexer Loss	0.0 dB	0.0 dB	0.0 dB
	Coax Type	1-1/4" Foam	1-1/4" Foam	1-1/4" Foam
	Coax Length	92 ft	110 ft	110 ft
	Coax Loss	0.8 dB	0.5 dB	0.9 dB
	Antenna Model	SC466-HF1LDF(D02-PIP)	SC466-HF1LDF(D03-PIP)	SC466-HF1LDF(D00-PIP)
	Antenna Height (C.L)	42 ft	60 ft	60 ft
	Antenna Azimuth	0°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°
	Antenna Gain (Hzn)	6.2 dBd	5.3 dBd	6.5 dBd
	Maximum ERP (Hzn)	151.3 W	107.1 W	158.5 W
	HAAT	840.0 ft	1552.0 ft	-89.0 ft
Site Receive	Total System Gain	6.2 dB	0.9 dB	6.3 dB
	Multicoupler Model	DS7PDU (8 ch.)	DS7PDU (8 ch.)	DS7PDU (8 ch.)
	Coax Type	1-1/4" Foam	1-1/4" Foam	1-1/4" Foam
	Coax Length	242 ft	175 ft	135 ft
	Tower Top Amp Model	DS7TMA17C	DS7TMA17C	DS7TMA17C
	TTA Pad	0.0 dB	0.0 dB	0.0 dB
	Distribution Pad	8.6 dB	8.6 dB	8.6 dB
	Duplexer Loss	0.0 dB	0.0 dB	0.0 dB
	Antenna Model	SC466-HF1LDF(D02-PIP)	SC466-HF1LDF(D03-PIP)	SC466-HF1LDF(D00-PIP)
	Antenna Height (C.L)	192 ft	125 ft	85 ft
	Antenna Azimuth	0°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°
	Antenna Gain (Hzn)	6.2 dBd	5.3 dBd	6.5 dBd
	HAAT	990.0 ft	1617.0 ft	-64.0 ft

The two maps below are the round-trip balance reports for the proposed VHF system. The green is the area the Talk Out and Talk In are the same, the pink is Talk In only and the blue is Talk Out only. Both the mobile is slightly Talk In limited and Portable maps show the system is balanced to slight Talk Out limited.

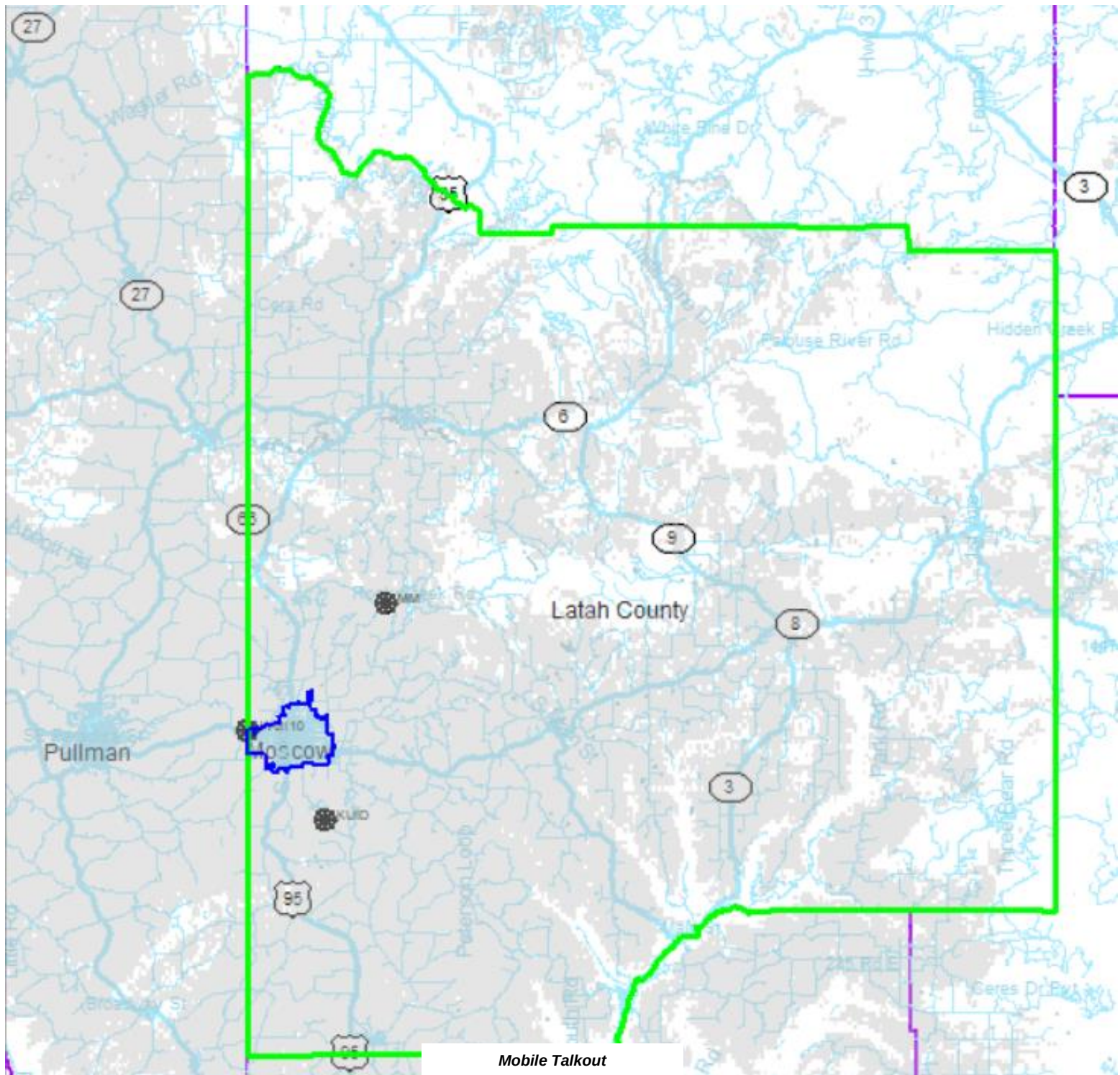


On the coverage maps that follow, the gray areas are covered, and the black/dark is simulcast delay spread areas. Since the system as outlined above is balanced or slightly talk-In limited, the maps shown are for talk-out only. We have provided three different maps, Mobile talk-out, Portable talk-out (on the street, and Portable talk-out (indoors TSB-88 levels). All Portable maps assume the radio is at the hip.

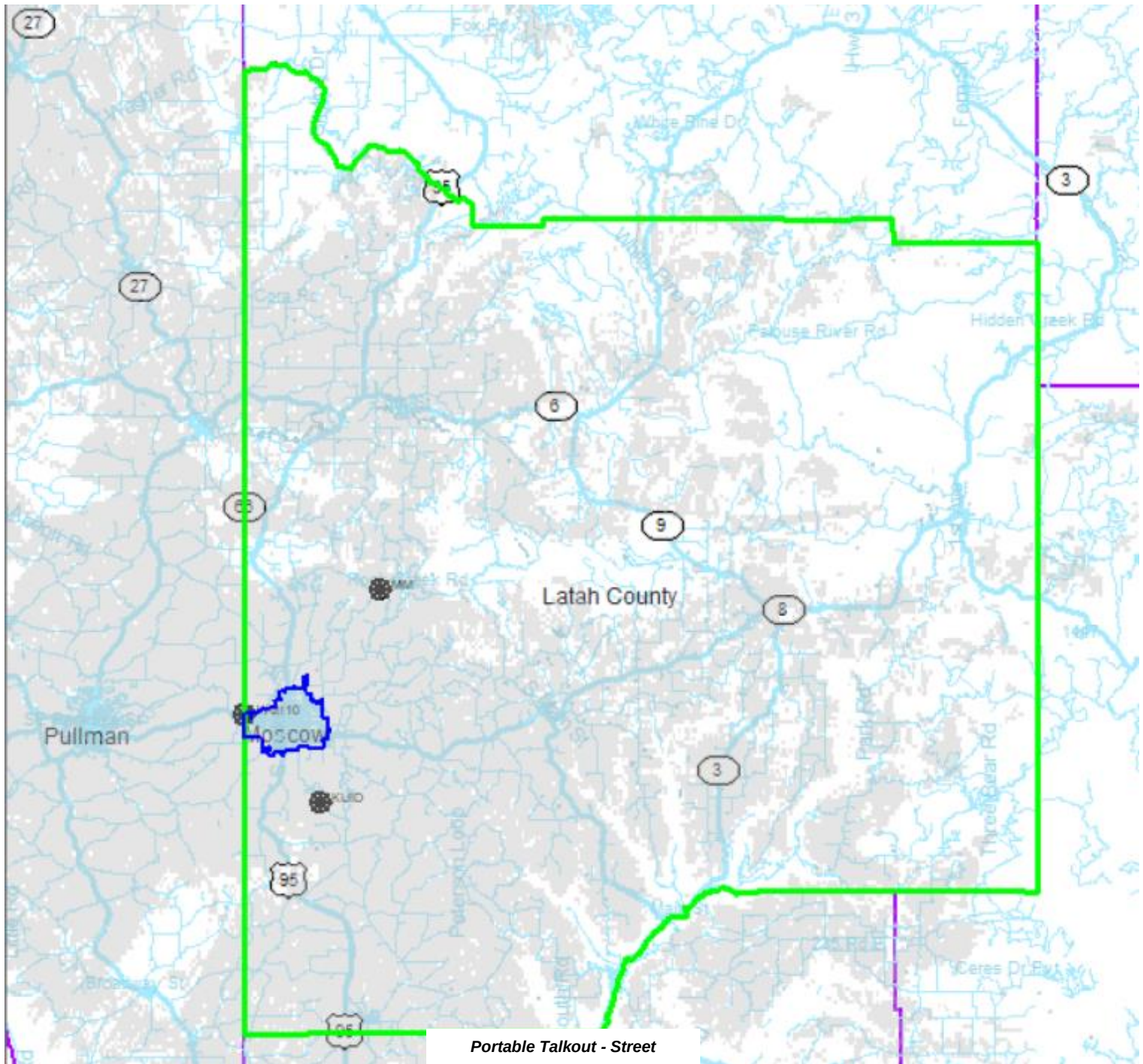
For each of the coverage maps shown, the tool provides the percentage of that area (County and City Limits) that is predicted to be covered in each of the areas. These will be listed after each map. The highest level available is 95%. If the level is greater than that we will >95% but not the actual predicted number.

Larger maps are provided at the end of the System Overview in the attachments section.

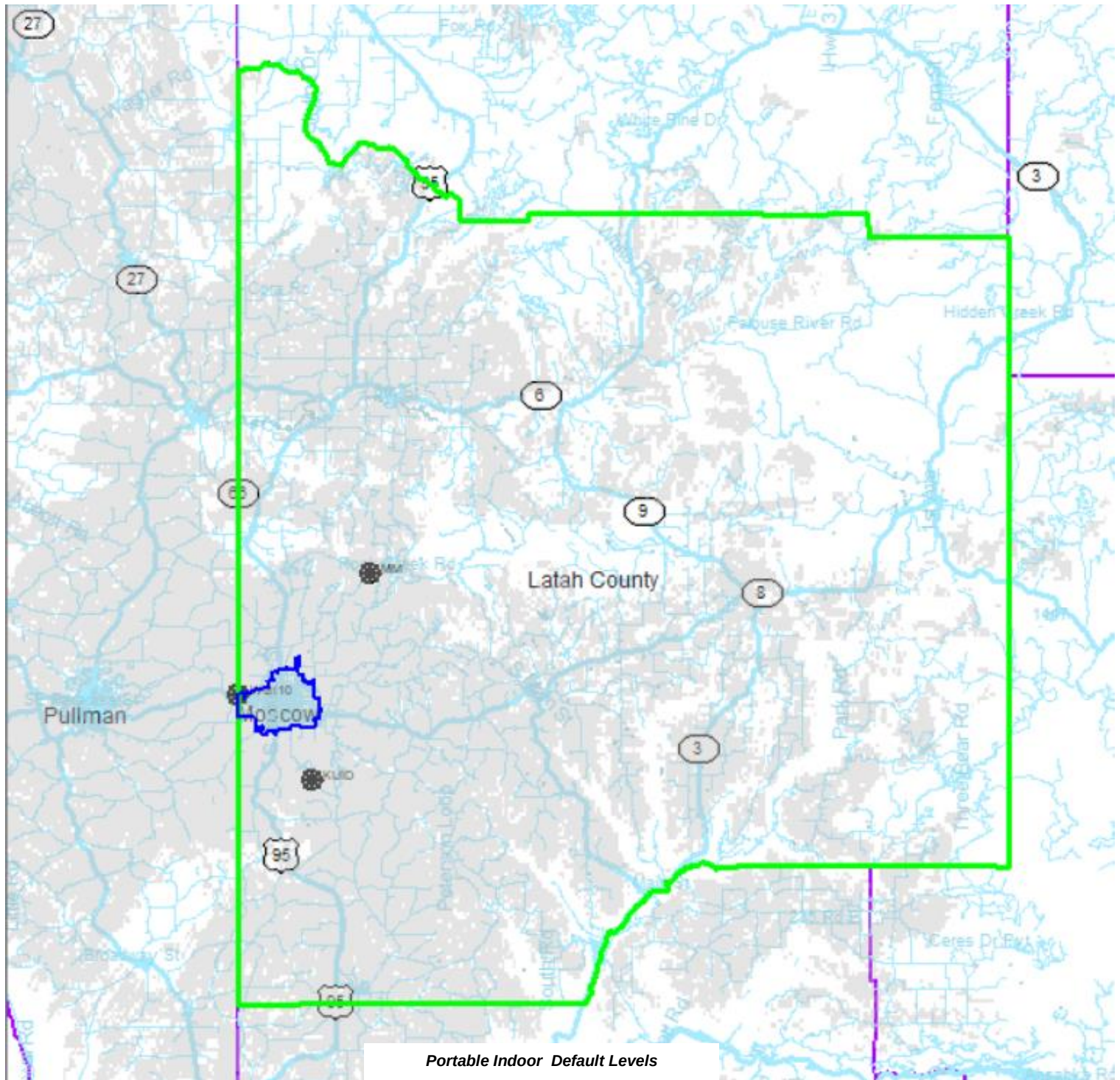
The following maps are for the three Site 700/800



Mobile Talk Out BAPC is >95% for the City of Moscow and 62 for the County



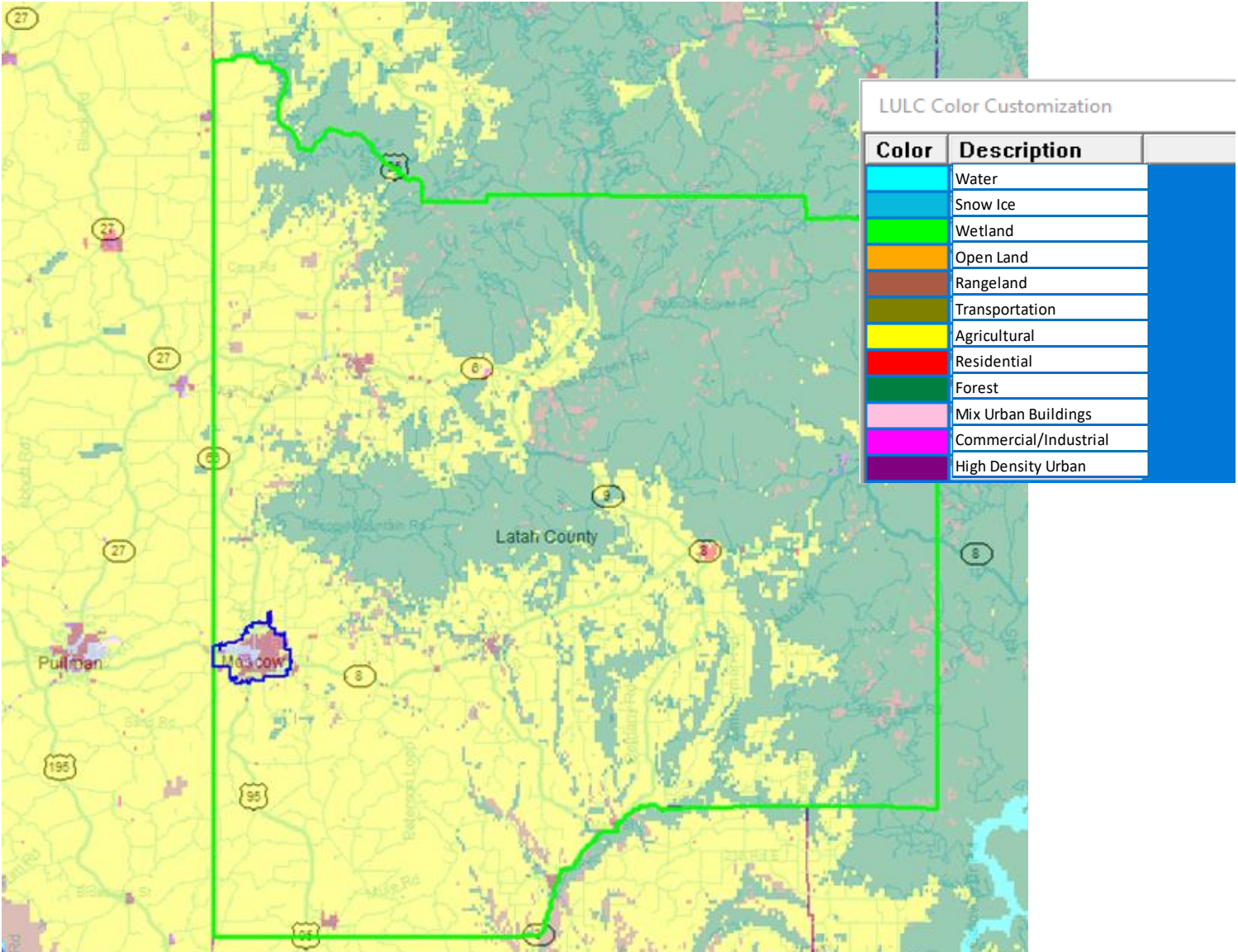
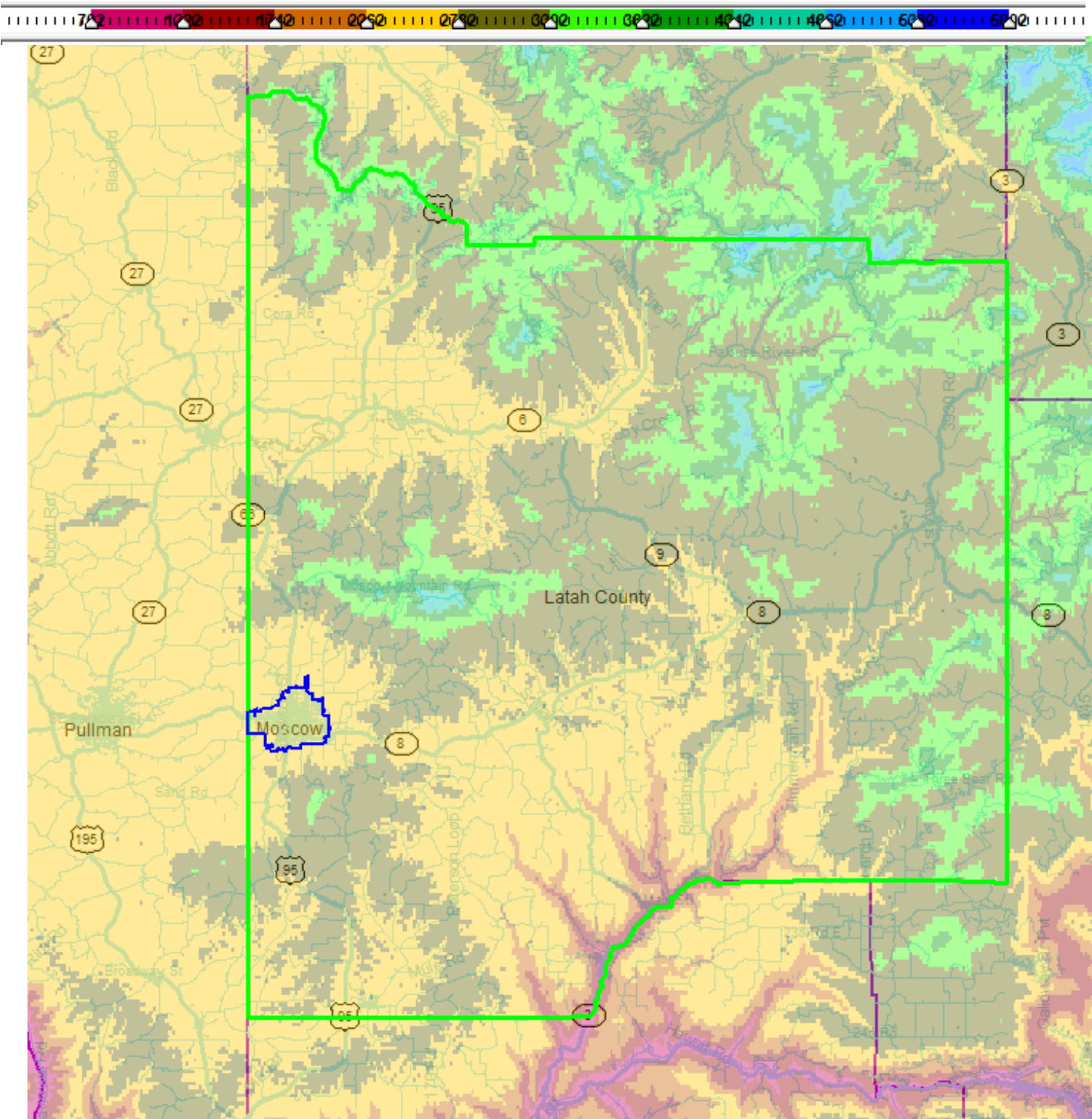
Portable Talk Out - Street BAPC is >95% for the City of Moscow and 53.0% for the County



Portable Talk Out - Indoors BAPC is >95% for the City of Moscow and 50.5% for the County

Larger Drawings, Images and Maps

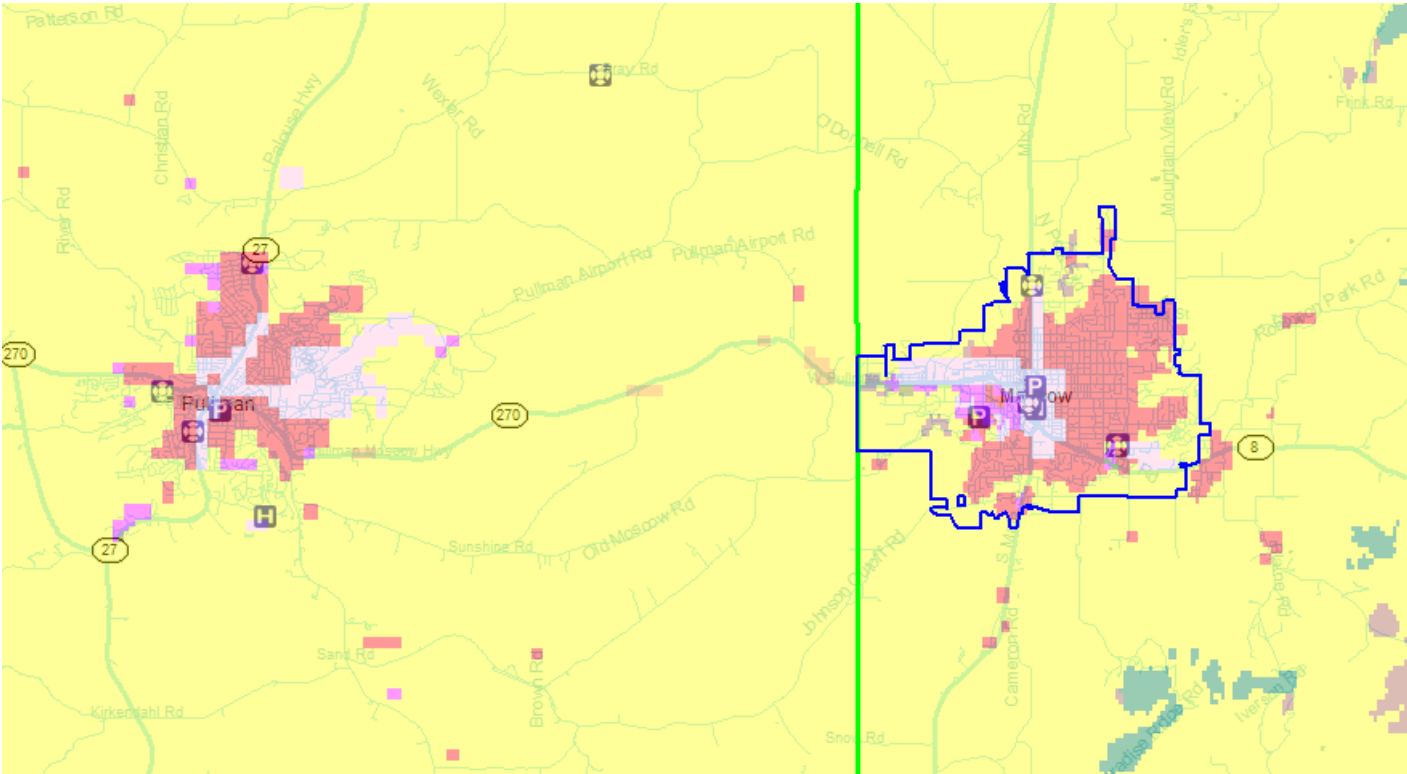
Land Use and Loss Clutter (LULC) Maps and Coverage Prediction Assumptions



LULC Color Customization	
Color	Description
 	Water
 	Snow Ice
 	Wetland
 	Open Land
 	Rangeland
 	Transportation
 	Agricultural
 	Residential
 	Forest
 	Mix Urban Buildings
 	Commercial/Industrial
 	High Density Urban

City of Moscow Environment Date Used for Maps (dB)				
	Clutter Loss	Street	Default	Type Category
Water	0	0	0	Lakes
Snow & Ice	0	0	0	Snow Pack
Wetland	3	0	3	Non-forested
Open Land	5	0	3	Bare Land
Rangeland	3	0	3	Herbaceous
Transportation	5	0	3	Roadways
Agricultural	7	0	3	Grassland
Residential	12	0	6	Suburban
Forest	15	0	3	Pine (>30')
Mixed Urban/Buildings	15	0	10	Apartment (<4 stories)
Commercial/Industrial	19	0	15	Commercial Services
High Density Urban	28	0	20	Skyscrapers

Land Use and Loss Clutter (LULC) Maps and Coverage Prediction Assumptions



Land Use Land Clutter Map
City of Moscow & Pullman

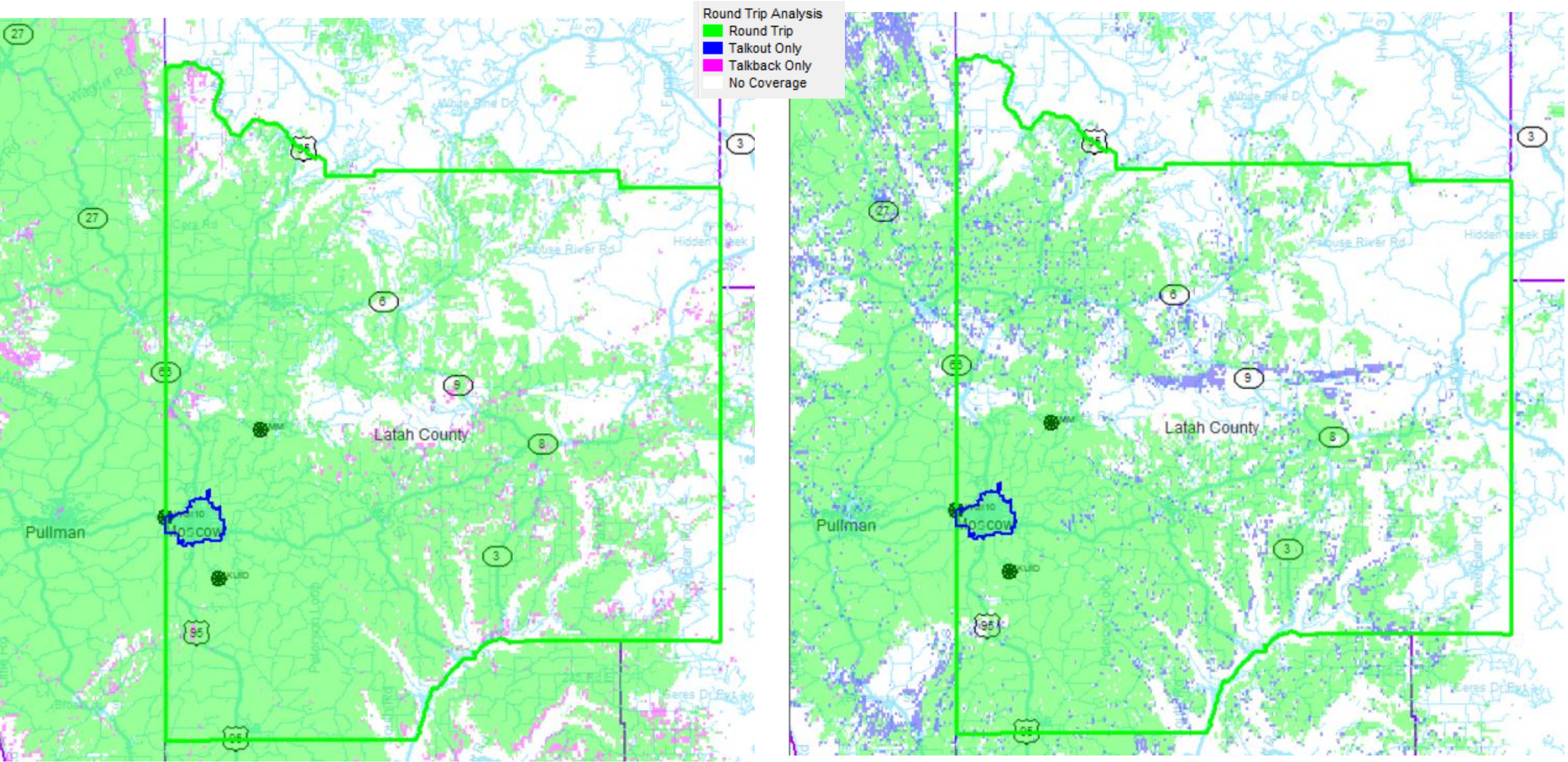
LULC Color Customization	
Color	Description
	Water
	Snow Ice
	Wetland
	Open Land
	Rangeland
	Transportation
	Agricultural
	Residential
	Forest
	Mix Urban Buildings
	Commercial/Industrial
	High Density Urban

Coverage Prediction Assumptions For City of Moscow					
1 General Project Parameters					
	A	Project/Site Datum	NAD83-CONUS		
	B	Frequency	764-806 Mhz		
	C	Project Sensitivity	a. Mobile -110dBm	b. Portable -110dBm	
	D	Terminal Antenna Height	a. Mobile 5.0 feet	b. Portable 3.5 feet	
	E	Prediction Model	Harris Okumura		
	F	Body Loss/ Harris Portables	Hip: 10dB Head: 8dB		
	G	Service Area/Design Target	Portable 95%/95% Mobile 95%/95%		
2 Mobile Radios					
	A	Transmit Power	25.0 watts		
	B	Receiver	Noise Figure 10 /-110dBm Faded/0.7uV, 50ohms		
	C	Mobile Antenna Gain	-1.0 dB	Net Gain (0dB antenna and -1 line/connector)	
	D	Vehicle Distortion Margin	(-)1.2dB		
	E	Antenna Mounting Position	Center of Roof with a light bar		
3 Portable Radios					
	A	Transmit Power	3.0 Watts		
	B	Receiver	Noise Figure 10 /-110dBm Faded/0.7uV, 50ohms		
	C	Portable Antenna Gain	1/2 wave Unity Gain 0 dB gain		
4 Environment					
		Clutter Loss (dB)		Building Loss - TSB 88 (dB)	
	A	Water	0	0	Lakes
	B	Snow & Ice	0	0	Snow Pack
	C	Wetland	3	3	Non-Forested
	D	Open Land	5	3	Bare Land
	E	Rangeland	3	3	Herbaceous
	F	Transportation	5	3	Roadways
	G	Agricultural	7	3	Row Crops
	H	Residential	12	6	Suburban
	I	Forest	15	3	Pine (>30')
	J	Mixed Urban/Buildings	15	10	Apartments (<4 stories)
	K	Commercial/Industrial	19	15	Commercial Services
	L	High Density Urban	28	20	Skyscrapers

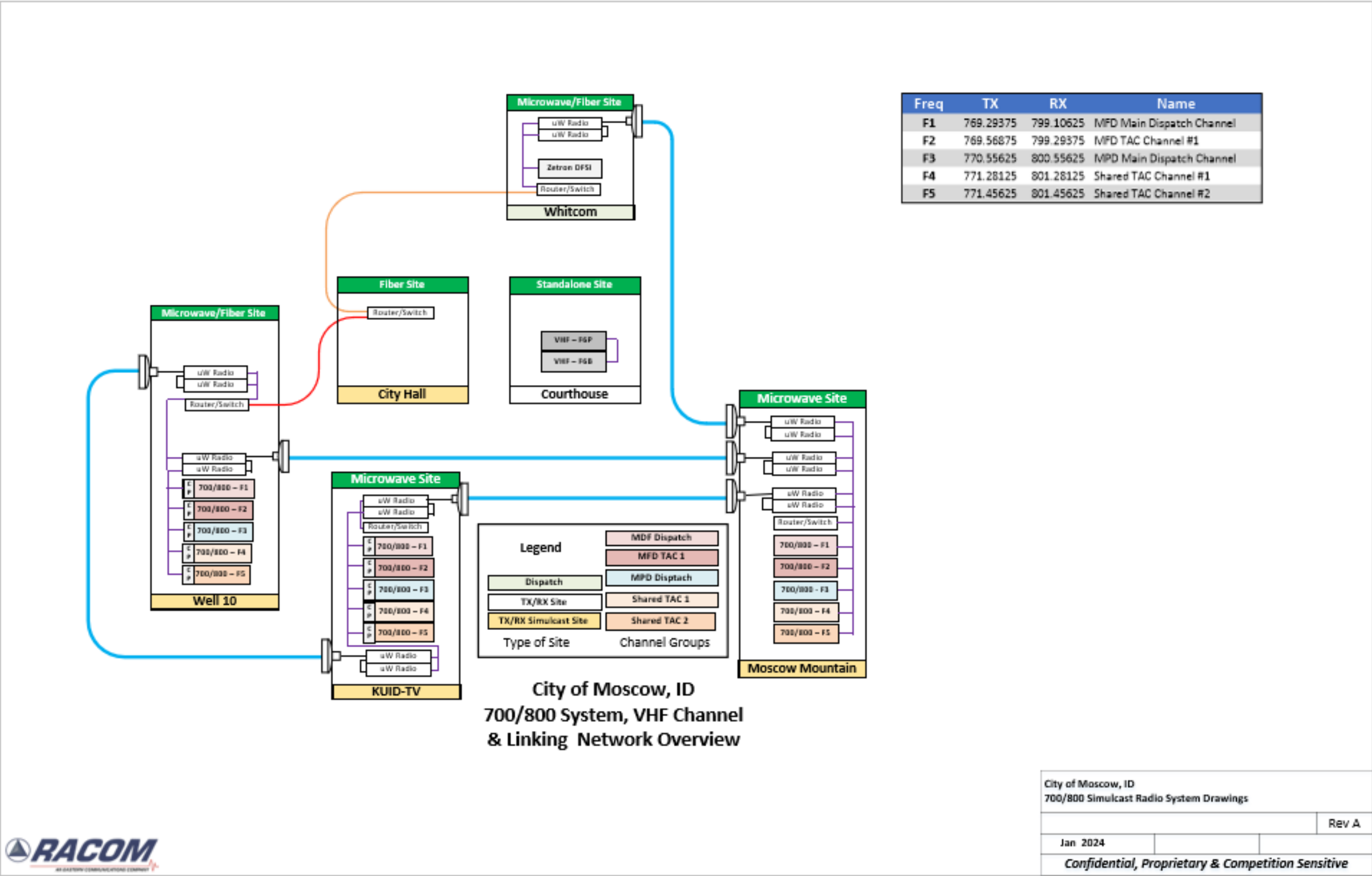
700/800 Site Details for Coverage Predictions

Site Name		KUID - TV Paradise Ridge	Moscow Mountain	Well10
Site ID		KUID	MM	Well10
Latitude		46° 40' 54.000" N	46° 48' 40.950" N	46° 44' 06.700" N
Longitude		116° 58' 17.000" W	116° 55' 02.940" W	117° 02' 21.700" W
Datum		NAD83	NAD83	NAD83
Site Elevation		3547 ft	4442 ft	2589 ft
Base Station		TB9400-P25 Ph1	TB9400-P25 Ph1	TB9400-P25 Ph1
Frequency Range		764 - 806 MHz	764 - 806 MHz	764 - 806 MHz
Site Transmit	Station Output Power	100.0 W	100.0 W	100.0 W
	Combiner Model	DSCC75 (5 ch.)	DSCC75 (5 ch.)	DSCC75 (5 ch.)
	Tx to Tx Spacing	150	150	150
	Combiner Loss	3.6 dB	4.5 dB	3.6 dB
	Filter/Duplexer Model			
	Filter/Duplexer Loss	0.0 dB	0.0 dB	0.0 dB
	Coax Type	1-1/4" Foam	1-1/4" Foam	1-1/4" Foam
	Coax Length	92 ft	110 ft	110 ft
	Coax Loss	0.8 dB	0.5 dB	0.9 dB
	Antenna Model	SC466-HF1LDF(D02-PIP)	SC466-HF1LDF(D03-PIP)	SC466-HF1LDF(D00-PIP)
	Antenna Height (C.L)	42 ft	60 ft	60 ft
	Antenna Azimuth	0°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°
	Antenna Gain (Hzn)	6.2 dBd	5.3 dBd	6.5 dBd
	Maximum ERP (Hzn)	151.3 W	107.1 W	158.5 W
	HAAT	840.0 ft	1552.0 ft	-89.0 ft
Site Receive	Total System Gain	6.2 dB	0.9 dB	6.3 dB
	Multicoupler Model	DS7PDU (8 ch.)	DS7PDU (8 ch.)	DS7PDU (8 ch.)
	Coax Type	1-1/4" Foam	1-1/4" Foam	1-1/4" Foam
	Coax Length	242 ft	175 ft	135 ft
	Tower Top Amp Model	DS7TMA17C	DS7TMA17C	DS7TMA17C
	TTA Pad	0.0 dB	0.0 dB	0.0 dB
	Distribution Pad	8.6 dB	8.6 dB	8.6 dB
	Duplexer Loss	0.0 dB	0.0 dB	0.0 dB
	Antenna Model	SC466-HF1LDF(D02-PIP)	SC466-HF1LDF(D03-PIP)	SC466-HF1LDF(D00-PIP)
	Antenna Height (C.L)	192 ft	125 ft	85 ft
	Antenna Azimuth	0°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°
	Antenna Gain (Hzn)	6.2 dBd	5.3 dBd	6.5 dBd
	HAAT	990.0 ft	1617.0 ft	-64.0 ft

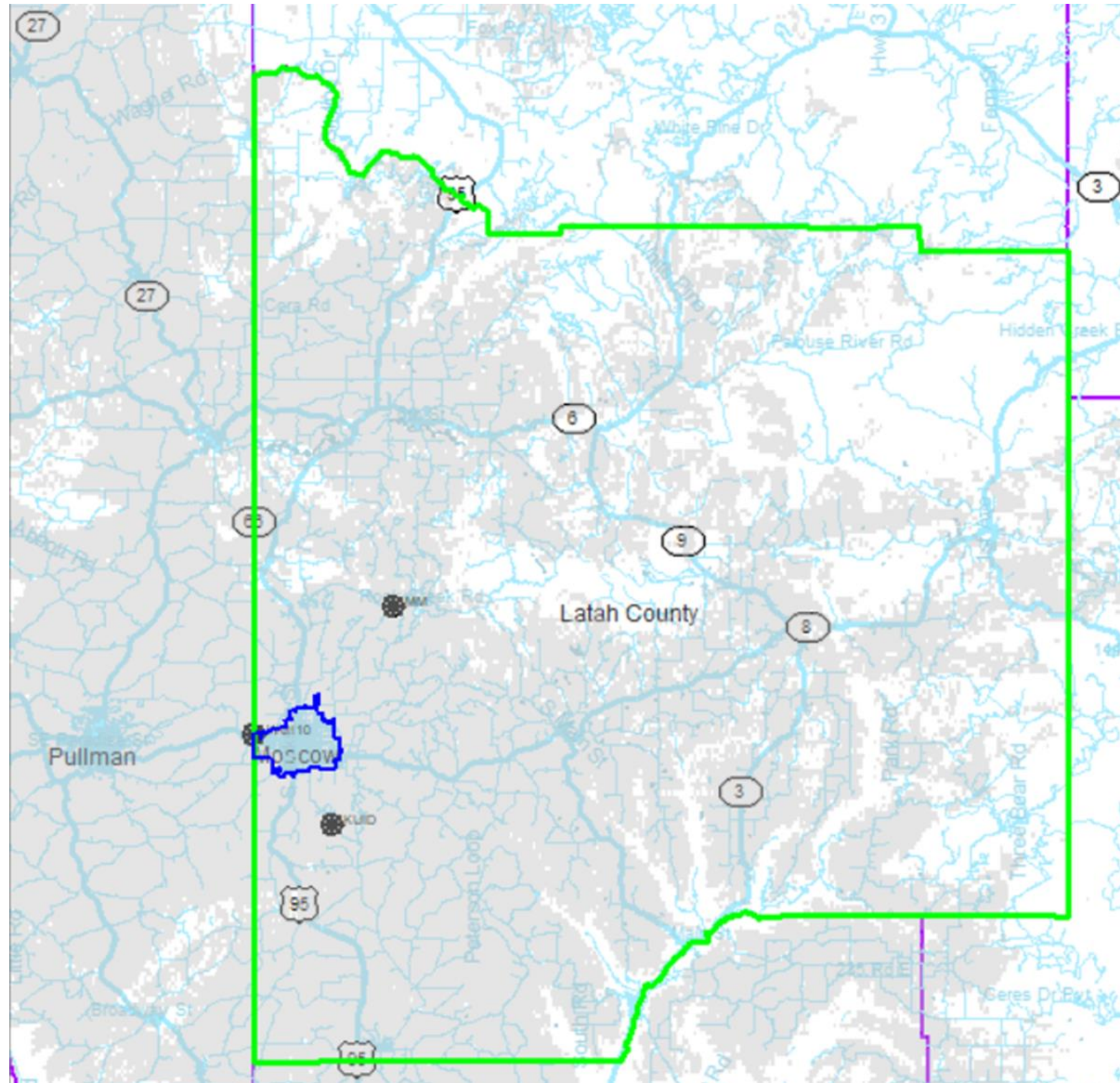
Site Balanced Report Mobile and Portable Round Trip Analysis Map



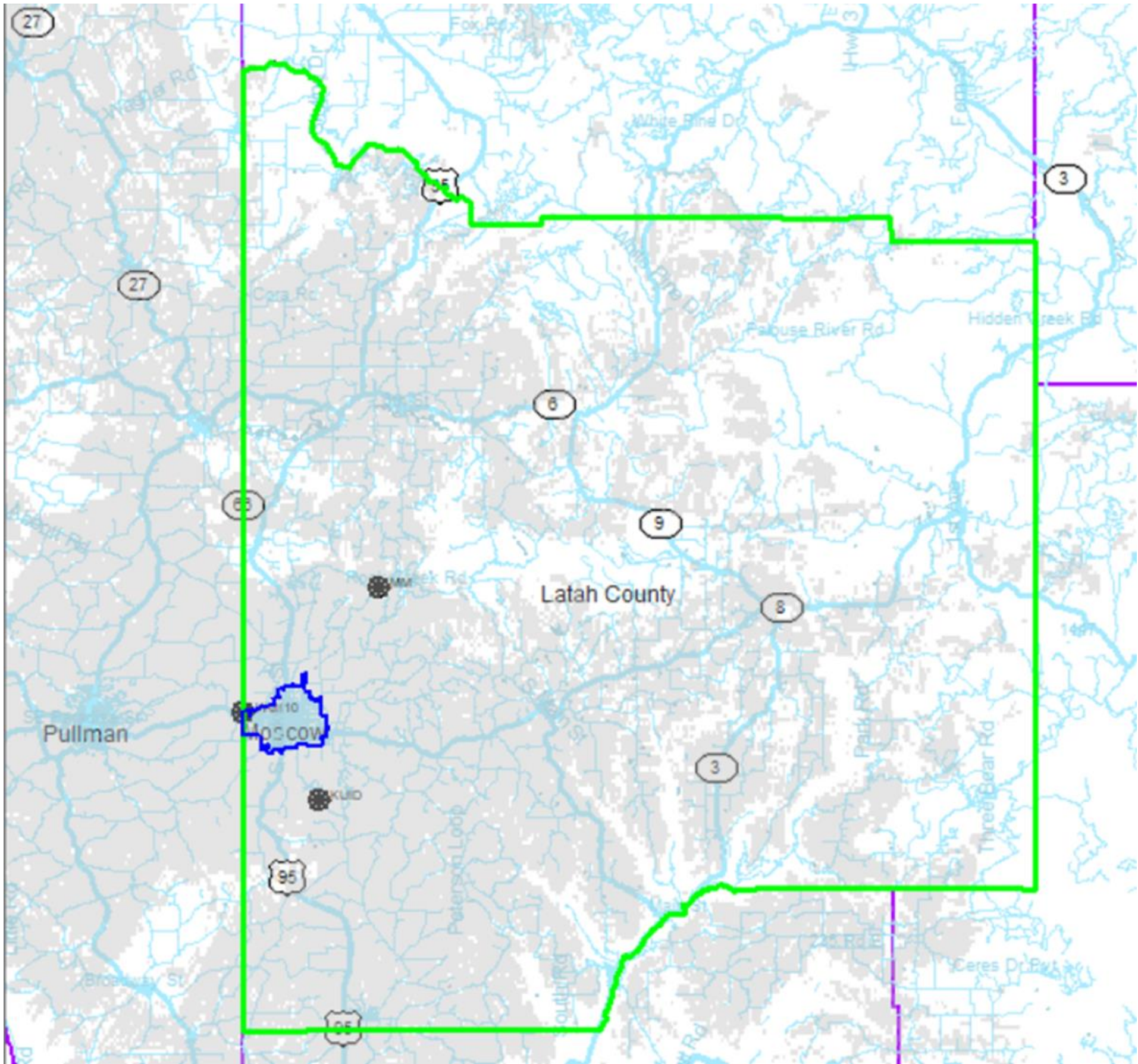
Highlevel System Drawing



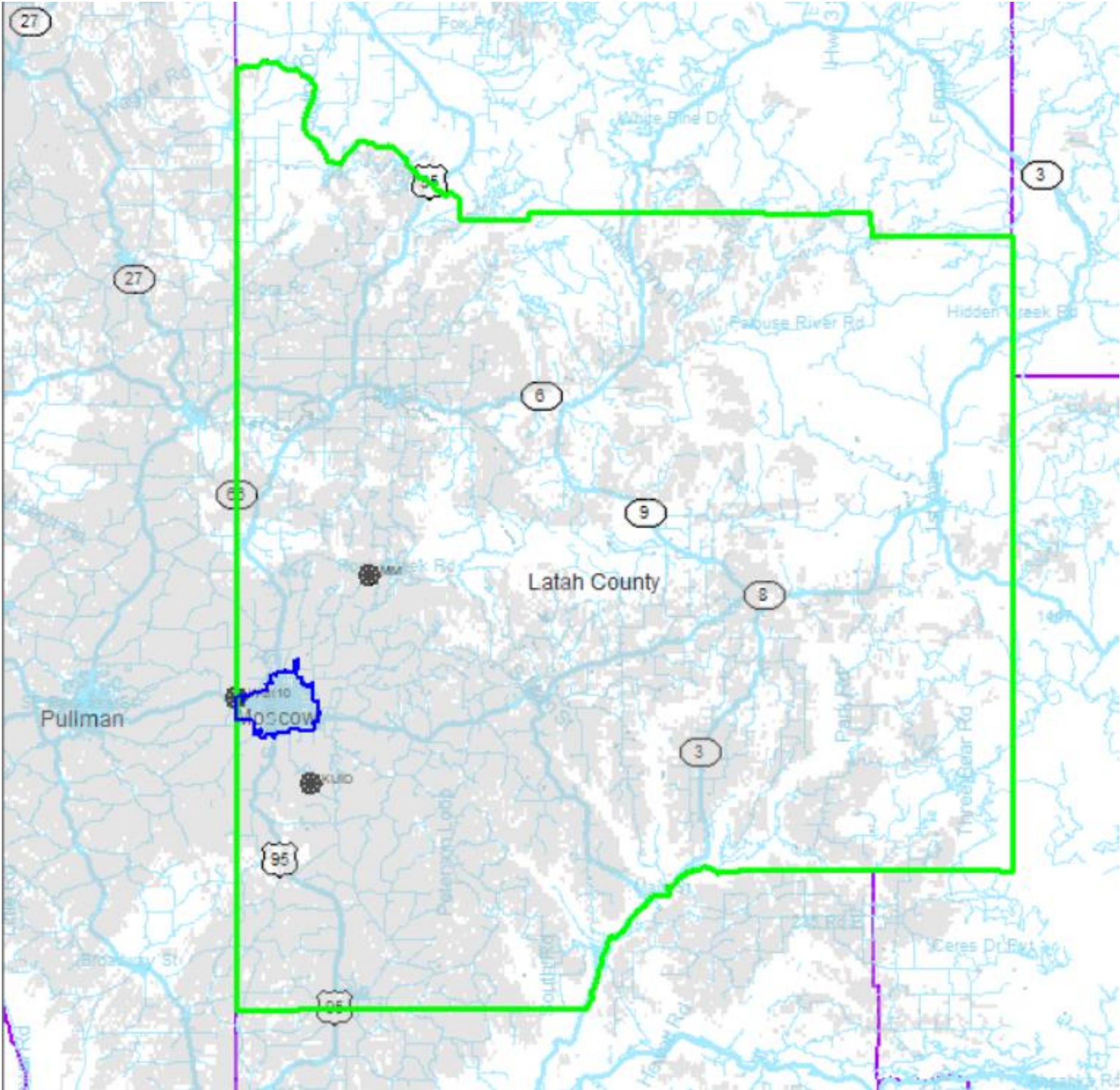
P25 Conventional Phase 1 Coverage Maps



Mobile Talkout



Portable Talkout – Street



***Portable Talkout – Indoors
Default Loss Levels***

SECTION 33 83 01 LAND MOBILE RADIO SYSTEMS – 700/800 MHz BID ALTERNATE

PART 1 GENERAL

RACOM Response: RACOM has included the Land Mobile Radio Systems- 700/800 MHz Bid Alternate as outlined below in Section 33 83 01 for those sites that require it and as outlined in our response. For those areas that have specified specific equipment, RACOM has either proposed the same or equipment that meets the specification intent as outlined based on our experience of the products, manufactures support and long-term supportability of the product proposed. The final equipment to be used will be mutually agreed to during the detailed design process.

For each indivual areas outlined RACOM has indicated if we Comply, Read & Understood (RACOM understands what is being asked for if it is something being provided by RACOM's scope of work) , Take Exception or Non-Comply as outlined.

1.1 SUMMARY

A. Section Includes

1. Contractor to provide and install voice radio systems, including all component parts reasonably incidental to providing a complete system.

RACOM Response: Read & Understood

2. The purpose of this Bid Alternate is to specify requirements and to obtain a separate cost proposal for the City of Moscow land mobile radio system with the VHF channels specified in Section 33 83 00 replaced with 700/800 MHz channels and analog operation replaced with P25 Phase 1 operation. All requirements specified in Section 33 83 00 and not related to the change in frequencies, combining systems and antennas shown in this Section are incorporated by reference into this Section, and still apply,

RACOM Response: Read & Understood While RACOM has provided the responses to the following item, there is no difference between the VHF and the 700/800 offering other than those items that are band specific. The cost to add the P25 Phase 1 Conventional is the same for both systems. RACOM does expect the cost of the combining system to be lower for the 700/800 system as less filtering is needed and we have shown those cost savings in our response.

3. Land mobile radio systems are defined to include, but are not limited to the following components at the City of Moscow radio sites described in this Specification:

- 700/800 MHz P25 Phase 1 radio base stations
- 700/800 MHz P25 Phase 1 radio voting receivers
- Receiver Voting Equipment
- Site Controllers Required for Simulcast Operation and for Receiver Voting
- Transmitter Combiners
- Receiver Multicouplers
- Monitoring and Alarm Systems
- Ethernet switches
- Equipment Racks

GPS Oscillators
Transmission Lines and Antennas
Surge Arrestors

RACOM Response: Read & Understood

B. Related Sections

1. Division 01 Sections.
2. Section 26 20 00 – DC Power and Alarm Systems
3. Section 33 83 40 Microwave Radio System
4. Section 16050 - Basic Electrical Materials and Methods
5. Section 16075 – Electrical Identification
6. Section 33 83 00 – Land Mobile Radio Systems

RACOM Response: Read & Understood

1.2 REFERENCES

A. ANSI/NFPA

1. ANSI/NFPA 70 - National Electrical Code

B. Federal Communications Commission:

1. 47 CFR 1.1310 – Radiofrequency Radiation Exposure Limits

RACOM Response: Read & Understood

1.3 SYSTEM DESCRIPTION

A. SYSTEM OVERVIEW

This Specification contains the requirements for the procurement, installation, configuration, and testing of new 700/800 MHz base station radio equipment that will make up a new 700/800 MHz P25 Phase 1 simulcast radio system with three base station repeater sites. The system will consist of a single 3-Site simulcast system, and a voting receiver system incorporating all of the receivers in the simulcast system.

The Contractor's responsibility shall be to provide and install, configure, test, and document the radio systems at the new and existing sites described in this specification.

Radio system equipment including 700/800 MHz P25 Phase 1 base station radios, site controllers, transmitter combiners and receiver multicouplers, monitoring and alarm units for the 700/800 MHz and microwave radios, Ethernet switches, GPS oscillators, transmission lines and antennas, surge arrestors and other equipment required to provide a complete and functional simulcast system with receiver voting will be provided and installed by the contractor, as described below.

All cabling and other ancillary equipment required to interconnect these items of equipment into fully functional systems shall be provided and installed by the contractor.

Microwave radio equipment and backup DC Power systems will also be installed under this contract, as described in Section 33 83 40 and Section 26 20 00. The microwave radio links from the Well 10 site to the two voting receiver sites at Residence Water Tower and Rotary Park Water Tower and the fiber link to the Vista Water Tank will not be implemented under this 700/800 MHz alternative, since these voting receiver sites will not be part of the 700/800 MHz radio system.

Section 33 83 00 contains the original requirements for a VHF analog simulcast radio system. Because VHF analog base stations are available from various vendors, and because some radios require -48 VDC power and some radios require 12 VDC (nominal 13.6 VDC) power, these specifications and the attached Contract Drawings show typical equipment configurations and equipment rack layouts for both -48 VDC equipment and for 12 VDC equipment. Proposers may specify a system configuration with either power supply alternative, provided that all of the radio equipment (excluding the transmitter combiner and receiver multicoupler equipment), microwave or fiber interconnect equipment and backup DC power equipment fits into a single EIA 19" equipment rack (because of equipment space limitations at some of the repeater sites). The configuration of equipment shown in the Contract Drawings is typical, and Proposers may provide a different configuration of equipment as long as it meets the space requirement described above. The same space constraints exist for the 700/800 MHz P25 Phase 1 system described in these specifications, and the proposed base station equipment and associated equipment described above must fit in the rack configurations show for the VHF system in the Contract Drawings associated with Section 33 83 00.

RACOM Response: Read & Understood, RACOM's proposed solution is -48 VDC. RACOM has not included any 12 VDC equipment in our response.

Existing City of Moscow Radio System

See Section 33 83 00 for a description of the existing City of Moscow radio system.

Proposed New City of Moscow Radio System

The channel names that will be used in the new 700/800 MHz P25 Phase 2 system are shown below in Table 1. Frequencies for the 700/800 MHz system will be obtained through the Region 12 Regional Planning Committee application and approval process and licensed with the FCC based on Region 12 approval. The City of Moscow is proceeding with the Region 12 approval process for these channels and will file the FCC license applications for these channels once they are approved. The channels listed below should be considered provisional until they are approved by the Region 12 700 MHz Regional Planning Committee.

The City of Moscow Public Works Channel will operate on a separate VHF channel and will have its base station facilities replaced as part of the radio system upgrade project, as shown in Table 2 below. The equipment required to upgrade the Public Works facilities at the Latah County is described in Section 33 83 00.

City of Moscow 700 MHz Simulcast TX Channels	
769.29375	MFD Main Dispatch Channel - TX
769.56875	MFD TAC Channel #1 - TX
770.55625	MPD Main Dispatch Channel - TX
771.28125	Shared TAC Channel #1 - TX
771.45625	Shared TAC Channel #2 - TX
City of Moscow 700 MHz Simulcast RX Channels	
799.10625	MFD Main Dispatch Channel - RX
799.29375	MFD TAC Channel #1 - RX
800.55625	MPD Main Dispatch Channel - RX
801.28125	Shared TAC Channel #1 - RX (Well 10 and Courthouse Sites Only)
801.45625	Shared TAC Channel #2

Table 1 – 700 MHz Frequencies and New System Channel Names

The configuration and locations of the sites that make up the new City of Moscow 700/800 MHz simulcast radio system are shown below in Table 2. The overall system consists of a simulcast system made up of the Moscow Mountain, KUID-TV and Well 10 repeater sites, and a voting receiver system made up the base station repeater receivers at those three sites.

The Moscow Mountain, KUID-TV and Well 10 simulcast system has five channels: the MFD main dispatch channel, the MFD TAC channel, the MPD main dispatch channel, and the two shared TAC channels, as shown above in Table 1.

The VHF Public Works repeater in the Courthouse will remain a stand-alone repeater with no connection to dispatch or to the simulcast system or the interconnect system. The requirements for upgrading the Public Works repeater at the Courthouse site are shown in Section 33 83 00.

Site	Geographical Coordinates		Elevation (Feet AMSL)	Shelter Type	Antenna Support Structure
700/800 MHz Simulcast System (TX Frequencies: TBD)					
Moscow Mountain	46-44-14.6 N	116-59-44.6 W	4485	Existing Shelter	Existing Lattice Tower
KUID-TV	46-40-54.0 N	116-58-17.0 W	3567	Existing Shelter	Existing Lattice Tower
Well 10	46-44-06.7 N	117-02-22.9 W	2625	Existing Well House Building	New Monopole
Public Works Repeater (TX Frequency: 153.9800 MHz) Stand-Alone Repeater					
Latah County Courthouse	46-43-50.3 N	116-59-48.6 W	2648	Courthouse Building	Existing Guyed Tower

Table 2 – Configuration and Location of City of Moscow Repeater Sites

The antennas used at each site, along with antenna elevations above ground, nominal transmitter output power and Effective Radiated Power for each channel at each repeater site are shown below in Table 3. Cut sheets for the antennas shown in Table 3 are shown in Appendix 1A of Section 33 83 01.

Antenna Requirements, Antenna Height, ERP and Delay Offset Parameters for City of Moscow 700/800 MHz Simulcast System							
Repeater Site	TX Antenna	Azimuth (" True)	Simulcast System ERP (Watts)	TX/RX Antenna Elevation (Meters AGL)	TX/RX Antenna Elevation (Meters AMSL)	TX Antenna AHAAT (Meters)	Delay Offset (µSec)
Moscow Mountain	TX Antenna - OMNI - 6.5 dBd [Sinclair SC466HF1LDF (D03-PIP) - 3° Downtilt]	N/A	150.0	16.8	1294	402	0.0
	RX Antenna - OMNI - 6.5 dBd [Sinclair SC466HF1LDF (D03-PIP) - 3° Downtilt]	N/A	N/A	36.6	1314	N/A	N/A
Well 10	TX Antenna - OMNI - 6.5 dBd [Sinclair SC466HF1LDF (D00-PIP) - 0° Downtilt]	N/A	100.0	16.8	804	-50	0.0
	RX Antenna - OMNI - 6.5 dBd [Sinclair SC476HF1LDF (D00-PIP) - 0° Downtilt]	N/A	N/A	24.4	812	N/A	N/A
KUID-TV (Paradise Ridge)	TX Antenna - OMNI - 6.5 dBd [Sinclair SC466HF1LDF (D02-PIP) - 2° Downtilt]	N/A	50.0	16.8	1113	264	7.0
	RX Antenna - OMNI - 6.5 dBd [Sinclair SC466HF1LDF (D02-PIP) - 2° Downtilt]	N/A	N/A	57	1153	N/A	N/A

Figure 3 – Frequencies, Antennas, and Effective Radiated Power by Site – 700/800 MHz Repeater Sites

The geographical coordinates of each of the simulcast repeater sites and the Whitcom site are shown below in Table 4.

Site name	Latitude	Longitude
KUID-TV (Paradise Ridge)	46 40 54.00 N	116 58 17.00 W
Moscow Mountain	46 48 40.95 N	116 55 02.94 W
Well10	46 44 06.70 N	117 02 21.70 W
Whitcom	46 45 05.96 N	117 10 03.00 W

Table 4 – Site Geographical Coordinates

RACOM Response: Read & Understood

- B. The subsystems and system components to be provided installed, configured, and tested as described in this Specification include:
1. 700/800 MHz P25 Phase 1 base station radios, consisting of the following equipment:
 - a.) 700/800 MHz P25 Phase 1 base station radios, configured as repeaters and programmed for operation on the frequencies and with the nominal transmit power output levels listed in Table 2 above, as follows:
 - b.) Moscow Mountain Site – 5 base station repeaters
 - c.) KUID-TV Site – 5 base station repeaters
 - d.) Well 10 Site – 5 base station repeaters
 - e.) Courthouse Site – Provide and install new Public Work VHF analog repeater as described in Section 33 83 00.
 - f.) General product specifications for the base station repeaters are shown below in Section 2.1.B
 - g.) Install the base station repeaters in the radio equipment rack at each site, as shown in the Contract Drawings.
 2. Provide and install transmitter combining equipment at the three simulcast repeater sites, consisting of the following equipment:
 - a.) dB Spectra DSCC-75-05N transmitter (or approved equivalent).
 - b.) Detailed specifications for these units are shown below in Section 2.1.G.
 - c.) The contractor shall be responsible for cables from the combining system to the surge arrestors at each site and from the radio equipment to the combiner input ports and from the combiner antenna output port to the surge arrestor at the building entry port.
 - d.) Install the combining systems and the duplexer in EIA 19" racks (either racks included with combining systems or a new rack for the duplexer), as shown in the Contract Drawings.
 3. Provide and install transmitter combining and receiver multicoupling equipment at the three simulcast repeater sites, consisting of the following equipment:

RACOM Response: Read & Understood, an overview of the system proposed by RACOM is provided in our response that matches what is outlined above, we also would recommend the City consider including the same additional RX sites unless the goal is to also eliminate the links to these sites also.

- a.) dB Spectra DS7TMD-17 Tower Top Amplifier (or approved equivalent)
- b.) dB Spectra DSX7P05-DT Receiver Multicoupler (or approved equivalent)
- c.) Detailed specifications for these units are shown below in Section 2.1.H and 2.1.I.
- d.) The contractor shall be responsible for cables from the multicoupler system to the surge arrestors at each site and from the radio equipment to the multicoupler output ports.
- e.) Install the combining systems and the duplexer in EIA 19" racks (either racks included with combining systems or a new rack for the duplexer), as shown in the Contract Drawings.

RACOM Response: Read & Understood. RACOM has proposed equivalent dbSpectra equipment for all the sites as outlined.

4. Courthouse Site – VHF Coaxial Switch

See Section 33 83 00 for VHF coaxial switch requirements for Public Works VHF repeater VHF Switch and Power Combiner.

RACOM Response: Read & Understood

- 5. Provide and install GPS master oscillator equipment consisting of the following items at the three simulcast sites (Moscow Mountain, KUID-TV, and Well 10).
 - 1. GPS Master Oscillator
 - a.) Orolia SecureSync 1200-433 Master Oscillator (or approved equivalent) – Quantity – 1 per site
 - b.) Orilia Spectacom 8230AJ GPS Antenna (or approved equivalent) – 1 per site
 - c.) Orilia Spectacom 8226 Antenna Line Surge Suppressor (or approved equivalent) – 1 per site
 - d.) Orilia Spectacom 1204-1C 10 MHz Frequency Output Option Module Card with 3 outputs per card (or approved equivalent). Quantities: 2 at Moscow Mountain site, Well 10 and KUID-TV sites
 - e.) Install GPS antennas as shown in the Contract Drawings.
 - f.) Provide and install 1/2" coaxial cables terminated in Type N male connectors (LMR-400 or approved equivalent) between each GPS oscillator and its associated GPS antenna.
 - g.) Detailed specifications for these GPS oscillators and associated components are

shown in Section 2.1.E below.

RACOM Response: Read & Understood

6. Provide and install new 16-port Ethernet switches (Cisco CBS250-16P-2P Stackable Managed Switch or approved equivalent) at the simulcast repeater sites, and at the Whitcom site, as shown in the Contract Drawings. (These switches are specified because they are the same switches used in the City of Moscow IP network, so the City has an inventory of spares and City IT personnel are familiar with these units.)
 - a.) Connect the AC power cord for each Ethernet switch to an outlet on the -48 VDC to 120 VAC inverter at each site. (See Section 26 20 00 – DC Power and Alarm Systems for detailed specifications for the DC-AC inverters.)
 - b.) Detailed specifications for these Ethernet switches are shown in Section 2.1.F below.

RACOM Response: Read & Understood. RACOM can provide these but propose to use the Cisco switches outlined in our system overview as they are available with -48VDC supplies so do not require an inverter.

7. Provide and install new 19" EIA equipment racks at the following sites, as shown in the Contract drawings. Racks shall be EIA 19 inch 2-post racks [Cooper B-Line SB506084XUYZ (or approved equivalent)] with zinc chromate finish and universal panel hole pattern, rated for Seismic Design Category B (minimum) with a 900 pound load.
 - a.) Moscow Mountain – 2 racks
 - b.) KUID-TV – 2 racks
 - c.) Well 10 – 2 racks
 - d.) Whitcom – 1 rack
 - e.) XU in the model number shown above indicates a universal hole pattern for the panel mounting holes; YZ in the model number shown above indicates a zinc chromate finish; Confirm with Cooper B-Line that the part number shown above is the correct part number for a 7-foot 19" rack with zinc chromate finish and universal hole pattern.
 - f.) Install racks following manufacturer's installation instructions, anchor racks to floor and as shown in the drawings.
 - g.) Provide a "Framework Ground Conductor System" for the equipment racks consisting of framework ground conductors that connect from the framework ground in each equipment rack directly to the Master Ground Bar ("MGB"). Implement Framework Ground System in a "tree" form. The "trunk" of the framework ground conductor starts at the Master Ground Bar and is run over the racks with a tap conductor connecting to each rack. Tap conductors are connected to the main conductor using irreversible compression "C-clip" taps. Use 1/0 AWG wire for the main conductor.

Main conductor may be either bare or green jacketed (THHN) stranded copper wire. Tap conductors from each rack to the framework ground feeder are green jacketed (RHW or THHN) 6 AWG wires terminated with two-hole irreversible compression lugs.

- h.) Bond main ground conductor runs to cable tray at 3-foot intervals, as shown in the Contract Drawings.
- i.) Details of the locations and mounting details for the racks are shown in the Contract Drawings.
- j.) Detailed specifications for these equipment racks are shown in Section 2.1.H below.

RACOM Response: Read & Understood

- 8. Provide and install site/channel controllers to provide simulcast system timing and receiver voting at the following sites. (These controllers are not required if simulcast timing control and receiver voting functionality is incorporated into the base station equipment provided in response to these Specifications.)

RACOM Response: Comply. The controllers and votes are built in software features of the proposed TB9400 Base Stations

- a.) Moscow Mountain Simulcast Site
- b.) KUID-TV Simulcast Site
- c.) Well 10 Simulcast Site
- d.) Detailed specifications for the site controllers are not included in these Specifications, since the specifications for this equipment is specific to the vendor supplying the base station radio equipment.
- e.) Install the site controllers (if required) as shown in the Contract Drawings.

RACOM Response: Read & Understood

- 9. Provide and Install transmission lines, transmission line jumpers, transmission line entry ports, surge arrestor frames and ground bars at the three simulcast repeater sites as shown below.

RACOM Response: Comply. Actual cables, connectors and there type and size will be finalized in the Detailed Design but all items proposed will be of those outlined or equivalent.

- a.) All connectors on all fixed station cables and omnidirectional antennas must be Type N or 7/16 DIN, constant impedance type connectors.
- b.) All exposed antenna hardware must be S31600 stainless steel, brass, or C65100 low silicon bronze. Hot dip zinc galvanized steel meeting ASTM A-123, A-153, A-385 and B-695 may be used for mounting brackets.
- c.) Transmission lines shall be CommScope AVA5P-50-C (or approved equivalent) 7/8" foam dielectric solid outer conductor coaxial cable Determine the correct

transmission line lengths for each antenna. Transmission lines shall be one continuous length; splices are not allowed. All transmission lines shall be terminated at the antenna end with a Type N female connector, CommScope 78EZNF (or approved equivalent) for 7/8" transmission line, and at the surge arrestor end with a Type N male Connector, CommScope 78EZNM (or approved equivalent) for 7/8" transmission line.

- d.) All connections between antennas and jumpers shall be weatherproofed using the cold-shrink weatherproofing kit recommended by the manufacturer, CommScope 221213 (or approved equivalent) for 1/2" and 7/8" transmission line to antenna or equipment connections].
- e.) GPS Antenna Transmission Lines - for transmission lines to the GPS antennas, use CommScope LDF4-50A 1/2" (or approved equivalent) foam dielectric coaxial cable with Type N male connectors (or appropriate connector for existing GPS antenna and surge arrestor). All connections between antennas and jumpers shall be weatherproofed using the cold-shrink weatherproofing kit recommended by the manufacturer, CommScope 221213 (or approved equivalent) for 1/2" transmission line to antenna connections].
- f.) Connections between the antenna end of each transmission line and the antenna connector shall be made using CommScope F4A-NMNM (or approved equivalent) or F4ANMDM (or approved equivalent) foam dielectric super-flexible jumpers terminated with Type N connectors male connectors or 7/16" DIN connectors (as appropriate for each antenna).
- g.) Transmission Line Connectors – Transmission line connectors shall be CommScope or approved equivalent Type N connectors designed specifically to fit the cable on which the connector is installed. Connections between line sections, antennas, and jumpers shall be weatherproofed using the weatherproofing kit recommended by the manufacturer. All transmission lines shall be terminated at the antenna end with a Type N female connector, CommScope 78EZNF (or approved equivalent) for 7/8" transmission line, and at the surge arrestor end with a Type N male Connector, CommScope 78EZNM (or approved equivalent) for 7/8" transmission line. All connections between line sections and jumpers shall be weatherproofed using the weatherproofing kit recommended by the manufacturer, CommScope 221213 (or approved equivalent) for 7/8" transmission line to 1/2" jumper connections.
- h.) All connectors shall be manufactured by the same manufacturer as the transmission line. All connectors shall be installed utilizing the manufacturer's recommended tooling following manufacturer's instructions.
- i.) The use of any adapters and/or splices is prohibited, with the exception of SMA to Type N adapters or cables required to connect base station radios with SMA connectors to transmitter combiner, receiver multicoupler or duplexer ports with Type N connectors.
- j.) Grounding Kits – Provide and install transmission line grounding kits recommended by the manufacturer to bond each transmission line and waveguide to the tower ground tab at the antenna end, to the ground bar at the base of the tower, and to the ground bar on the outside of the building at the transmission line entry port. Use

CommScope CSG78-12B2U (or approved equivalent) universal Grounding Kit (with 45" ground lead and two-hole lugs) for 7/8" transmission line runs. Use CommScope CSG12-06B1A (or approved equivalent) universal Grounding Kit (with 45" ground lead and two-hole lugs) for 1/2" transmission line runs.

Choose ground lead length to be appropriate for the installation situation using the shortest practical route. Ground lead cable bends shall be sweeping and have a bend radius of no less than 8 inches. Bends shall not form an included angle of less than 90 degrees. Install kit following manufacturer's instructions. Weatherproof connections between grounding kit and transmission line using the weatherproofing materials provided with the grounding kit.

Connect ground lead at tower base ground bar and building ground bars with 2 each 5/16"x18 x1" bolt with flat washer between bolt and lug and flat washer, split lock washer and nut behind ground bar or ground plate near antenna. Hardware to be C65100 Low-Silicon Bronze. Use conductive grease between lug and ground bar or ground plate.

- k.) All transmission lines must be secured with the transmission line manufacturer's recommended stainless-steel hardware, with appropriate tower mounting hardware, and supported by transmission line bridges that will be supplied as part of this procurement. Hangers used to support transmission line on transmission line bridge, transmission line ladder, and other locations where support members with mounting holes are used shall attach to support members with a bolt installed through the mounting hole and a lock washer and nut on the back side of the support member. "Snap-in" hangers are not permitted.
- l.) Detailed specifications for the transmission lines and associated equipment shown above are shown in Section 2.1.I through 2.1.P below.
- m.) Provide and install Site Pro E1449 transmission 6-port (2 X 3) 4" transmission line entry panels (or approved equivalent) with Site Pro BA121M boot kit (or approved equivalent) for the transmission lines, as described in Section 2.15.S below, and as shown in the Contract Drawings. Install panels at the following sites:
 - 1.) Well 10
 - 2.) KUID-TV
 - 3.) Detailed specifications for these entry ports are shown in Section 2.1.Q below
- n.) Entry Port Grounding Assembly - Moscow Mountain, KUID-TV and Well 10 simulcast repeater sites,

Provide and install an CommScope AT-K306-U (or approved equivalent) grounding bar trapeze assembly to mount surge suppressors immediately inside building entry port, as shown in the drawings. Mount grounding bar trapeze assembly to both the ceiling and the wall of the building, as shown in the drawings, to assure structural stability. Connect ground bar assembly to Master Ground Bar ("MGB") using 2 AWG tinned solid copper wire with irreversible compression 2-hole lugs, as shown in drawings. Attach lugs to MGB using 2 each 3/8"x 18 x 1" bolt with flat washer between bolt and lug and flat washer, split lock washer and nut behind ground bar.

Hardware to be C65100 Low-Silicon Bronze. Connect exterior ground bar to building buried ground ring using 3" wide 0.032" thick copper strap, as shown in drawings. Attach to-hole lugs from transmission line ground kits to external ground bar, using 2 each 3/8"x 18 x 1" bolt with flat washer between bolt and lug and flat washer, split lock washer and nut behind ground bar. Use conductive grease between ground kit mounting hardware and external ground bar.

Detailed Specifications for the Surge Arrestor Trapeze are shown below in Section 2.1.T below.

- o.) Surge Suppressors –Provide and install surge suppressors (Polyphaser IS-B50HN-C2 or approved equivalent) on incoming transmission lines. Mount surge suppressors directly to AT-K306-U grounding bar assembly at the Moscow Mountain, KUID-TV and Well 10 simulcast repeater sites using integral surge side Type N Connectors and appropriate lock washers and nuts and integral bulkhead flange plate with #10 stainless steel hardware.

Detailed specifications for these surge suppressors are shown below in Section 2.1.U and 2.1.Vbelow.

- p.) Cable Ladders –Provide and install cable ladders (B-Line SB17U12BYZ or approved equivalent) at the KUID-TV site, as shown in the drawings.

Detailed specifications for these cable ladders are shown below in Section 2.1.W below.

- q.) Assure that antennas are mounted to minimize, as much as possible, the pattern distortion effects caused by close proximity to tower members, transmission lines, other antennas, and other metallic objects located near the antenna. Antenna mounting structures and devices shall be mechanically compatible with the antenna support structures at each site, and shall be adequate to support each antenna on the tower or other antenna support structure.
- r.) Antennas shall meet or exceed the requirements of ANSI/EIA/TIA-329-C. Antenna bandwidths shall allow an antenna to be used for receive or transmit for each transmit/receive frequency pair (or frequency pairs in the case of combined antennas). Pattern tilt (other than electrical beam tilt if applicable) across this band shall be minimized to the degree that this is possible.
- s.) Transmission lines shall have their outer conductors bonded to the tower at the antenna end, as close to the antenna as possible, to the ground bars at the base of the tower and at the building entry port, using the manufacturer's recommended grounding kit. Grounding kit wires used to connect transmission line and waveguide ground kits to tower ground lugs or ground bars shall be continuous lengths of wire supplied by the manufacturer as part of the ground kit. Splices in ground kit wires are not permitted.

RACOM Response: [Read & Understood](#)

- 10. Provide and install transmit and receive antennas at all simulcast repeater sites. Any substitutions with antennas equivalent to the model numbers shown in Table 3 must be

approved by the City.

- a.) Mount antennas on towers or monopoles, as shown in the Contract Drawings.
- b.) At the Courthouse site, replace the existing VHF duplex antenna mounted on the rooftop guyed tower with the new antenna shown in Table 3 of Section 33 83 00.

RACOM Response: Read & Understood

C. Network Interconnect Configuration and Documentation

- 1) Coordinate with City IT personnel to assign IP address to the base station repeaters, voting receivers, microwave radios and site controllers (if site controllers are required) at each site. Connect base station repeaters and voting receivers to the IP backbone interconnect system via the Ethernet switches at each site. Coordinate with City IT personnel to connect to the City fiber backbone at the Well 10 simulcast repeater site, the City Hall simulcast repeater site, and the Vista voting receiver site.

RACOM Response: Read & Understood

D. Simulcast System Alignment

- 2) Adjust the launch time for each new simulcast repeater site to minimize audio distortion in the non-capture overlap zones among the new sites making up the two simulcast sub-systems, using the initial delay settings shown in Table 3, which have been determined via modeling of the simulcast delay spread and simulcast system performance in the system coverage area within and around the City of Moscow.
- 3) Provide written results of the simulcast system optimization showing final system simulcast settings to the City.

RACOM Response: Read & Understood

E. Voting Receiver Configuration

- 1) Configure voting receivers to select the best received signal among all the receive sites in the system, as follows:
 - a.) Moscow Mountain Simulcast Repeater Site
 - b.) KUID-TV Simulcast Repeater Site
 - c.) Well 10 Simulcast Repeater Site

RACOM Response: Read & Understood

F. Fire Alerting System

Use the existing primary VHF Fire Dispatch repeater at Moscow Mountain, which operates on 153.8000 MHz TX/155.8875 MHz RX, to transmit tones for the existing Fire Alerting System. Cross-connect the audio for these tones so that they are simultaneously transmitted over the 700/800 MHz Fire Dispatch Channel and the existing VHF Fire Dispatch repeater simultaneously.

RACOM Response: Read & Understood. This connection would be best done within the console system that RACOM can help with that configuration change.

G. Mobile and Portable Radio Configuration

Program all City of Moscow portable mobile radios to operate on the new 700/800 MHz simulcast system frequencies. Coordinate with the City to produce a template that includes new frequencies, CTCSS tones and Channel Names for the radio programming. Program radios to allow for a smooth cutover from the existing radio system to the new radio system.

RACOM Response: Read & Understood – RACOM can program the radios assuming they can support 700/800 MHz. It is our understanding that most of the radios the users within the City have are VHF radios.

H. Coordination with Whitcom Dispatch Center

Coordinate with the City and with the Whitcom Dispatch Center to incorporate the radio channels in the new 700/800 MHz simulcast system into the dispatch consoles at Whitcom and to provide appropriate interconnections between the new system and the dispatch consoles at Whitcom.

RACOM Response: Read & Understood

I. Network Management System

Provide, install, and configure a new network management system to provide status, alarms and monitoring of the radios and associated equipment in the radio system. City will provide a server for the Network Management System software. Coordinate with City to implement the Network Management System.

RACOM Response: Comply RACOM has proposed the Tait EnableMonitor tool for this.

J. Cutover Plan

30 days prior to the beginning of any installation work provide a complete cutover plan, arranged by site, to the City. The cutover plan shall describe how the systems described below will be installed, configured, and tested, and how cutover from the existing configuration of systems at the existing sites to the new system configuration and new sites will be accomplished. Submit the cutover plan for approval by the City.

RACOM Response: Read & Understood

1.4 PERFORMANCE REQUIREMENTS

- A. Conform to all applicable code for manufacture and installation of land mobile radio systems and associated equipment and materials.

RACOM Response: Read & Understood

- B. Install and configure land mobile radio systems in accordance with good engineering practices.

RACOM Response: Read & Understood

- C. All proposed equipment shall be supported by the vendor for a minimum of seven years after product discontinuation. If necessary parts are not available before the end of the seven years, a replacement will be provided at no additional cost to the City of Moscow which meets the contractual requirements and is compatible with the system. All applicable product discontinuations shall be promptly reported to the City of Moscow. This includes the equipment manufactured by the radio vendor as well as any third-party equipment provided by the radio vendor.

RACOM Response: Read & Understood RACOM can offer up to 10 years of extended warranty on the proposed equipment which includes software updates.

1.5 WARRANTY

- A. The Vendor shall include warranty support for the first year, beginning at Final Acceptance or Beneficial Use, whichever comes first.

RACOM Response: Comply

- B. Warranty shall include the following services:

1. Depot Advanced Repair: The replacement part is to be shipped overnight to the field before the broken part is shipped to Depot Repair.

RACOM Response: Read & Understood. RACOM would recommend having on-site spares to minimums downtime of the channel.

2. Technical Support: 24 x 7 phone support.

RACOM Response: Comply

- C. At the end of the warranty period, one Preventative Maintenance (PM) shall be performed by the Vendor, and all equipment shall be brought to the latest software revision.

RACOM Response: Comply

1.6 POST-WARRANTY SUPPORT REQUIREMENTS

- A. All technical service bulletins shall be sent to the City of Moscow via email or another approved method.

RACOM Response: Read & Understood, these are only provided to customers under a support agreement and are available on the manufacture's technical web site.

- B. All software revisions shall be provided at no cost to the City of Moscow.

RACOM Response: Read & Understood, these are only provided to customers under a support agreement (Extended Warranty) and are available on the manufacture's technical web site.

- C. Any known major defect with the products supplied by the Vendor shall be corrected at no cost. A major defect is defined as a defect degrading the performance of the product below its published specifications or causing outages.

RACOM Response: Read & Understood, these are only provided to customers under a support agreement (Extended Warranty) and are available on the manufacture's technical web site.

- D. Proposer shall offer post-warranty services matching 1.5.B.

RACOM Response: Comply – RACOM has included the cost for post warranty support in our pricing response.

1.7 TRAINING

- A. The Proposer shall describe the available training related to this system.

RACOM Response: Read & Understood details on the training offered are provided in our response in the implementation section.

1.8 PRICING SHEETS

- A. Pricing sheets shall be formatted as below. Line-item pricing for both the equipment at the line-item level and services pricing broken out into the categories below shall be presented. Proposals with any pricing rolled up into larger categories shall be considered non-compliant and rejected.

RACOM Response: Read & Understood. RACOM has included fixed pricing for the services proposed and if required to use hourly billing, the cost to the City will be the actual time spent and there will be an additional administration cost to manage invoice them.

- B. Reference any contractual agreements being used for discounts. Pricing incentives may also be utilized. Pricing shall be valid for one year after system acceptance.

RACOM Response: Read & Understood

- C. Equipment Pricing

RACOM Response: Read & Understood. Some items outlined in the RFP if not listed individually are included in the miscellaneous parts line items.

SITE	MODEL NUMBER	DESCRIPTION	QTY	LIST PRICE	DISCOUNT %	CONTRACT PRICE	EXTENDED CONTRACT PRICE
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- D. Services Pricing

RACOM Response: Read & Understood. RACOM has included fixed pricing for the services proposed and if required to use hourly billing, the cost to the City will be the actual time spent and there will be an additional administration cost to manage invoice them.

Post Warranty Services Technical Support (24/7 Remote Support) and Depot Repair

(Extended Warranty) along with Software Updates is available as one offering called Service Advantage as outlined in our pricing sheet.

CATEGORY	PER HOUR	TOTAL HOURS	LABOR COST	EXPENSES	TOTAL
PROJECT MANAGEMENT					
ENGINEERING					
DOCUMENTATION					
COVERAGE TESTING					
TECHNICIAN OPTIMIZATION					
TRAINING					
WARRANTY SERVICES					
OTHER (DESCRIBE)					

POST WARRANTY SERVICE	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9	YR 10
TECHNICAL SUPPORT									
DEPOT REPAIR									
OTHER (DESCRIBE)									

1.9 SUBMITTALS

- A. Submittal Drawings: Submit shop drawings showing details and location of Radio System equipment (700/800 MHz base station repeater radios, transmitter combiners and receiver multicouplers, GPS oscillators, DC power systems and associated equipment) at each site. Provide rack elevation drawings for each site. Provide schematic line drawings showing configuration of radio equipment, network equipment, DC power equipment, microwave radio equipment and related equipment provided under this specification. Submit elevation drawings showing antenna mounting locations for land mobile and microwave antennas (see Section 33 83 40 Microwave Radio System for microwave antenna requirements).

RACOM Response: Read & Understood

- B. Manufacturer's Installation Instructions: Submit preparation requirements, and special installation instructions.

RACOM Response: Read & Understood, as available from the manufacturer.

- C. Provide manuals for each type of equipment. Manuals may be provided electronically in Portable Documentation Format and/or as a hard-copy. For any manual supplied as a hard-copy, provide three copies.

RACOM Response: Read & Understood

1.10 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Submit as-built drawings recording actual locations, configuration, and installation details of all radio system components.

RACOM Response: Read & Understood

- B. Provide a detailed on-site manual with complete documentation of all installed systems for each individual site. Provide an overall system manual that includes complete documentation of all installed systems for all the sites.

RACOM Response: Read & Understood

- C. Provide all documentation in original .docx, .xlsx or .dwg formats, with PDF versions of each document.

RACOM Response: Read & Understood – for those related to the closeout documents only.

1.11 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with a minimum of five (5) years demonstrated experience in the installation of land mobile and microwave radio equipment, antennas, and waveguides/transmission lines with a documented history of neat and workmanlike installation practices. Provide photo documentation of previous installation work comparable to the work called for in these specifications. Provide project references (including customer contact information) for at least three (3) previous projects with work comparable to the work called for in these specifications.

RACOM Response: Read & Understood – references included in our response. RACOM has been providing and installing Public Safety Communication systems for over 50 years and with us joining Eastern Communication we are now one the three largest system integrators nationwide.

1.12 KICK-OFF MEETING

- A. Vendor shall meet with City of Moscow personnel to verify the design and the Bill of Materials (BOM). The Vendor will visit each site with City personnel to confirm space, power, and other considerations needed for installation. An initial cutover plan will be developed and mutually agreed upon. From this, the Vendor shall provide the County with an installation document including but not limited to:

1. Overall system block diagram
2. Equipment rack elevations
3. Equipment (cabling) interconnections, with references to any cable labels as needed
4. Power/breaker requirements
5. System Interconnect Diagram and Interconnect System Details (see Section 33 83 40 for interconnect network requirements)
6. Any other information required to successfully install the provided equipment
7. Installation and User Manuals for all provided equipment

RACOM Response: Read & Understood – Kick Off meeting will be used to start the overall Detailed Design process which will produce the items outlined above. They will

not be provided as part of the Kick-Off meeting.

- B. Attendance is to include all parties directly affecting, or affected by work of this section, including electrical sub-contractor, and installers responsible for installation of DC power systems and microwave radio at the City of Moscow sites.

RACOM Response: Read & Understood

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products with adequate protection against damage. Avoid breakage, denting and scoring finishes. Do not install damaged equipment.
- B. Deliver material to work site in original factory packaging.
- C. Store radios, transmitter combiners and receiver multicouplers, GPS receivers, transceivers and site controllers, equipment racks, and other components and accessories in original cartons or shipping containers and in a clean dry space; protect from weather and construction traffic. Wet materials should be unpacked and dried before storage.

RACOM Response: Read & Understood – equipment that is racked and tested before the delivery to the sites will not be in its original factory packaging but will be protected from damage and kept dry.

1.14 FIELD MEASUREMENTS

- A. Verify field measurements prior to equipment installation.

RACOM Response: Read & Understood – field measurements will be done as part of the installation along with pretesting and staging that is done with the equipment.

1.15 SEQUENCING

- A. Sequence work to allow for installation of electrical systems, cable tray systems, site grounding systems, DC power systems and other work required before installation of radio systems.

RACOM Response: Read & Understood – Overall installation plan will be defined and agreed on as part of the Detailed Design.

1.16 COORDINATION

- A. Coordinate work with sub-contractors installing electrical systems, site grounding systems, cable tray systems, tower work and site construction work.

RACOM Response: Read & Understood

PART 2 PRODUCTS

2.1 GENERAL

A. Shown below are detailed specifications for the equipment items to be provided, installed, and tested by the Contractor.

B. Specifications for base station repeater transceivers are shown below.

1. Base station transceivers shall meet the following specifications as measured per the methods as described in TIA-603-E:
2. Transmitters rated for continuous duty
3. Maximum Transmit power 100 W (including external power amplifier if required)
4. Transmitter Spurious & Harmonic Emissions Attenuation ≥ 90 dB
5. FM Hum and Noise > 45 dB
6. RF Output Impedance = 50Ω
7. Receiver Sensitivity (5% BER) $\leq 0.25 \mu\text{V}$ (-119 dBm)
8. Receiver Adjacent Channel Rejection ≥ 80 dB
9. Receiver Intermodulation Rejection ≥ 85 dB
10. Receiver Spurious and Image Rejection ≥ 100 dB

RACOM Response: Read & Understood

C. Specifications for the VHF duplexer for the Public Works base station at the Courthouse site are shown In Section 33 83 00:

RACOM Response: Read & Understood

D. The specifications for the Manual RF Switch, Power Divider and RG-213 Jumper Cables for Public Works main/backup repeater switching at Courthouse site are shown in Section 33 83 00.

RACOM Response: Read & Understood – The manufacturers may be different, but the products will be equivalent and agreed to within the Detailed Design.

E. The specifications for the GPS oscillators at the simulcast repeater sites (Orilia Securesync 1200-433 [-48 VDC power, Rubidium Oscillator, Multi-GNSS] or approved equivalent are shown below:

1. Network Services

Timing

- NTP v2, v3, v4: Conforms with or exceeds RFC 1305 and 5905. Supports Unicast, Broadcast, Multicast, MD5 encryption, Peering, Stratum 2, Autokey
- SNTP v3, v4: Conforms with or exceeds RFC 1769, 2030, 4330, and 5905
- Time (RFC 868)
- Daytime (RFC 867)
- IEEE-1588v2 (PTP) via option card(s)
- NTP over Anycast

Management

- IPv4/IPv6: Dual stack
- DHCPv4/DHCPv6 (AUTOCONF)/SLAAC: Automatic IP address

assignment

- Authentication: LDAP, RADIUS, TACACS+
- Syslog: Logging
- SNMP: Supports v1, v2c, and v3 (no auth/auth/priv) with Enterprise MIB

Communications

- HTTP: Browser-based configuration and monitoring
- Telnet: Remote configuration
- FTP Server: Access to files (logs, etc.)
- SMTP: Email

Security Features

- Enable/Block Protocols
- Set SNMP Community Names and Network Access
- Password Protected
- Standard encryption/authentication protocols
- SSL Web-based Interface: SSL is used to secure HTTPS protocol to access configuration and status web pages.
- SSH: SSL and data compression technologies provide a secure and efficient means to control, communicate with, and transfer data to or from the time server remotely.
- SCP: Securely transfers files to and from the time server over an SSH session.
- SFTP: FTP replacement operates over an encrypted SSH transport
- SNMP v3: Remotely configure and manage over an encrypted connection
- Alert notifications via SNMP Traps and e-mail

2. GNSS Receiver

- Connector: Type N, +5V to power active antenna
- Frequency: GPS L1 (1575.42 MHz), Galileo E1 (1575.42 MHz), GLONASS L1 (1602.0 MHz), BeiDou B1 (1561.1 MHz), QZSS L1 (1575.42 MHz); optional SAASM: GPS L1 & L2 (1227.6 MHz)
- Satellite tracking: 1 to 72, T-RAIM satellite error management
- Synchronization time: Cold start < 15 minutes (includes almanac download), warm start < 5 minutes (assumes almanac download)

3. Option Module Cards

a.) Frequency Output (1, 5, 10 MHz)

The 1, 5, and 10 MHz SecureSync option cards provide three (3) sine wave BNC outputs. Outputs are phased-locked to the SecureSync's disciplined oscillator

Specifications

Frequency Output	Quantity 3 per card
Signal Type and Connector	+13 dBm (10 MHz) into 50 ohm, BNC
Spurious	-70 dBc (10 MHz)
Harmonics	-40 dBc
Maximum Number of Cards:	4 total (1 MHz, 5 MHz or 10 MHz)

4. Antenna system – Model 8230AJ

Electrical

Type: Active

Frequency: 1559 to 1606 MHz Out-of-Band Rejection:

- < 1500 MHz: > 50 dB

- > 1650 MHz: > 50 dB

Gain: 40 dB from internal LNA Antenna Pattern: 0 dB at zenith 15 dB or more rejection at < 30 degrees elevation Connector: N type, female

Recommended Cable: Low Loss LMR-400 Equivalent Maximum Cable Length: 125 meters (400 ft.) maximum with most Orolia equipment and LMR-400 equivalent cable;

250 meters (800 ft.) maximum with Inline Amplifier - Model 8227 Power: 2.5 to 16 Volts, 19 milliamps (typical), powered by receiver

Mechanical

Size: 100 mm dia. (3.9");

101.5 mm H (4") from base to top;

127.2 mm H (5") including "N" connector

Enclosure: Radome: High Temperature UV Resistant Polycarbonate.; Base: Zamak White Metal

Weight: 370g (13.1oz) Compliance: IP67 and RoHS

Temperature Range: -40° to +85° C (-40° to +185° F)

Mounting: L-bracket (included) for vent pipe/pole mounting via hose clamps (included), PVC pipe sold separately

Warranty

1-Year Limited

RACOM Response: Read & Understood

- F. Specifications for the 16-port Ethernet switches (Cisco CBS250-16P-2P Stackable Managed Switch or approved equivalent) at the simulcast repeater sites and at the voting receiver sites are shown below:

Network Ports	16 X 1G
Uplink Ports	2 x 1G SFP
Power over Ethernet (POE)	120 Watts
Fan	Fanless
Power Supply	Internal (120 VAC, 50/60 Hz)
Features	Layer 2 switching, VLAN support, Spanning Tree Protocol (STP), access control list (ACL), quality of service (QoS), IPv4/IPv6 static routing
Network Management	On-device UI, Cisco Business Dashboard and mobile app
Warranty	Limited lifetime warranty

RACOM Response: Read & Understood – RACOM is proposing a different line of Cisco products that support -48VDC power supplies that are equivalent to what is outlined.

G. 700/800 MHz Transmitter Combiners

Specifications for the 5-channel 700 MHz transmitter combiners to be installed at the three 700/800 MHz simulcast repeater sites (dB Spectra DSCC75-05-N or approved equivalent) are shown below:

Specifications

<u>Electrical Specifications</u>	
Frequency Range	See Ordering Information for models
TX Frequency Separation	150 kHz Minimum
Number of TX Channels	2-12
Channel Power Maximum	110 W
<u>Isolation</u> TX to TX ANT to TX	>65 dB >50 dB
Isolation at Transmit Frequencies	>45 dB at 30 MHz Offset
Insertion Loss	See Insertion Loss Table
Return Loss	>19 dB
<u>Mechanical Specifications</u>	
Construction/Finish	5" Cavities with Ceramic Resonator, Chem Film and Paint Black
Mounting Brackets	AL Clear Chem Film
Mounting Chassis Front Panel	AL panel, black powdercoat
Input Connectors	N- Female
Mounting	EIA 19-inch rack
Temperature Range	-10° C to +60° C **
<u>Dimensions and Weight</u>	
Width	19.0 in
Depth	12.5 in
Height	See Height & Weight Table
Weight / Shipping Weight	See Height & Weight Table

Insertion Loss Table

No. of Channels	Frequency Separation -- KHz		
	150-250	250-500	>500
2	3.6	3.1	2.9
3	4.0	3.2	2.9
4	4.3	3.4	3.0
5	4.6	3.4	3.1
6	4.7	3.6	3.1
7	4.7	3.6	3.1
8	5.0	3.7	3.2
9	5.0	3.8	3.2
10	5.1	3.8	3.3
11	5.2	3.9	3.4
12	5.4	4.1	3.5

RACOM Response: Read & Understood

H. 700/800 MHz Tower-Top Amplifiers

Specifications for the 700/800 MHz tower top amplifiers to be installed at the three 700/800 MHz simulcast repeater sites (dB Spectra DS7TMD-17 or approved equivalent – DIN Connectors) are shown below. Provide and install one additional run of ½” test line coax cable from the receiver multicoupler to the tower top preamplifier for testing. Provide and install a DC block surge arrester (the Polyphaser IS-B50HN-C2 or approved equivalent) in the test line and the main feed line between the TTA and the RX multicoupler at the building entry port.

ELECTRICAL SPECIFICATIONS	
Frequency Range	See Ordering Information
TTA Gain (typical)	21 dB
TTA System Noise Figure (typical)	3 dB
System Input IP3	+15 dBm min
Return Loss (typical)	14 dB
Test Port Coupling (typical)	30 dB
Power Supply Input (nominal)	18 and 24 VDC
Operating Current (typical)	600 mA
Surge Suppression	18 KA ANSI C62.1, 8/20 waveform, 110 joules
LNA SPECIFICATIONS	
Type	Quadrature Coupled Redundant Amps (A & B)
Dual Redundancy	Two independent amps with automatic backup amplifier switching
Amplifier Bypass	Automatic or manual bypass of amps in case of amp alarms or power failure
LNA Gain	30 dB
LNA Noise Figure	0.8 dB
FILTER SPECIFICATIONS	
Filter Bandwidth	See Frequency Range in Ordering Information
Filter Isolation	> 120 dB @ 851-869 MHz and 763-776 MHz
MECHANICAL SPECIFICATIONS	
Construction	Aluminum; OPTIONAL: SS304 Stainless 11 gauge with 0.120” thickness
Environmental / Finish	Weatherproof canister, UV protected, powder coat white
RX Antenna Connector	TMA models – N (F); TMD models – DIN (F)
RX Output Connector	TMA models – N (F); TMD models – DIN (F)
Test Port Input Connector	TMA models – N (F); TMD models – DIN (F)
Temperature Range	-30° C to +60° C
Mounting Hardware	DB380 clamps for up to 3.5” OD pipe
DIMENSIONS	
Width	9 in (228.6 mm)
Height	21.25 in (539.75 mm)
Depth	13.25 in (336.55 mm)
Weight (Aluminum Enclosure)	21 lbs (9.5 kg)
Weight (Stainless Steel Enclosure)	45 lbs (20.5 kg)

RACOM Response: Read & Understood

I. 700/800 MHz Receiver Multicoupler Systems

Specifications for the 700/800 MHz receiver multicouplers to be installed at the three 700/800 MHz simulcast repeater sites (dB Spectra DSX7P05-DT or approved equivalent) are shown below. Connect the main feed line and the test line from the TTA to the RX multicoupler.

Specifications

Electrical Specifications	
Frequency Range	799-824 MHz
Number of Channels	8-32 Channels **
Internal Post Filter Passband	See Ordering Information
Isolation at offset from edge of Multicoupler Input Filter Passband (See Plots Page 2)	Standard Filter: >60 dB at 25 MHz from 25 MHz Passband Cavity Filter: >15 dB at 3 MHz from 3 MHz Passband >20 dB at 6 MHz from 6 MHz Passband >25 dB at 9 MHz from 9 MHz Passband >25 dB at 12 MHz from 12 MHz Passband
Insertion Loss (Of Multicoupler Input Filters)	Standard Filter: <2.5 dB at 25 MHz Passband Cavity Filters: <2.0 dB at 3 MHz Passband <1.5 dB at 6 MHz Passband <1.2 dB at 9 MHz Passband <1.0 dB at 12 MHz Passband
Gain (With 799-824 MHz Standard Filter)	Expansion Ports: 20 dB Minimum Splitter Outputs: 799-818 MHz: 8 dB (+/-1 dB) * 818-824 MHz: 8 dB (+/-1.5 dB) * (0 dB pre & post attenuator settings)
Noise Figure	6.8 dB Maximum (0 dB pre & post attenuator settings, NF includes Post filter loss)
Input/output Return Loss	14 dB in Passband
Input IP3	+15 dBm
Low Noise Amplifier	Quadrature Coupled
Test Port Instrument Connection	Front Panel BNC
Post-LNA Filter Connections	Available on Rear Panel
Pre & Post -LNA Adjustable Attenuators	Electronic, 0 – 15 dB, 0.5 dB steps
RX – RX Port Isolation	>20 dB
Power Input	90-240 VAC or -48 VDC (36-72 VDC isolated) models available
Output DC Voltages to TTA	Transmission Line Port: 18-24 VDC Test Port: 6 VDC
User Interface	Web Browser or Front panel Touchscreen display
IP Interface	IPV4, TLS Security Layer, SNMP Alarms V2C/V3
Mechanical Specifications	
RF Connectors	✓ RF Input: N Female ✓ RF Outputs: BNC Female (rear) ✓ Test Port –Instrument: BNC Female (front) ✓ Test Port Out to TTA: N Female (rear) ✓ RF External Filter Ports: N female
IP Interface Connector	RJ45
Dry Contact Alarm Connector	Block Type
Mounting	19" x 3.5" 2 RU Panel, depth 11.5" including connectors
Grounding Provision	¼-inch stud at rear
Temperature Range (no degradation)	0°C to +50° C
Weight / Shipping Weight	8 lbs. / 12 lbs.

RACOM Response: Read & Understood

- J. The specifications for the equipment racks to be installed at the base station repeater sites, as described above, are shown below. These racks are Two Post Seismic Relay Rack 19" Panel Mounting, Welded Steel (Copper B-Line SB506084XUYZ, or approved equivalent).
- a.) 84" x 20-5/16" x 15" (Height x Overall Width x Overall Depth).
 - b.) Independently tested to the NEBS GR-63-CORE Seismic Zone 4 standard and rated for 900 lbs. (408kg) of equipment
 - c.) Conformance to EIA/ECA-310-E.
 - d.) Mounting rail spacing is adjustable from 3" (76mm) to 8" (203mm).
 - e.) 45 rack mounting units.
 - f.) Open top, bottom, and sides permit unlimited cable management options.
 - g.) Industry standard mounting holes on sides allow attachment of vertical cable managers.
 - h.) #12-24 panel mounting screw holes (universal pattern)
 - i.) Top angles drilled for runway attachment.
 - j.) Openings in front and rear of base for duplex receptacle mounting.
 - k.) Holes for grounding provided in four locations.
 - l.) Tubular steel frame provides a high degree of strength to weight ratio.
 - m.) Zinc chromate finish.

RACOM Response: Read & Understood – The racks provided will be industry standard as outlined.

- K. CommScope AVA5P-50-C, HELIAX® Foam Coaxial Cable, corrugated copper, 7/8" in, black PE jacket (or approved equivalent)

Construction Materials

Jacket Material	PE
Outer Conductor Material	Corrugated copper
Dielectric Material	Foam PE
Flexibility	Standard
Inner Conductor Material	Copper tube
Outer Conductor	Corrugated Copper
Jacket Color	Black

Dimensions

Nominal Size	7/8 in
Cable Weight	0.302 lb/ft 0.45 kg/m
Diameter Over Dielectric	24.13 mm 0.950 in
Diameter Over Jacket	27.991 mm 1.102 in
Inner Conductor OD	9.449 mm 0.372 in
Outer Conductor OD	25.4 mm 1.0 in

Electrical Specifications

Cable Impedance	50 ohm ±1 ohm
Capacitance	22.25 pF/ft 73 pF/m

dc Resistance, Inner Conductor	0.473 ohms/kft 1.435 ohms/km
dc Resistance, Outer Conductor	0.340 ohms/kft 1.116 ohms/km
dc Test Voltage	6000 V
Inductance	0.184 μ H/m 0.056 μ H/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	8000 V
Operating Frequency Band	1 – 5000 MHz
Peak Power	91 kW
Velocity	91%

Environmental Specifications

Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)

Mechanical Specifications

Bending Moment	19 Nm 168.164 in lb
Flat Plate Crush Strength	72.97 lb/in 1.3 kg/mm
Minimum Bend Radius, Multiple Bends	254 mm 10 in
Minimum Bend Radius, Single Bend	127 mm 5 in
Number of Bends, minimum	15
Number of Bends, typical	30
Tensile Strength	159 kg 350.535 lb

Note

Performance Note Values typical, unless otherwise stated

Standard Conditions

Attenuation, Ambient Temperature	20 °C 68 °F
Average Power, Ambient Temperature	40 °C 104 °F
Average Power, Inner Conductor Temperature	100 °C 212 °F

Regulatory Compliance/Certifications

Agency	Classification
CENELEC	EN 50575 Compliant, Declaration of Performance (DoP) available
China RoHS	Below Maximum Concentration Value (MCV)
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

RACOM Response: Read & Understood – RACOM is recommending the use of Eupen coax as an equivalent. Currently we are finding the availability to be better and the support from the manufacturer.

- L. CommScope LDF4-50A, HELIAX® Low Density Foam Coaxial Cable, corrugated copper, 1/2 in, black PE jacket (or approved equivalent)

Construction Materials

Jacket Material	PE
Outer Conductor Material	Corrugated copper
Dielectric Material	Foam PE
Flexibility	Standard

Inner Conductor Material	Copper-clad aluminum wire
Jacket Color	Black
Dimensions	
Nominal Size	1/2 in
Cable Weight	0.148 lb/ft 0.22 kg/m
Diameter Over Dielectric	12.954 mm 0.51 in
Diameter Over Jacket	15.875 mm 0.625 in
Inner Conductor OD	4.826 mm 0.190 in
Outer Conductor OD	13.97 mm 0.550 in
Electrical Specifications	
Cable Impedance	50 ohm $\pm$ 1 ohm
Capacitance	23.104 pF/ft 75.8 pF/m
dc Resistance, Inner Conductor	0.451 ohms/kft 1.480 ohms/km
dc Resistance, Outer Conductor	0.820 ohms/kft 2.690 ohms/km
dc Test Voltage	4000 V
Inductance	0.190 μ H/m 0.058 μ H/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	8000 V
Operating Frequency Band	1 – 8800 MHz
Peak Power	40 kW
Velocity	88%
Environmental Specifications	
Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)
Mechanical Specifications	
Bending Moment	3.8 Nm 33.633 in lb
Flat Plate Crush Strength	111.995 lb/in 2.0 kg/mm
Minimum Bend Radius, Multiple Bends	127 mm 5 in
Minimum Bend Radius, Single Bend	50.8 mm 2 in
Number of Bends, minimum	15
Number of Bends, typical	50
Tensile Strength	113 kg 249.122 lb
Standard Conditions	
Attenuation, Ambient Temperature	20 °C 68 °F
Average Power, Ambient Temperature	40 °C 104 °F
Average Power, Inner Conductor Temperature	100 °C 212 °F
Regulatory Compliance/Certifications	
Agency	Classification
CENELEC	EN 50575 Compliant, Declaration of Performance (DoP) available
China RoHS	Below Maximum Concentration Value (MCV)
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

RACOM Response: Read & Understood – RACOM is recommending the use of Eupen

coax as an equivalent. Currently we are finding the availability to be better along with the support from the manufacturer.

- M. CommScope F4A-NMNM-P (or approved equivalent) or F4ANMDM-P (or approved equivalent) foam dielectric super-flexible jumpers terminated with Type N connectors male connectors or 7/16" DIN connectors, as appropriate.

Produce Classification

Product Type	Shureflex®
Body Style	Straight
Product Series	RSJ4-50

General Specifications

Body Style – Connector A	Straight
Body Style – Connector B	Straight
Interface – Connector A	N Male
Interface – Connector B	N Male or 7-16 DIN Male
Cable Impedance	50 ohm
3rd Order IMD, Static	-112 dBm
3rd Order IMD Test Method	Two +43 dBm carriers
VSWR/Return Loss	30.04 dB

Regulatory Compliance/Certifications

Agency	Classification
RoHS	Compliant
China-RoHS	Below Maximum Concentration Value (MCV)
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

RACOM Response: Read & Understood – RACOM is recommending the use of Eupen coax as an equivalent. Currently we are finding the availability to be better along with the support from the manufacturer.

- N. CommScope L4NF-F or L4NM-F, Type N Female or Type N Male for 1/2 in LDF4-50A cable (or approved equivalent)

General Specifications

Interface	N Female or N Male
Body Style	Straight
Brand	HELIAX®
Mounting Angle	Straight

Electrical Specifications

Connector Impedance	50 ohm
Operating Frequency Band	0 – 8800 MHz
Cable Impedance	50 ohm
3rd Order IMD, typical	-159 dBc @ 900 MHz
3rd Order IMD Test Method	Two +43 dBm carriers
RF Operating Voltage, maximum (vrms)	707 V
dc Test Voltage	2000 V

Outer Contact Resistance, maximum	0.25 mOhm
Inner Contact Resistance, maximum	1.00 mOhm
Insulation Resistance, minimum	5000 MOhm
Average Power	0.6 kW @ 900 MHz
Shielding Effectiveness	-110 dB

Mechanical Specifications

Outer Contact Attachment Method	Clamp
Inner Contact Attachment Method	Captivated
Outer Contact Plating	Trimetal
Inner Contact Plating	Silver
Interface Durability	500 cycles
Interface Durability Method	IEC 61169-16:9.5
Connector Retention Tensile Force	600 N 134.885 lbf
Connector Retention Torque	4.5 N-m 39.828 in lb

Dimensions

Nominal Size	1/2 in
Diameter	23.0 mm 0.906 in
Length	61.7 mm 2.429 in

Environmental Specifications

Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-65 °C to +125 °C (-85 °F to +257 °F)
Immersion Depth	1 m
Immersion Test Mating	Mated
Immersion Test Method	IEC 60529:2001, IP68
Mechanical Shock Test Method	IEC 60068-2-27
Thermal Shock Test Method	IEC 60068-2-14
Vibration Test Method	IEC 60068-2-6
Corrosion Test Method	IEC 60068-2-11

Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
0-1000 MHz	1.08	28.30 - Male
0-1000 MHz	1.05	32.26 - Female

RACOM Response: Read & Understood – RACOM is recommending the use of Eupen coax as an equivalent. Currently we are finding the availability to be better along with the support from the manufacturer.

- O. CommScope 78EZ NF or 78EZNM, Type N Female or Type N Male for 7/8 in AVA5-50 cable (or approved equivalent)

General Specifications

Interface	N Female or N Male
Body Style	Straight
Brand	HELIAX®
Mounting Angle	Straight

Electrical Specifications

Connector Impedance	50 ohm
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Operating Frequency Band	0 – 5000 MHz
Cable Impedance	50 ohm
3rd Order IMD, typical	-116 dBm @ 1800 MHz
3rd Order IMD Test Method	Two +43 dBm carriers
RF Operating Voltage, maximum (vrms)	707 V
dc Test Voltage	2000 V
Outer Contact Resistance, maximum	0.30 mOhm
Inner Contact Resistance, maximum	2.00 mOhm
Insulation Resistance, minimum	5000 MOhm
Peak Power, maximum	10.0 kW
Mechanical Specifications	
Outer Contact Attachment Method	Clamp
Inner Contact Attachment Method	Captivated
Outer Contact Plating	Trimetal
Inner Contact Plating	Silver
Interface Durability	500 cycles
Interface Durability Method	IEC 61169-16:9.5
Connector Retention Tensile Force	1334.47 N 300 lbf
Connector Retention Torque	8.14 N-m 72.001 in lb
Dimensions	
Nominal Size	7/8 in
Diameter	37.08 mm 1.46 in
Length	52.07 mm 2.05 in
Environmental Specifications	
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-65 °C to +125 °C (-85 °F to +257 °F)
Immersion Depth	1 m
Immersion Test Mating	Mated
Immersion Test Method	IEC 60529:2001, IP68
Mechanical Shock Test Method	IEC 60068-2-27
Thermal Shock Test Method	IEC 60068-2-14
Vibration Test Method	IEC 60068-2-6
Corrosion Test Method	IEC 60068-2-11

Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
50-1000 MHz	1.02	40.09

RACOM Response: Read & Understood – RACOM is recommending the use of Eupen coax as an equivalent. Currently we are finding the availability to be better along with the support from the manufacturer.

- P. Specifications for ground kits for ½" coaxial cable (CommScope CSG12-06B1A or approved equivalent are shown below:

General Specifications

Bonding Conductor Jacketing Material	PVC
Bonding Conductor Material	Copper
Bonding Conductor Wire Size	16 mm²

Cable Type	Corrugated Smoothwall
Color	Black
Grounding Kit Type	Compact SureGround® Grounding Kits
Grounding Strap Material	Tinned copper
Lug Attachment	Factory attached
Lug Type	One-hole lug
Thread Size	3/8 in

Dimensions

Enclosure Width	25.4 mm 1 in
Bonding Conductor Length	609.6 mm 24 in
Enclosure Length	55.88 mm 2.2 in
Compatible Diameter, maximum	16.256 mm 0.64 in
Compatible Diameter, minimum	15.367 mm 0.605 in
Nominal Size	1/2 in

Electrical Specifications

Current Handling	Tested to withstand 100,000 amps peak current surge
Current Handling	Test Method MIL-STD-1757
Grounding, Bonding and Shielding Test Method	MIL-STD-188-124A
Lightning Protection Test Method	IEC 1024-1

Material Specifications

Locking Bail Material	Stainless steel
Rivet Material	Tinned copper

Environmental Specifications

Operating Temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Storage Temperature	-40 °C to +80 °C (-40 °F to +176 °F)
Blowing Rain Test Method	MIL-STD-810, Method 506
Corrosion Test Method	MIL-STD-1344, Method 1001
Freezing Rain/Icing Test Method	MIL-STD-810, Method 521
Humidity Test Method	MIL-STD-1344, Method 1002
Immersion Test Method	IEC 60529:2001, IP68
UV Resistance Test Method	MIL-STD-810, Method 505
Vibration Test Method	MIL-STD-202, Method 214
Weatherproofing Method	Tinned copper strap contact over molded with EPDM rubber

RACOM Response: Read & Understood

- Q. Specifications for ground kits for 7/8" coaxial cable (CommScope CSG78-12B2U or approved equivalent are shown below:

General Specifications

Bonding Conductor Jacketing Material	PVC
Bonding Conductor Material	Copper
Bonding Conductor Wire Size	6 gauge
Cable Type	Corrugated Smoothwall
Color	Black

Grounding Kit Type	Compact SureGround® Grounding Kits
Grounding Strap Material	Tinned copper
Lug Attachment	Field attached
Lug Type	Two-hole lug
Thread Size	3/8 in

Dimensions

Enclosure Width	40.64 mm 1.6 in
Bonding Conductor Length	1143 mm 45 in
Enclosure Length	63.5 mm 2.5 in
Compatible Diameter, maximum	28.372 mm 1.117 in
Compatible Diameter, minimum	27.559 mm 1.085 in
Nominal Size	7/8 in

Electrical Specifications

Current Handling	Tested to withstand 100,000 amps peak current surge
Current Handling Test Method	MIL-STD-1757
Grounding, Bonding and Shielding Test Method	MIL-STD-188-124A
Lightning Protection Test Method	IEC 1024-1

Material Specifications

Locking Bail Material	Stainless steel
Rivet Material	Tinned copper

Environmental Specifications

Operating Temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Storage Temperature	-40 °C to +80 °C (-40 °F to +176 °F)
Blowing Rain Test Method	MIL-STD-810, Method 506
Corrosion Test Method	MIL-STD-1344, Method 1001
Freezing Rain/Icing Test Method	MIL-STD-810, Method 521
Humidity Test Method	MIL-STD-1344, Method 1002
Immersion Test Method	IEC 60529:2001, IP68
UV Resistance Test Method	MIL-STD-810, Method 505
Vibration Test Method	MIL-STD-202, Method 214
Weatherproofing Method	Tinned copper strap contact over molded with EPDM rubber

RACOM Response: [Read & Understood](#)

- R. Specifications for the CommScope 221213 Weatherproofing Kit (or approved equivalent) are shown below:

General Specifications

Application	Provides additional moisture seal for cable connections
Applications per Kit	Four 1/2 in–7/8 in Twelve 1/2 in–1/2 in Twelve 1/2 in–7/8 in to device Two 1/2 in–2-1/4 in
Harmonized System (HS) Code	854420 (Coaxial cable and other coaxial electric conductors)
Dimensions	Nominal Size 1-1/4 in 1-5/8 in 1/2 in 1/4 in 2-1/4 in 3/8 in 5/8 in 7/8 in

Material Specifications

Material Type Butyl rubber tape | PVC tape

Environmental Specifications

UV Resistance Test Method Butyl test method in QUV weatherometer cycle of 8 hours UV at 150 °F then 4 hours of condensation at 104 °F | PVC tape test method UL 510, ASTM D1000

UV Resistance, minimum with no degradation ≥1000 hours

Weather Resistance Test Method 04AS00-03.6.0 | MIL-STD-1344A, Method 1002

RACOM Response: Read & Understood

- S. Specifications for 6-Port transmission line entry panels (Site Pro E1449 transmission 6-port (2 X 3) 4" transmission line entry ports (or approved equivalent) with Site Pro BA121M (or approved equivalent) boots are shown below:

Port Size 4"
Port Layout 2 x 3 • # of Ports = 6
Overall Size 17.5" x 23"
Wall Opening 9.5" x 15"
Manufactured from heavy gauge T6 Aluminum.
Baked-on powder coat finish
Sealing caps and mounting hardware included.

Boots

of Holes 3
Cable Size Mixed (1) 1/2" Foam Coax (2) 7/8" Coax.
One piece design for easy installation.
Kit includes rubber boot, insert, and hose clamps.

RACOM Response: Read & Understood

- T. Specifications for the CommScope AT-K306-U Arrestor Trapeze Kit (or approved equivalent) are shown below:

Product Classification

Product Type Arrestor trapeze kit

General Specifications

Mounting Ceiling | Walls

Dimensions

Height 76.2 mm | 3 in
Width 457.2 mm | 18 in
Length 1,219.2 mm | 48 in
Material Thickness 7.62 mm | 0.3 in

RACOM Response: Read & Understood

- U. Specifications for the Polyphaser IS-B50HN-C2 DC Block bulkhead mount surge suppressor (or approved equivalent) ground bar are shown below:

Insertion Loss:	$\leq 0.1\text{dB}$
Freq. Range:	125-1000 MHz
Mounting:	Bulkhead Flange
Protected Side Connector:	N Female 50 Ω
RF Power:	500 Watts
Surge Side Connector:	N Female 50 Ω
Throughput Energy:	$\leq 800 \mu\text{J}$
Throughput Voltage:	$\leq 12 \text{ Vpk}$
Unit Impedance:	50 Ω
Voltage Standing Wave Ratio:	1.1:1

RACOM Response: Read & Understood

- V. Specifications for the Polyphaser DC-Pass bulkhead mount surge suppressor (Polyphaser DGXZ+06NFNF-A or approved equivalent)

Unit Technical Specifications:
Current: 4Adc
Insertion Loss: $\leq 0.1\text{dB}$
Freq. Range: 800-2500 MHz
Mounting: Bulkhead Flange
User Voltage: +6.0 VDC Max
Usage Current <4.0 Amps Continuous
Polarity: +
Protected Side Connector: N Female 50 Ω
Surge Side Connector: N Female 50 Ω
Throughput Energy: $\leq 175 \mu\text{J}$ for 3kA @ 8/20 μs Waveform
Turn-On Voltage: 7.0 VDC
Turn-On Time: 4 ns for 2 kV/ns
Unit Impedance: 50 Ω
Voltage Standing Wave Ratio: 1.1 : 1
UL Approved and Listed UL497B.

RACOM Response: Read & Understood

- W. Specifications for the cable ladders at the KUID-TV site [Eaton B-Line SB17U12BYZ (or approved equivalent)] are shown below:

Tubular Stringer Style - 1 1/2" (Boxed)

- Ladder type cable runway for communication cabling pathways
- Mounts to ceilings, walls, floors, relay racks, and electronic enclosures
- 3/8" (9mm) x 1 1/2" (38mm) x 0.049" (1.2mm) tubular steel stringers
- 3/8" (9.5mm) x 1 1/2" (38.1mm) steel tube welded rungs spaced 12" (305mm) on center
- All finishes are UL Classified as suitable as an equipment grounding conductor (File number E60548)
- Material: ASTM A513 grade 1008 steel tube
- Finish ____: Yellow zinc (YZ)

RACOM Response: Read & Understood – Based on what is to be added in the shelter in the provided drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means installer accepts existing conditions.

RACOM Response: Read & Understood

3.2 INSTALLATION

- A. Install equipment racks, VHF base station radios, transmitter combiner and receiver multicoupler systems, GPS oscillators and other radio system equipment as described in this specification and as shown in the Contract Drawings. Install all required interconnecting cable in compliance with all applicable electrical codes.
- B. Coordinate installation radio system equipment with other electrical and DC power system work as necessary to properly integrate installation of radio system work with other work.

RACOM Response: Read & Understood

3.3 PROJECT MANAGEMENT

- A. The Vendor shall create a Work Breakdown Structure (WBS). From the WBS, the Vendor shall derive a Schedule, Risk Management Plan, Quality Management Plan, and Communication Plan to be delivered and approved by Con Fire. The WBS shall describe which party has which responsibilities for each task.
 - 1. The schedule should be in PERT form and be updated as needed.
 - 2. A Risk Registry should be updated and maintained.
 - 3. Updates to the Schedule and Risk Registry should be communicated at each status update meeting as well as a list of issues that require resolution.
 - 4. Periodic Status meetings shall be included in the Communication Plan. The Vendor may suggest the frequency of these calls, the frequency is allowed to vary based on the project activity.

RACOM Response: Read & Understood – Plan will be part of the Detailed Design and provided to the City of Moscow (not Con Fire).

- B. Change Orders: Either Party may request changes within the general scope of this Agreement. If a requested change causes an increase or decrease in the cost or time required to perform this Agreement, the Parties will agree to an equitable adjustment of the Contract Price, Performance Schedule, or both, and will reflect the adjustment in a change order. Neither Party is obligated to perform requested changes unless both

Parties execute a written change order.

The Change Order Form shall describe the details of the change of scope, the reason why the change is needed, and the cost of the change broken out by materials and time and expenses for each discipline (PM, engineering, technician, etc.), and any other applicable costs on a line item bases with any labor costs showing both hours, travel, and total cost. Delays causes include but are not limited to; Acts of God, site issues, and supply chain delays shall not be a reason for a Change Order other than to update the Project Schedule.

RACOM Response: Read & Understood

3.4 FIELD QUALITY CONTROL AND ACCEPTANCE TESTING

A. SYSTEM AND COVERAGE ACCEPTANCE TESTING

- 1) In order to confirm proper adjustment and operation of the City of Moscow VHF simulcast system the radio system coverage tests described below will be based on an evaluation of the DAQ ("Delivered Audio Quality") provided at test locations throughout the City of Moscow.
- 2) Prior to the commencement of the Coverage Acceptance Tests, the Contractor shall provide the City with a documentation of field tests performed on the installed radio system, including:
 - a.) Measured Base Station Transmitter Output Power (Watts/dBm)
 - b.) Measured Base Station Receiver 5% BER Sensitivity (dBm)

(Perform this measurement through an ISO-T or coupler with the input to the coupler terminated in a 50 ohm load and with the input connected to the receiver multicoupler.)
 - c.) Measured transmitter combiner and receiver multicoupler insertion loss for each channel.
 - d.) Calculated Effective Radiated Power for each channel at each site (which should correspond to the values shown in Table 3 for each channel at each site).
 - e.) To ensure that antennas and transmission lines meet specifications after installation, sweep antennas and transmission lines for return loss (with 50-ohm load and with antenna at antenna end of each line) and distance-to-fault (with short and antenna at antenna end of line. Perform return loss measurements for TX and RX antennas as mounted on the tower or monopole at each repeater site. For the tests of the 700/800 MHz RX antenna, put the Tower Top Amplifier in bypass mode. Submit a detailed test plan to City for approval in advance of these tests. Record and sign tests and present tests to City in printed and PDF format.
 - f.) Provide these measurement results to the City as a System Field Testing Report in printed and PDF format.

RACOM Response: Read & Understood – RACOM will provide the information outlined and will be based on the final approved values in the Detailed Design for final system design as implemented.

- 3) DAQ Tests will be performed on an unused channel that is part of the 3-site simulcast subsystem that includes the Moscow Mountain, KUID-TV and Well 10 sites. Perform these tests on one of the conventional channels on the 3-site simulcast system that includes the Well 10, KUID-TV and City Hall sites.

RACOM Response: Read & Understood – Assumes the test is just for the Moscow Mountain, KUID-TV, and Well 10 and not City Hall existing VHF channel that is being updated.

- 4) DAQ Tests will be performed within each area defined by the rectangular grid laid over the Moscow city limits. Each square in this grid defines an area within which a DAQ test must be performed as part of the coverage testing. A map showing this grid (which is based on squares 500 meters on a side) is shown in Drawing R38.

RACOM Response: Read & Understood

- 5) DAQ tests shall be performed on-board a City of Moscow vehicle equipped with a mobile radio with outboard speakers installed by the contractor to allow the evaluation team members to hear the audio produced by the system well enough to provide a reasonable evaluation of its quality. The configuration of the mobile radio shall include 15 dB of attenuation between the antenna and the mobile radio to simulate a portable radio operating at belt level.

RACOM Response: Read & Understood – Radio(s) to be provided by the City of Moscow. The requirements are for Mobile and Portable coverage so two radios will need to be used or a switchable attenuation and two calls are made at each location. Radios are to be calibrated and their performance verified to specification.

- 6) The evaluation team will be made up of at least 5 members, at least three of whom shall be City of Moscow representatives.

RACOM Response: Read & Understood

- 7) At each test location, a test team member located at the Whitcom dispatch center with audio access to the channel being tested shall read a random selection from the Harvard Sentences (shown in Appendix 3 of Section 33 83 00), and each evaluation team member on the vehicle shall rate the audio quality of the received transmission on a DAQ scale from DAQ 1 to DAQ 5, based on the descriptions of these DAQ levels shown in Table 2 below (from *TSB 88.1-C, Wireless Communications Systems Performance in Noise Limited Situations; Part 1 – Recommended Methods for Technology Independent Performance Modeling; February 2008*):

Table 2 Delivered Audio Quality

DAQ Delivered Audio Quality	Faded Subjective Performance Description	Static SINAD equivalent intelligibility ^{1,2}
1	Unusable, Speech present but unreadable	<8 dB
2	Understandable with considerable effort. Frequent repetition due to Noise/Distortion	12 ± 4 dB
3	Speech understandable with slight effort. Occasional repetition necessary due to Noise/Distortion	17 ± 5 dB
3.4	Speech understandable with repetition only rarely needed. Some Noise/Distortion	20 ± 5 dB ³
4	Speech easily understood. Occasional Noise/Distortion	25 ± 5 dB
4.5	Speech easily understood. Infrequent Noise/Distortion	30 ± 5 dB
5	Speech easily understood.	>33 dB

RACOM Response: Read & Understood – The expectation of RACOM is that the test member at Whitcom will be using a console position for the testing and not a radio so the test involves the testing of both sides of the system not just radio to radio.

- 8) One of the evaluation team members shall record the results provided by each team member at each measurement location, as well as the location of each DAQ test. An example of the test sheet used in the similar tests to record results is shown in Appendix 3 of Section 33 83 00. Perform a DAQ test on each of the simulcast subsystems (described above) at each test grid location.

RACOM Response: Read & Understood

- 9) An average result for each measurement location shall be determined by discarding the highest and lowest results and taking the average of the remaining results. Both this weighted average and the average of all five results shall be shown in the table of results.

RACOM Response: Read & Understood – The City and RACOM need to agree on which of the averages will be used to determine the grid (tile) for evaluation of that grid as outlined in #10

- 10) The results of these tests shall be compiled into a coverage test map showing the coverage grids tested and using color –coding to depict the coverage results obtained in each grid, as follows:

GREEN	Good Coverage - DAQ 3.4 to DAQ 5.0
YELLOW	Marginal Coverage – DAQ 2.0-DAQ 3.0
RED	Poor Coverage - Below DAQ 2.0

RACOM Response: Read & Understood – The ranges outlined are not in line with the actual DAQ levels. RACOM would propose the following are better in line with the levels outlined: Green 3.4 to 5, Yellow 2 to 3 and Red 0 to 1 with 0 being no audio heard.

- 11) The contractor shall produce DAQ test result sheets, DAQ tabulated measurement result sheets, and DAQ measurement maps and shall provide them to the City in the form of a final coverage DAQ test report.

RACOM Response: Read & Understood – For any guaranty provided by RACOM, the coverage maps are based on 95% @ 95% reliability, so a passing test would be that 95% or greater of the grids tested are Yellow or Green.

3.1 CLEANING

- A. Upon completion of this section of work, remove protective wraps and debris. Repair damages due to installation of this section of work.

RACOM Response: Read & Understood

3.2 PROTECTION OF FINISHED WORK

- A. Protect radio systems work from damage after installation.

RACOM Response: Read & Understood – from other work being done by RACOM at the sites or while testing.

END OF SECTION 33 83 01

SERVICES PRICING

Category	Per Hour	Total Hours	Labor Cost	Expenses	Total
Project Management	1 LS		\$ 69,613.33	\$ -	\$ 69,613.33
Engineering	1 LS		\$ 67,971.83	\$ -	\$ 67,971.83
Documentation	1 LS		\$ 34,633.33	\$ -	\$ 34,633.33
Coverage Testing	1 LS		\$ 19,083.33	\$ -	\$ 19,083.33
Technician Optimization	1 LS		\$ 46,583.33	\$ -	\$ 46,583.33
Training	1 LS		\$ 15,553.33	\$ -	\$ 15,553.33
Warranty Services	1 LS		\$ -	\$ -	\$ -
Estimated Bonds	1 LS		\$ 23,044.50	\$ -	\$ 23,044.50
Tower Work	1 LS		\$ 51,734.00	\$ -	\$ 51,734.00

Services Total**\$ 328,217.00**

EQUIPMENT PRICING

Site	Model Number	Description	Qty	Contract Price	Extended Contract Price
01 -Moscow Mountain	RACK-MISC	Equipment Racks & Miscellaneous Installation Materials	1	\$ 3,784.50	\$ 3,784.50
01 -Moscow Mountain	MP2P-NE	Aviat MW, GPS Oscillators, Network Equipment	1	\$ 98,132.74	\$ 98,132.74
01 -Moscow Mountain	DC-POWER	-48VDC Power Plant	1	\$ 16,719.50	\$ 16,719.50
01 -Moscow Mountain	TAIT-S	Tait TB9400, 7/800 MHz, 100W,	5	\$ 19,947.75	\$ 99,738.75
01 -Moscow Mountain	ANT-SYS	Antenna System Components (Antennas, Cabling, Combiner/Multicoupler, etc.)	1	\$ 62,870.99	\$ 62,870.99
02 - KUID-TV	RACK-MISC	Equipment Racks & Miscellaneous Installation Materials	1	\$ 3,784.50	\$ 3,784.50
02 - KUID-TV	MP2P-NE	Aviat MW, GPS Oscillators, Network Equipment	1	\$ 62,224.84	\$ 62,224.84
02 - KUID-TV	DC-POWER	-48VDC Power Plant	1	\$ 16,719.50	\$ 16,719.50
02 - KUID-TV	TAIT-CV	Tait TB9400, 7/800 MHz, 100W, Central Voter	5	\$ 24,161.25	\$ 120,806.25
02 - KUID-TV	ANT-SYS	Antenna System Components (Antennas, Cabling, Combiner/Multicoupler, etc.)	1	\$ 62,870.99	\$ 62,870.99
02 - KUID-TV	RAC-SI	Site Improvements	1	\$ 4,050.00	\$ 4,050.00
03 - Well 10	RACK-MISC	Equipment Racks & Miscellaneous Installation Materials	1	\$ 3,784.50	\$ 3,784.50
03 - Well 10	MP2P-NE	Aviat MW, GPS Oscillators, Network Equipment	1	\$ 79,907.84	\$ 79,907.84
03 - Well 10	DC-POWER	-48VDC Power Plant	1	\$ 16,719.50	\$ 16,719.50
03 - Well 10	TAIT-CV	Tait TB9400, 7/800 MHz, 100W, Central Voter	5	\$ 24,161.25	\$ 120,806.25

EQUIPMENT PRICING

Site	Model Number	Description	Qty	Contract Price	Extended Contract Price
03 - Well 10	ANT-SYS	Antenna System Components (Antennas, Cabling, Combiner/Multicoupler, etc.)	1	\$ 62,870.99	\$ 62,870.99
03 - Well 10	RAC-SI	Site Improvements	1	\$ 286,132.50	\$ 286,132.50
04 - City Hall	NETWORK-EQUIP	Network Equipment	1	\$ 8,897.91	\$ 8,897.91
04 - City Hall	DC-POWER	-48VDC Power Plant	1	\$ 16,719.50	\$ 16,719.50
08 - Whitcom	TAIT-EM	Tait Enable Monitor	1	\$ 14,264.25	\$ 14,264.25
08 - Whitcom	MP2P-NE	Aviat MW, GPS Oscillators, Network Equipment	1	\$ 43,878.92	\$ 43,878.92
08 - Whitcom	NETWORK-EQUIP	Network Equipment	1	\$ 642.59	\$ 642.59
08 - Whitcom	DC-POWER	-48VDC Power Plant	1	\$ 16,719.50	\$ 16,719.50
08 - Whitcom	ZET-MRG	Zetron MAX Radio Gateways with DFSI Licensing	3	\$ 5,554.40	\$ 16,663.20

Equipment Total**\$ 1,239,710.01**

Post Warranty Services

Category	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9	YR 10
Technical Support	\$ 35,649.05	\$ 35,649.05	\$ 35,649.05	\$ 35,649.05	\$ 36,376.58	\$ 37,125.95	\$ 37,897.79	\$ 38,692.78	\$ 39,511.63
Depot Repair	\$ 14,753.28	\$ 19,635.02	\$ 19,781.89	\$ 19,933.18	\$ 20,231.17	\$ 20,538.11	\$ 20,854.25	\$ 21,179.88	\$ 21,515.28
Other (Describe)									

Annual Totals	\$ 50,402.33	\$ 55,284.07	\$ 55,430.94	\$ 55,582.23	\$ 56,607.76	\$ 57,664.05	\$ 58,752.04	\$ 59,872.66	\$ 61,026.90
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**City of Moscow, ID
Package Breakdown**

**** 700 MHz Alternative Bid *****

Site Name	Model Number	Part Number	Description	Quantity
01 -Moscow Mountain	RACK-MISC	RAC-RACK	Rack	2
01 -Moscow Mountain	MP2P-NE	CISCO-MANAGED-SWITCH	Cisco Ethernet Switch	1
01 -Moscow Mountain	MP2P-NE	S4D-OSC	GPS Oscillator, 48VDC	1
01 -Moscow Mountain	DC-POWER	NEWMAR-48VDC	Newmar Power Plant	1
01 -Moscow Mountain	TAIT-S	TAIT-TB94-A-S	Tait ASIP, 100W, Satellite	5
01 -Moscow Mountain	ANT-SYS	DBS-700-5CH	dbSpectra Equipment (5Ch TxRx)	1
01 -Moscow Mountain	ANT-SYS	RACOM-LINE-MM	Bucket for Antenna Systems - Moscow Mountain	1
01 -Moscow Mountain	ANT-SYS	TELEWAVE-ANT-RX	Telewave Antennas (Rx)	1
01 -Moscow Mountain	ANT-SYS	TELEWAVE-ANT-TX	Telewave Antennas (Tx)	1
01 -Moscow Mountain	MP2P-NE	AVIAT-MOSCOW MOUNTAIN	Avait MW System - MOSCOW MOUNTAIN	1
02 - KUID-TV	RACK-MISC	RAC-RACK	Rack	2
02 - KUID-TV	MP2P-NE	CISCO-MANAGED-SWITCH	Cisco Ethernet Switch	1
02 - KUID-TV	MP2P-NE	S4D-OSC	GPS Oscillator, 48VDC	1
02 - KUID-TV	DC-POWER	NEWMAR-48VDC	Newmar Power Plant	1
02 - KUID-TV	TAIT-CV	TAIT-TB94-A-CV	Tait ASIP, 100W, Central Voter	3
02 - KUID-TV	TAIT-CV	TAIT-TB94-A-CV	Tait ASIP, 100W, Central Voter	2
02 - KUID-TV	ANT-SYS	DBS-700-5CH	dbSpectra Equipment (5Ch TxRx)	1
02 - KUID-TV	ANT-SYS	RACOM-LINE-KUID	Bucket for Antenna Systems - KUID-TV	1
02 - KUID-TV	RAC-SI	RACOM-SI-KUID	Site Improvements - KUID-TV	1
02 - KUID-TV	ANT-SYS	TELEWAVE-ANT-RX	Telewave Antennas (Rx)	1
02 - KUID-TV	ANT-SYS	TELEWAVE-ANT-TX	Telewave Antennas (Tx)	1
02 - KUID-TV	MP2P-NE	AVIAT-KUIDTV	Avait MW System - KUIDTV	1
03 - Well 10	RACK-MISC	RAC-RACK	Rack	2
03 - Well 10	MP2P-NE	CISCO-MANAGED-SWITCH	Cisco Ethernet Switch	1
03 - Well 10	MP2P-NE	CISCO-FIBER-MODULE	Cisco Fiber Module	1
03 - Well 10	MP2P-NE	S4D-OSC	GPS Oscillator, 48VDC	1
03 - Well 10	DC-POWER	NEWMAR-48VDC	Newmar Power Plant	1
03 - Well 10	TAIT-CV	TAIT-TB94-A-CV	Tait ASIP, 100W, Central Voter	3
03 - Well 10	TAIT-CV	TAIT-TB94-A-CV	Tait ASIP, 100W, Central Voter	2
03 - Well 10	ANT-SYS	DBS-700-5CH	dbSpectra Equipment (5Ch TxRx)	1
03 - Well 10	ANT-SYS	RACOM-LINE-W10	Bucket for Antenna Systems - Wells 10	1
03 - Well 10	ANT-SYS	TELEWAVE-ANT-RX	Telewave Antennas (Rx)	1
03 - Well 10	ANT-SYS	TELEWAVE-ANT-TX	Telewave Antennas (Tx)	1
03 - Well 10	MP2P-NE	AVIAT-WELL10	Avait MW System - WELL10	1
03 - Well 10	RAC-SI	RACOM-SI-W10	Site Improvements - Wells 10	1
04 - City Hall	NETWORK-EQUIP	CISCO-MANAGED-SWITCH	Cisco Ethernet Switch	1
04 - City Hall	NETWORK-EQUIP	CISCO-FIBER-MODULE	Cisco Fiber Module	2
04 - City Hall	DC-POWER	NEWMAR-48VDC	Newmar Power Plant	1
08 - Whitcom	TAIT-EM	TAIT-ENABLEMON	Tait EnableMonitor	1
08 - Whitcom	MP2P-NE	CISCO-MANAGED-SWITCH	Cisco Ethernet Switch	1
08 - Whitcom	NETWORK-EQUIP	CISCO-FIBER-MODULE	Cisco Fiber Module	1
08 - Whitcom	DC-POWER	NEWMAR-48VDC	Newmar Power Plant	1
08 - Whitcom	ZET-MRG	ZETRON-DFSI	Zetron DFSI Interface	1
08 - Whitcom	MP2P-NE	AVIAT-WHITCOM	Avait MW System - WHITCOM	1

**City of Moscow, ID
BOM**

**** 700 MHz Alternative Bid *****

Component Part Number	Description	Qty
8226	GPS Surge protector, highly recommended for all outdoor GPS antenna installations. Includes MP10-0000-0002 Mounting Bracket. Compatible with cable with Type N connectors. Recommended to purchase 2 GPS antenna cables to and from 8226.	3
8230	GPS/GNSS Outdoor Antenna supporting GPS L1, GLONASS L1, BeiDou B1, Galileo E1, and QZSS L1, with L-bracket for vent pipe/pole mounting via metal straps (included). Compatible with CA01-0N0N, CAL7XXX or CALP7XXX cables.	3
037-579311-150	CABLE,ODU WITH CONN.GROUND KIT, 150M 0.4INCH 50OHM COAX	10
037-579315-001	Aux Card Alarm I/O Cable, HD15 to Stub, 10 Meters	5
037-579461-500	Protection / Bridging Cable, DAC GE3 to DAC GE3, SFP Direct Fit, 500 mm	10
079-422656-001	SFP OPT GIGE 1310nm SMF LC 10KM 0 to 70C	12
083-845434-001	SFP Elec GIGE RJ45 100m 0 to 70C	8
086-523300-113	Coupler Assy ODU 600v2 , 10/11 GHz Equal 3 dB, V and H Pole (840D611H1A)	8
179-530062-002	LIGHTNING ARRESTOR KIT, UNIVERSAL, 50 OHM, TYPE N, MALE TO FEMALE	16
179-530064-001	INUe Forward Mounting Kit	5
219-01561-00	Cable cord 2m USA/CAD IEC black	15
2400-HS-D2	Hot Swappable 24/48 VDC Power Supply ; Compatible only with SecureSync 2400 configuration with Hot Swap power supply support. Limit 2 per system. Includes mating connector & clamp	3
2402-613	SecureSync 2400 Time & Frequency synchronization system with 2 expansion slots for option cards, support for AC or DC dual hot swappable power supply modules (modules not included), OCXO oscillator, and L1 GNSS reference. Includes a SMA to N-type conversion RF cable, front panel mounting ears and quick start guide. Order AC power cord(s) as a no charge line item (for AC power supply configuration only).	3
405-4355-0	19x19 battery tray	5
591-1210-0	100AH front terminal battery	20
614-225009-002	ProVision Solution Pack, Electronic Shipment - 10 Nodes	1
901-9725	MAX Digital Radio Gateway	3
930-0270	P25 DFSI Interface License	6
AND-VHLP3-11W-GTU	ANTENNA, 10/11 GHZ, 0.9 M (3FT), VALULINE, HPLP (RECTANGULAR AND CIRCULAR INTERFACE), DIRECT MOUNT, DISH (STD: WHITE), 10.125-11.7 GHZ, RADOME (STD: GRAY), CLASS III/FCC101A/B, WTM4K AND ODU600V2, 250 KMPH, 180 KMPH (VHLP3-11W-GTU)	4
AND-VHLP4-11W-GTU	ANTENNA, 10/11 GHZ , 1.2 M (4FT), VALULINE, HPLP (RECTANGULAR AND CIRCULAR INTERFACE), DIRECT MOUNT, DISH (STD: WHITE), 10.125-11.7 GHZ, RADOME (STD: GRAY), CLASS III/FCC101A/B, WTM4K AND ODU600V2, 250 KMPH, 200 KMPH (VHLP4-11W-GTU)	4
ANT790F2-PIM-PIP	763-869 MHz 2.5dB Omni Collinear Antenna	3
ANT825F6	745 - 860 MHz Fiberglass Collinear Antenna 6 dBd	3

**City of Moscow, ID
BOM**

**** 700 MHz Alternative Bid *****

Component Part Number	Description	Qty
ANT-KUID	Transmission Line, Connectors, Surge Protectors, etc.	1
ANT-MM	Transmission Line, Connectors, Surge Protectors, etc.	1
ANT-W10	Transmission Line, Connectors, Surge Protectors, etc.	1
C2BP	Centurion II Blank Panel	55
C3C-12-40	Centurion III 12VDC DC Converter Module	10
C9300L-24P-4GE	CISCO C9300L 24-PORT WITH POE	5
C9300-NM-4G	Cisco Catalyst 9300 Series Network Module - expansion module - Gigabit SFP x 4	4
CMDR-II+	Commander II+ Shelf	5
CMDR-X	Circuit Breakers	90
DBSPD-700	700 RF Distribution System 5-CH Site	3
EXA-001	Aux Card for Alarm I/O	5
EXD-181-002	Gigabit Ethernet Card (DAC GE3)	10
EXR-700-002	RAC 70v2, QPSK-4096QAM, NO XPIC, ACM	16
EXS-002	Node Protection Card	5
EXT-WARR-01	Tait Extended Hardware Warranty	3
EXT-WARR-02	Tait Extended Hardware Warranty	30
EXT-WARR-03	Tait Extended Hardware Warranty	15
EXX-000-205	INUe Shelf e/w Node Controller Card & Fan Shelf	5
EZE-08005	NODE SW LICENSE, 300 Mbps TOTAL RADIO PAYLOAD CAPACITY	1
EZE-08006	NODE SW LICENSE, 400 Mbps TOTAL RADIO PAYLOAD CAPACITY	1
EZE-08007	NODE SW LICENSE, 800 Mbps TOTAL RADIO PAYLOAD CAPACITY	4
EZF-01	LAYER 1 LINK AGGREGATION NODAL ON DAC GE / DAC GE3	6
EZF-02	Node Software License: Adaptive Coding & Modulation (ACM)	6
EZF-03	Node Software License: Secure Management	6
EZF-09	SYNCHRONOUS ETHERNET NODAL LICENSE for DAC GE3	6
EZF-10	Node Software License: Ethernet OAM w/ G.8032 Ring Protection	1
EZF-52	ODU 600 Nodal High power option 2 x ODU	2
EZF-54	ODU 600 Nodal High power option 4 x ODU	4
MASV-NMR1H	Rack,Open,86 in(Xtra Dp) with support	6
M-ECH-11	ODU 600v2, 11 GHZ, PLANNING PART NUMBER	16
MISC	Miscellaneous Installation Materials	6
NSM-ICE-SHIELD3	ICE SHIELD FOR 3 FT DISH (ICE-SHIELD3)	4
NSM-ICE-SHIELD4	ICE SHIELD FOR 4 FT DISH (ICE-SHIELD4)	4
PLI	Placeholder Line Item	4
RACOM-PB	Estimate for Performance Bond	1
RACOM-SERV	RACOM Technical Services	1
RM3048HE	CII and CII+ 48V Rectifier 3000W	15
SA-ADV-02	Tait Advantage	50
SA-ADV-03	Tait Advantage	25
SI-KUID	Site Improvements - KUID-TV	1
SI-W10	Site Improvements - Wells 10	1
SWW-PV85G1XX1299	ProVision Software Support, Up to 20 Nodes, 8x5 Coverage - Year 1	10
T01-01103-NAAA	TB9400 Reciter 762-870MHz	15
T01-01121-NBAA	TB94 Linear PA 762-870MHz 100Watts	15
TB9435S-100T	TB9400 Single 100Watts Chassis Assembly	15
TBA30A4-4100	TB9000 Power Management Unit ACDC48volts with Aux12volts	15

**City of Moscow, ID
BOM**

**** 700 MHz Alternative Bid ****

Component Part Number	Description	Qty
TBAS050	P25 Common Air Interface (CAI)	15
TBAS060	Digital Fixed Station Interface	10
TBAS061	Central Voter	10
TBAS062	Simulcast Enable	15
TBAS065	P25 Linear Simulcast Modulation (LSM)	15
TBAS071	IP Networking Satellite	5
TE1000-0201-0001-AAAA-10	EnableMonitor Server AC Professional 100 Network Devices 1 Year Maintenance	1
TEMMC100		4
	EnableMonitor support and maintenance fee for 100devices - Professional	
VAS-ODU000-003	ODU Level 3, Standard Integration Service	6

Document A310™ – 2010

Conforms with The American Institute of Architects AIA Document 310

Bid Bond

CONTRACTOR:

(Name, legal status and address)

RACOM Corporation
201 West State St
Marshalltown, IA 50158

SURETY:

(Name, legal status and principal place of business)

Berkley Insurance Company
475 Steamboat Road
Greenwich, CT 06830
Mailing Address for Notices

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

OWNER:

(Name, legal status and address)

City of Moscow
206 East Third Street
Moscow, ID 83843

BOND AMOUNT:

5%

Five Percent of Amount Bid

PROJECT:

(Name, location or address, and Project number, if any)

Radio System Upgrade Project

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this 27th day of February, 2024.

(Witness)

(Witness)

Susan Bulman

RACOM Corporation

(Principal)

(Seal)

By:

(Title)

Ryan Veatch, CFO

Berkley Insurance Company

(Surety)

(Seal)

By:

(Title)

Robert F. Laing

Attorney-in-Fact

ACKNOWLEDGEMENT OF ANNEXED INSTRUMENT

Acknowledgement by Surety

STATE OF NJ

COUNTY OF Morris

On this 27th day of February, 2024 before me personally came Robert F. Laing who, being by me duly sworn, did depose and say that he/she is an Attorney-In-Fact of Berkley Insurance Company and knows the corporate seal thereof; that the seal affixed to said instrument is such corporate seal, and was thereto affixed by authority of the Power of Attorney of said Company, of which a Certified Copy is hereto attached, and that he/she signed said instrument as an Attorney-In-Fact of said Company by like authority.


NOTARY PUBLIC

CAITLYN J MAGENNIS
Notary Public, State of New Jersey
My Commission Expires Jan 29, 2026

POWER OF ATTORNEY
BERKLEY INSURANCE COMPANY
 WILMINGTON, DELAWARE

KNOW ALL MEN BY THESE PRESENTS, that BERKLEY INSURANCE COMPANY (the "Company"), a corporation duly organized and existing under the laws of the State of Delaware, having its principal office in Greenwich, CT, has made, constituted and appointed, and does by these presents make, constitute and appoint: **Susan Bulman-Ditchkus; John P. Hyland; Robert F. Laing; or Thomas J. Henn of NFP Property & Casualty Services, Inc. of Morristown, NJ** its true and lawful Attorney-in-Fact, to sign its name as surety only as delineated below and to execute, seal, acknowledge and deliver any and all bonds and undertakings, with the exception of Financial Guaranty Insurance, providing that no single obligation shall exceed **Fifty Million and 00/100 U.S. Dollars (U.S.\$50,000,000.00)**, to the same extent as if such bonds had been duly executed and acknowledged by the regularly elected officers of the Company at its principal office in their own proper persons.

This Power of Attorney shall be construed and enforced in accordance with, and governed by, the laws of the State of Delaware, without giving effect to the principles of conflicts of laws thereof. This Power of Attorney is granted pursuant to the following resolutions which were duly and validly adopted at a meeting of the Board of Directors of the Company held on January 25, 2010:

RESOLVED, that, with respect to the Surety business written by Berkley Surety, the Chairman of the Board, Chief Executive Officer, President or any Vice President of the Company, in conjunction with the Secretary or any Assistant Secretary are hereby authorized to execute powers of attorney authorizing and qualifying the attorney-in-fact named therein to execute bonds, undertakings, recognizances, or other suretyship obligations on behalf of the Company, and to affix the corporate seal of the Company to powers of attorney executed pursuant hereto; and said officers may remove any such attorney-in-fact and revoke any power of attorney previously granted; and further

RESOLVED, that such power of attorney limits the acts of those named therein to the bonds, undertakings, recognizances, or other suretyship obligations specifically named therein, and they have no authority to bind the Company except in the manner and to the extent therein stated; and further

RESOLVED, that such power of attorney revokes all previous powers issued on behalf of the attorney-in-fact named; and further

RESOLVED, that the signature of any authorized officer and the seal of the Company may be affixed by facsimile to any power of attorney or certification thereof authorizing the execution and delivery of any bond, undertaking, recognizance, or other suretyship obligation of the Company; and such signature and seal when so used shall have the same force and effect as though manually affixed. The Company may continue to use for the purposes herein stated the facsimile signature of any person or persons who shall have been such officer or officers of the Company, notwithstanding the fact that they may have ceased to be such at the time when such instruments shall be issued.

IN WITNESS WHEREOF, the Company has caused these presents to be signed and attested by its appropriate officers and its corporate seal hereunto affixed this 17th day of May, 2022.



Attest:

By

Ira S. Lederman
 Executive Vice President & Secretary

Berkley Insurance Company

By

Jeffrey M. Hafer
 Senior Vice President

STATE OF CONNECTICUT)

) ss:

COUNTY OF FAIRFIELD)

Sworn to before me, a Notary Public in the State of Connecticut, this 17th day of May, 2022, by Ira S. Lederman and Jeffrey M. Hafer who are sworn to me to be the Executive Vice President and Secretary, and the Senior Vice President, respectively, of Berkley Insurance Company.

MARIA C RUNDBAKEN
 NOTARY PUBLIC
 CONNECTICUT
 MY COMMISSION EXPIRES
 APRIL 30, 2024

Maria C. Rundbaken
 Notary Public, State of Connecticut

CERTIFICATE

I, the undersigned, Assistant Secretary of BERKLEY INSURANCE COMPANY, DO HEREBY CERTIFY that the foregoing is a true, correct and complete copy of the original Power of Attorney; that said Power of Attorney has not been revoked or rescinded and that the authority of the Attorney-in-Fact set forth therein, who executed the bond or undertaking to which this Power of Attorney is attached, is in full force and effect as of this date.



Given under my hand and seal of the Company, this 27th day of February, 2024.

Vincent P. Forte
 Vincent P. Forte

BERKLEY INSURANCE COMPANY

STATUTORY BALANCE SHEET

DECEMBER 31, 2022

(AMOUNTS IN THOUSANDS)

Admitted Assets

Bonds	\$ 13,748,920
Common & Preferred Stocks	5,444,146
Cash & Short Term Investments	1,220,600
Premiums Receivable	2,409,952
Other Assets	<u>4,173,176</u>
<u>Total Admitted Assets</u>	<u>\$ 26,996,794</u>

Liabilities & Surplus

Loss & LAE Reserves	\$ 13,487,428
Unearned Premium Reserves	4,200,566
Other Liabilities	<u>978,212</u>
<u>Total Liabilities</u>	<u>\$ 18,666,206</u>
Common Stock	\$ 43,000
Preferred Stock	10
Additional Paid In Capital	2,949,106
Unassigned Surplus	<u>5,338,471</u>
<u>Total Policyholders' Surplus</u>	<u>\$ 8,330,587</u>
<u>Total Liabilities & Surplus</u>	<u>\$ 26,996,794</u>

Officers:

President: William Robert Berkley, Jr.
Secretary: Philip Stanley Welt
Treasurer: Richard Mark Baio
Asst. Treasurer: Bertman Adam Braud, Jr.
Asst. Secretary: Aaron Pearce
Asst. Treasurer: Ted William Rogers

Directors:

William Robert Berkley
(Executive Chairman)
William Robert Berkley, Jr.
Philip Stanley Welt
Richard Mark Baio
Paul James Hancock
Carol Josephine LaPunzina
James Gerald Shiel

CONSENT OF SURETY

Berkley Insurance Company a corporation formed under the laws of the State of Delaware and authorized to transact business in the State of ID hereby consents and agrees that if the accompanying proposal of RACOM Corporation to City of Moscow for Radio System Upgrade Project be accepted and contract awarded to it, the Berkley Insurance Company will become bound, as Surety, and will execute **Performance, Payment and Maintenance** bond(s) in the amount and form called for by the Owner conditioned for the proper and faithful fulfillment of said contract.

Dated this 27th **day** of February, 2024.

Berkley Insurance Company

BY: _____



Robert F. Laing, Attorney-In-Fact

POWER OF ATTORNEY
BERKLEY INSURANCE COMPANY
 WILMINGTON, DELAWARE

KNOW ALL MEN BY THESE PRESENTS, that BERKLEY INSURANCE COMPANY (the "Company"), a corporation duly organized and existing under the laws of the State of Delaware, having its principal office in Greenwich, CT, has made, constituted and appointed, and does by these presents make, constitute and appoint: **Susan Bulman-Ditchkus; John P. Hyland; Robert F. Laing; or Thomas J. Henn of NFP Property & Casualty Services, Inc. of Morristown, NJ** its true and lawful Attorney-in-Fact, to sign its name as surety only as delineated below and to execute, seal, acknowledge and deliver any and all bonds and undertakings, with the exception of Financial Guaranty Insurance, providing that no single obligation shall exceed **Fifty Million and 00/100 U.S. Dollars (U.S.\$50,000,000.00)**, to the same extent as if such bonds had been duly executed and acknowledged by the regularly elected officers of the Company at its principal office in their own proper persons.

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RESOLVED, that such power of attorney limits the acts of those named therein to the bonds, undertakings, recognizances, or other suretyship obligations specifically named therein, and they have no authority to bind the Company except in the manner and to the extent therein stated; and further

RESOLVED, that such power of attorney revokes all previous powers issued on behalf of the attorney-in-fact named; and further

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IN WITNESS WHEREOF, the Company has caused these presents to be signed and attested by its appropriate officers and its corporate seal hereunto affixed this 17th day of May, 2022.



Attest:

By

Ira S. Lederman
 Executive Vice President & Secretary

Berkley Insurance Company

By

Jeffrey M. Hafter
 Senior Vice President

STATE OF CONNECTICUT)

) ss:

COUNTY OF FAIRFIELD)

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MARIA C RUNDBAKEN
 NOTARY PUBLIC
 CONNECTICUT
 MY COMMISSION EXPIRES
 APRIL 30, 2024

Maria C. Rundbaker
 Notary Public, State of Connecticut

CERTIFICATE

I, the undersigned, Assistant Secretary of BERKLEY INSURANCE COMPANY, DO HEREBY CERTIFY that the foregoing is a true, correct and complete copy of the original Power of Attorney; that said Power of Attorney has not been revoked or rescinded and that the authority of the Attorney-in-Fact set forth therein, who executed the bond or undertaking to which this Power of Attorney is attached, is in full force and effect as of this date.



Given under my hand and seal of the Company, this 27th day of February, 2024.

Vincent P. Forte



DRAWINGS, SPECIFICATIONS AND PROPOSAL FOR:

RADIO SYSTEM UPGRADE PROJECT

Attachment A

Statement of Work (SOW)

RADIO SYSTEM UPGRADE PROJECT

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CITY OF MOSCOW VHF SIMULCAST RADIO SYSTEM

HIGH LEVEL SCOPE OF WORK BY LOCATION

A. Moscow Mountain Site

Provide and install radio equipment for the VHF simulcast subsystem system with two (2) TB9400 VHF simulcast stations, ethernet switch, backup DC power systems, antennas, transmission lines, surge arrestors, transmitter combining and receiver multicoupler systems.

Provide and install two (2) microwave radios and associated antennas to provide links to the KUID-TV and Whitcom sites.

Equipment is to be installed in new equipment racks inside the exiting shelter at the Moscow Mountain site and connected to an existing electrical panel at the site.

Radio Antennas are to be installed on the existing tower and Microwave Antennas on the roof of the shelter at the Moscow Mountain site.

B. KUID-TV Site

Provide and install radio equipment for the VHF simulcast subsystem system with five (5) TB9400 VHF simulcast stations (three with P25), ethernet switch, backup DC power systems, antennas, transmission lines, surge arrestors, transmitter combining and receiver multicoupler systems.

Provide and install two (2) microwave radios and associated antennas to provide links to the Well 10 and Moscow Mountain sites.

Equipment is to be installed in new equipment racks inside the exiting shelter at the KUID-TV site and connected to an existing electrical panel at the site.

Radio and Microwave Antennas are to be installed on the existing tower at the KUID-TV site.

C. Well 10 Site

Provide and install radio equipment for the VHF simulcast subsystem system with five (5) TB9400 VHF simulcast stations (three with P25), ethernet switch (with a Fiber SIF), backup DC power systems, antennas, transmission lines, surge arrestors, transmitter combining and receiver multicoupler systems.

Provide and install one (1) microwave radios and associated antennas to provide links to the KUID-TV site.

Equipment is to be installed in new equipment racks inside the equipment building at the Well 10 site and connected to an existing electrical panel at the site.

Radio and Microwave Antennas are to be installed on the roof of the Well 10 site.

D. City Hall Site

Provide and install radio equipment for the VHF simulcast subsystem system with five (5) TB9400 VHF simulcast stations (three with P25), ethernet switch (with three Fiber SIFs), backup DC power systems, antennas, transmission lines, surge arrestors, transmitter combining and receiver multicoupler systems.

Equipment is to be installed in new equipment racks inside the basement communications room at City Hall and connected to an existing electrical panel at the site.

Antennas are to be installed on the roof of City Hall (replacing the existing antennas now installed at that site).

E. Latah County Courthouse Site

Provide and install radio equipment for a VHF standalone system with two (2) TB9400 VHF stations, ethernet switch (with a fiber SIF), backup DC power systems. The stations will be configured for main/backup redundant operation. The existing duplexer and antenna system will be re-used at the Courthouse site.

Equipment to be installed in the existing rack in the data/communications room at the Courthouse site and connected to an existing electrical panel at the site.

F. Whitcom Site

Provide and install equipment to provide an interface between the City of Moscow simulcast systems and the Whitcom dispatch console, including an ethernet switch and other equipment required to provide a console interface. Coordinate with Whitcom and Whitman County Department of Emergency Management to properly configure the new radio channels at the console dispatch positions.

Provide and install one microwave radio and associated antenna to provide a link to the Moscow Mountain site. Microwave antennas are to be installed on the existing tower at this site. Interface the microwave radios with the console interface system.

G. System-Wide Tasks

Support the licenses for the radio and microwave frequencies with the FCC for the City.

Provide complete alignment and optimization of the simulcast sub-systems.

Complete all tests required by the specifications, including transmission line and antenna sweeps.

Configure the microwave/fiber interconnect system to provide redundant connections among the sites including to the Whitman Dispatch Center.

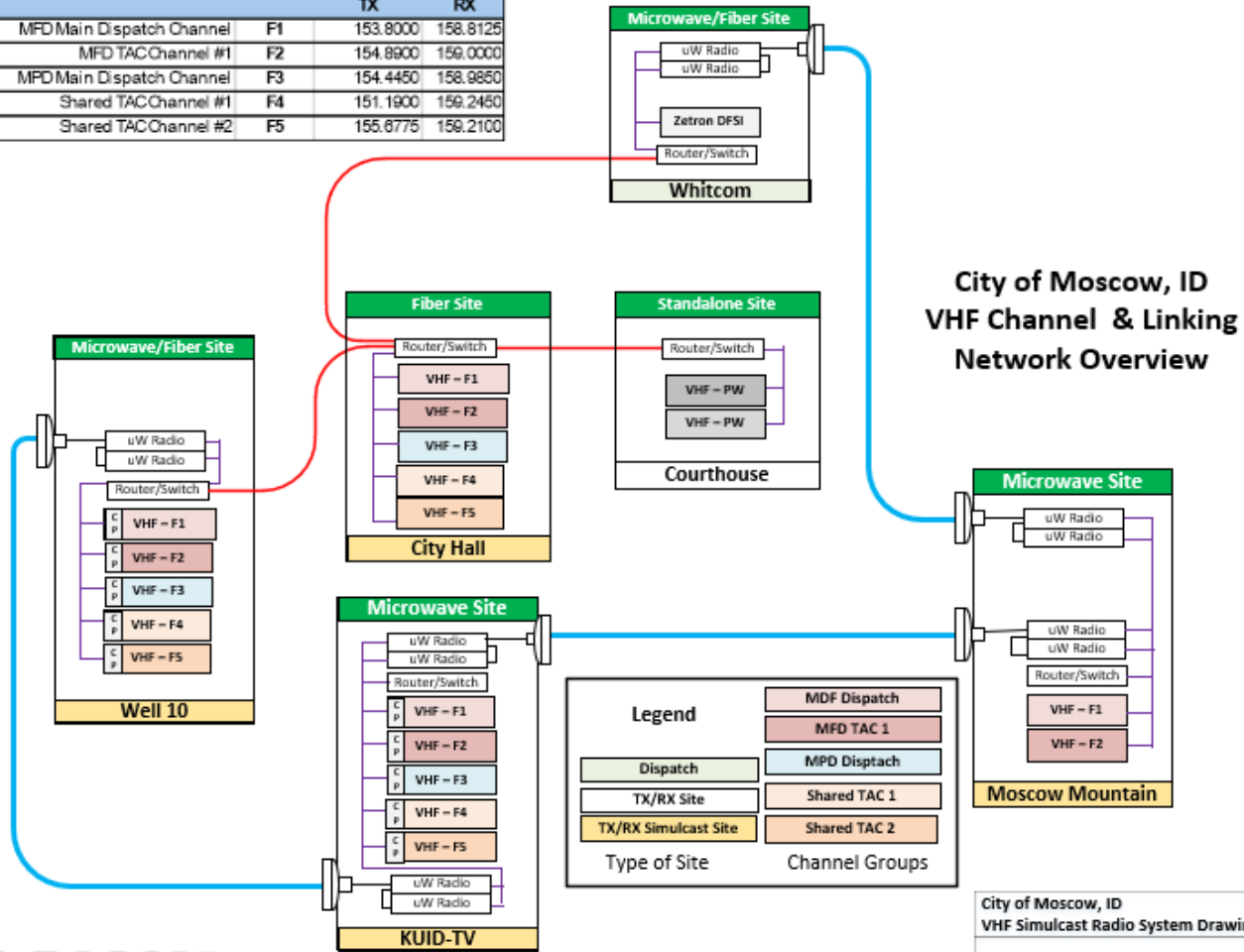
Re-program City of Moscow mobile and portable radios for new system configuration/frequencies.

Complete coverage testing as described in this SOW and RFP specifications and drawings.

Provide all testing and as-build documentation described in the specifications.

Provide warranty service for the radio system as described in the specifications.

Public Works	PW	153.9800	158.1350
		TX	RX
MFD Main Dispatch Channel	F1	153.8000	158.8125
MFD TAC Channel #1	F2	154.8900	159.0000
MPD Main Dispatch Channel	F3	154.4450	158.9850
Shared TAC Channel #1	F4	151.1900	159.2450
Shared TAC Channel #2	F5	155.6775	159.2100



City of Moscow, ID VHF Simulcast Radio System Drawings		Rev A
March 2024		
Confidential, Proprietary & Competition Sensitive		

DC POWER SYSTEMS

SUMMARY

1.1 SECTION INCLUDES

DC power systems, including all component parts reasonably incidental to providing a complete system.

DC power systems are defined to include, but are not limited to the following components (common to each -48 VDC and 12 VDC power system):

- Meter & alarm panel/controller
- Shunt switch panel
- Fuse panels
- Power return bar
- Wiring and hardware
- Battery termination bus assembly
Batteries and battery racks
- Rectifierschargers

1.2 SYSTEM DESCRIPTION

All provided equipment will be supplied by -48 VDC power at the sites.

Provide and install DC power systems at the City of Moscow VHF Simulcast System Sites as described herein and as shown in the drawings.

These systems provide all the necessary components to provide primary distribution of - 48 V DC that make up the new City of Moscow VHF radio system.

The -48 VDC system also provides distribution breakers, metering, and power plant alarm functions, and cable termination for input and distribution loads. The systems specified herein have charging capacity to cover the full design plus 20% future load at the City of Moscow radio sites.

1.3 EQUIPMENT SPECIFICATION

Manufacturer's Standard of Design and Quality: The DC Power System being provided will consist of a the Newmar DC Power System Commander II with two or three Rectifiers 3000W Hot swappable rectifiers, Distribution Circuit Breaker panel, four 12VDC 100AH front terminal batteries and a Battery Tray.

The power system outlined above will be provided at the following sites:

- Moscow Mountain (2 Rectifiers)
- KUID-TV (3 Rectifiers)
- Well 10 (3 Rectifiers)
- City Hall (3 Rectifiers)
- Court House (2 Rectifiers)
- Whitcom Site (2 Rectifiers)

The DC Power System will be connected to the local AC power. AC power connections from the rectifier systems to the local electrical panel at each site as follows based on the information provided in the RFP:

- Moscow Mountain – 50 Amp 220 VAC breaker at electrical sub-panel
- KUID-TV – 70 Amp 220 VAC breaker at KUID Generator panel
- Well 10 – 70 AMP 220 VAC Breaker at main electrical panel
- City Hall – 70 AMP 220 VAC breaker at electrical sub-panel (location and available space needs to be confirmed)
- Court House – 50 AMP 220 VAC breaker at electrical sub-panel (location and available space needs to be confirmed)
- Whitcom – 50 AMP 220 VAC breaker at electrical sub-panel (location and available space needs to be confirmed)

Provide and install a new -48 distribution breaker panel equipped with a minimum of 18 distribution circuit breakers mounted in a circuit breaker panel, Grounded Return Bus Bars and "Breaker Tripped" alarm contacts. Provide and install suitable breakers, cabling and connections to the equipment connected to the breaker panel for each site.

The drawings to be completed during the Detail Design, will indicate the general installation locations for the battery banks, rectifiers, distribution panels, and other components of the DC power systems.

1.4 PERFORMANCE REQUIREMENTS

Conform to all applicable code for manufacture and installation of DC power systems and associated equipment and materials.

Install and configure DC power systems in accordance with good engineering practices.

DOCUMENTATION SUBMITTALS

Submittal Drawings: Submit shop drawings showing details and location of DC Power System equipment (battery banks, rectifiers, and associated equipment) at each site. Provide schematic line drawing showing configuration of DC power distribution for each DC power system provided under this specification.

Product Data: Submit manufacturer's data on DC power systems including, but not limited to, batteries and battery racks, rectifiers, controllers and alarm equipment, DC distribution and alarm panels.

Manufacturer's Installation Instructions: Submit preparation requirements, and special installation instructions.

1.5 CLOSEOUT SUBMITTALS

Project Record Documents: Submit as-built drawings recording actual locations, configuration, and installation details of DC power systems.

1.6 PRE-INSTALLATION MEETINGS

Convene pre-installation meeting minimum one week prior to commencing work of this section.

Attendance is to include all parties directly affecting, or affected by work of this section, including electrical sub-contractor, and contractor responsible for installation of new racks, microwave radio and mobile radio systems at the City of Moscow radio sites.

1.7 DELIVERY, STORAGE, AND HANDLING

Deliver, store, protect and handle products with adequate protection against damage. Avoid breakage, denting and scoring finishes. Do not install damaged equipment.

Store batteries, rectifiers, and other DC power system components and accessories in original cartons or shipping containers and in a clean dry space; protect from weather and construction traffic. Wet materials should be unpacked and dried before storage.

1.8 SEQUENCING

Sequence work to allow for installation of electrical systems, land mobile and microwave radio equipment, security equipment, and other work required before installation of DC power systems.

1.9 COORDINATION

Coordinate work with sub-contractors installing electrical systems, cable tray systems, equipment racks, and radio & microwave radio systems.

1.10 WARRANTY

Provide standard manufacturer's warranty for all equipment listed in these Specifications.

1.11 MAINTENANCE SERVICE

Furnish service and maintenance of DC power systems for one year from Date of Substantial Completion.

DC POWER SYSTEM COMPONENTS

1.12 DC POWER EQUIPMENT CONFIGURATION

All DC supply equipment shall be installed in 19-inch wide, EIA universal mounting spacing, welded steel, zinc plated, seismic rated floor supported equipment racks or approved equivalent.

The -48 VDC rectifier systems to be provided is the Newmar Commander II or II+ series DC Power Plant. The configuration will include at a minimum the following item: 1xCommander Shelf, 3xCII 48V 3000W Rectifiers, Circuit Breakers.

The battery system will consist of one 19 x 19 battery tray and four 12VDC 100AH batteries.

1.13 SAFETY AND HAZARDS

The design of the plant shall not expose personnel to any safety hazards, and product damage shall not occur during normal installation, operation, and maintenance.

The safe replacement of components such as fuse holders shall not require that the plant be de-energized.

1.14 EXAMINATION

Check work with related trade's shop drawings and make corrections when required.

Verify that field conditions are acceptable and are ready to receive work.

Beginning of installation means installer accepts existing conditions.

1.15 INSTALLATION

Install battery banks and 12 VDC and -48 VDC rectifier/charger systems as shown in the drawings. Provide and install all required interconnecting cable in compliance with all applicable electrical codes.

Coordinate installation of battery and DC power system equipment with other electrical work as necessary to properly integrate installation of DC power system work with other work.

1.16 FIELD QUALITY CONTROL AND TESTING

The tests described in the following sections apply to the DC power systems in the new Communications Room only.

Test each tray of batteries for ground faults prior to installation as soon as the batteries are received from the manufacturer, after the battery trays have been installed in the racks at each site, and one week after installation of the battery system. Perform the tests as follows:

Connect a megohm meter (Extech 380360 or equivalent) between the tray and one

of the terminals of the battery (or one terminal of a series of cells if the cells are strapped together). Set the test set for 2000 megohms with 1000 Volt test voltage. If the value is above 2000 megohms the batteries are acceptable for installation. If a lower value is obtained, isolate the problem cell by disconnecting the connectors between the batteries, and replace the bad battery or batteries with a new cell.

Using a battery impedance tester, perform a battery impedance (or internal battery resistance, depending upon the test equipment used) measurement of each battery in the battery bank and record the results to establish a baseline for each battery. Compare the values with the manufacturer's specifications for the battery cell. Values should be within approximately $\pm 20\%$ of the manufacturer's nominal specification. Perform these tests one week after battery plant has been put into service.

1.17 CLEANING

Upon completion of this section of work, remove protective wraps and debris. Repair damages due to installation of this section of work.

1.18 PROTECTION OF FINISHED WORK

Protect DC power systems work from damage after installation.

END OF SECTION

MICROWAVE RADIO AND ANTENNA SYSTEMS

SUMMARY

2.1 SECTION INCLUDES

Product requirements and specifications for microwave radios, antennas and associated hardware, waveguides, connectors, grounding kits, and weatherproofing, for the City of Moscow simulcast sites.

Requirements and specifications for installation of microwave antennas and associated equipment at the City of Moscow simulcast sites.

2.2 SYSTEM DESCRIPTION

A network map of the proposed City of Moscow Ethernet interconnection network is shown above in the high-level system scope. The network is made up of both microwave radio connections and fiber connections over the City of Moscow fiber network. The microwave radios operate in the 11GHz under Part 101 of the FCC's Rules.

The microwave radio antennas to be provided and installed will be outlined in the detail design based on final path studies and verification of line of sight.

Configuration of the microwave radios, including antenna mounting locations and equipment installation in equipment rack at each site will be in the detail design document.

Antenna mounts compatible with the tower will be installed for all antennas provided under this contract, as defined in the agreed to detail design.

A Split system with indoor network interface and power supply unit and outdoor RF unit mounted on the antenna will be used for all the links. Interconnections between indoor units and outdoor units provided with a cable supplied by the manufacture. The radios will be configured for 1+1 MHSB operation.

2.3 PERFORMANCE REQUIREMENTS

The supplied product shall meet the requirements of this specification and the applicable industry codes and standards.

The work includes all items necessary for the safe, efficient and continuous operation of the equipment within the scope of this specification.

The digital Microwave equipment operates in the FCC Part 101 licensed 11GHz band. Bandwidth utilization shall be 100% packet based using Ethernet as the interface to each radio.

RACOM shall provide all required frequency coordination and FCC licensing necessary to implement the City of Moscow interconnect system described in these Specifications.

General Requirements

All licensed microwave radios shall operate in spectrum allocated by the FCC under Part 101 as follows for 11GHz Links:

Electrical interface shall be Ethernet. Ethernet layer shall be auto-negotiable at 10/100/1000 Mb/s. The Ethernet bandwidth shall be 155 Mb/s in 30 MHz channels.

The microwave radio equipment shall have remote access capability for diagnostics, monitoring of performance metrics and configuration data and remote configuration. The microwave radio equipment diagnostics, monitoring of configuration data and configuration shall be locally accessible via a laptop computer using a web browser.

Management System Support

Radio terminals shall have an Element Management System (EMS) or Microwave Craft Terminal (MCT) software for both local and remote operations, administration, maintenance, and provisioning (OAM&P) of the complete radio system as a single Network Element (NE).

The radio shall be capable of reporting alarm, status conditions as well as performance monitoring and diagnostic information to external Network Management System(s) via SNMPv3.

Indoor radio components shall be mountable in ANSI/ EIA 310 standard racks.

The City of Moscow will use standard Windows-based PCs for field configuration and diagnostics.

2.4 GENERAL EQUIPMENT SPECIFICATIONS

The microwave transceivers for all radio configurations shall be fully operational within the temperature range of 0° C to +50°

The radio equipment shall be designed to operate in a communications equipment environment installed in or near the vicinity of other types of equipment which may include other digital radio equipment, fiber optic terminal equipment, VHF base stations, and telephone signaling equipment.

The microwave radio equipment shall operate from a nominal -48 VDC power source.

The microwave radio equipment shall allow the “hot” insertion and removal of radio transceiver, modem and tributary cards without service interruptions or damage to themselves or other modules. The radio shall also be capable of “hot” insertion and removal of an out-of-service common equipment module.

The microwave radio equipment shall restart with no loss of provisioning for interfaces upon the loss and regaining of power.

Each microwave radio equipment module shall have a visual alarm/status indication noting either “normal” or “alarm” condition. A summary remote alarm shall be available via dry contacts (Form C) indicating, as a minimum, microwave radio equipment alarm conditions for the following:

- Critical Alarm
- Major Alarm
- Minor Alarm
- Link and Network Topologies & Protection

The following configurations shall be supplied: 1+1 Monitored Hot Standby

2.5 RF SPECIFICATIONS AND FEATURES

All microwave radios shall provide the following:

Transmitter output power (typical at 128 QAM, or 256 QAM in a 30 MHz channel and with reference to the antenna port)

- RF Switch for hot standby TX configuration
- Auto-tuning when spare unit is installed
- Standard transmitter-receiver filtering and combining using an integrated diplexer or separate TX and RX filters integrated into the radio’s antenna coupling unit.
- Frequency Stability shall be +/- 10 ppm
- Automatic Transmitter Power Control

The radio shall support Automatic Transmitter Power Control with independently variable maximum, minimum, and operational threshold settings, all adjustable in 1dB steps. Range may be variable based on modulation setting, but in any case, shall be no less than 10 dB.

For split systems with an indoor network interface unit, the core Ethernet switch shall provide a minimum of 3 Ethernet ports:

2.6 MAINTENANCE

Normal maintenance actions that include replacements of failed or faulty redundant traffic processing units on the off-line portion of the radio shall not cause hits or impairments on the online portion of the radio.

Test Points/Voltage Displays - Means shall be provided to measure or read-out critical voltage parameters within the radio. This may be satisfied through test points suitable for simple voltmeter connection or voltage reading displays using built-in devices in conjunction with a hand-held terminal or laptop PC. The following parameters, as a minimum, shall be able to be monitored in such a fashion:

2.7 STATION DC VOLTAGE

Direct measurement of transmitter power output and transmitter frequency via an integrated calibrated RF test port (SMA connector).

2.8 MODULATION REQUIREMENTS

Minimum modulation formats and channel bandwidths of 128 QAM, and 256 QAM with channel widths of 10 MHz 30 MHz are required.

Optional modulation formats and channel bandwidths of QPSK, 16 QAM, 64 QAM, and 128 QAM and Bandwidths of 5 MHz are desired.

DOCUMENTATION SUBMITTALS

Indicate proposed locations and details of installation for each antenna and transmission line to be installed under this Section. Indicate proposed configuration of specific transmission line at the transmission line entry port and at the interior (radio) side of the waveguide entry. Specifically identify the antenna, tower leg, and elevation proposed to be associated with each transmission line.

Product Data: Submit manufacturers cut sheets for antennas, transmission lines and associated equipment. Submit manufacturer's cut sheets for all antenna mounts, and add manufacturer and model number for antenna mounts to the antenna schedule shown in the drawings. Submit revised antenna schedule with antenna mount information included.

Test Reports: Submit test reports provided by the manufacturer for each antenna and transmission line.

Manufacturer's Installation Instructions: Submit manufacturer's installation instructions for all antennas, antenna support structures, transmission lines, transmission line connectors, transmission line ground kits transmission line entry ports, grounding bars and surge suppressors provided under this Section.

2.9 CLOSEOUT SUBMITTALS

Project Record Documents: Record as-built tower locations and details of installation for each antenna and waveguide installed under this Section. Record and document configuration of

specific waveguides at the waveguide entry port and at the interior (radio) side of the entry port. Specifically identify the antenna, tower leg, and elevation associated with waveguide.

2.10 PRE-INSTALLATION MEETINGS

Convene a pre-installation meeting a minimum of one week prior to commencing work of this section.

Attendance is to include all parties directly affecting the work of this section.

2.11 DELIVERY, STORAGE, AND HANDLING

Deliver, store, protect and handle products with adequate protection against damage.

Accept antennas, waveguides, and associated equipment on site or at Contractor's local storage facility in the Honolulu area. Inspect for damage.

Arrange for transportation of all equipment from local storage facility to City of Moscow sites. Take care to assure that waveguides are protected from damage and from rain and moisture as they are transported, and once they are delivered to the job site. Keep the ends of waveguide runs capped to avoid migration of water into the waveguides during transport, storage, or installation. Waveguides are especially delicate and subject to damage if they are uncoiled from their spool prior to transport or prior to actual installation on the tower. Take steps to assure that waveguides are not twisted, dented, or otherwise distorted during transport and installation.

2.12 ENVIRONMENTAL REQUIREMENTS

Do not install transmission line connectors or transmission line weatherproofing during inclement weather.

2.13 FIELD MEASUREMENTS

Verify field measurements prior to fabrication.

2.14 SEQUENCING

Sequence work to coordinate with installation and alignment of microwave system antennas.

2.15 COORDINATION

B. Coordinate work with work of others affected by work of this section, including those performing microwave antenna and transmission line installation and alignment and those performing land mobile radio antenna and transmission line equipment.

2.16 WARRANTY

Provide manufacturer's standard warranty.

PRODUCTS

2.17 PRODUCT

Product Description: the products described in this section include antennas, waveguides, grounding kits, weatherproofing materials, transmission line entry ports, other equipment required to implement the microwave systems and RF antenna systems.

2.18 COMPONENTS

Antennas - The antenna manufacturers and model numbers for the antennas to be mounted on the towers and other antenna support structures at the City of Moscow as defined in the Detail Design.

Microwave Radios – Provide and install new 155 Mbps microwave radios at the at the City of Moscow Sites, as outlined above. Configure radios for 1+1 MHSB (monitored hot- standby) operation. Mount indoor equipment in the radio equipment rack at each site, as shown in the Contract Drawings. DC power for the radios is to be provided from the -48 VDC systems at each site, as shown in the drawings.

2.19 INSTALLATION

Install antennas, transmission lines, connectors, entry ports, grounding kits, and weatherproofing in accordance with manufacturer’s instructions.

Install transmission line hangers at 3-foot intervals on the horizontal runs across the transmission line bridge and at 3-foot intervals on vertical runs up the tower.

Weatherproof grounding kits using the materials and following the procedures contained in grounding kits specified above.

Microwave Antenna and Transmission Line Installation Requirements

These requirements apply to the installer mounting the microwave antennas and installing the microwave transmission lines.

Confirm correct antenna polarization and rough alignment.

Align antenna using existing signal from far end of path, using a spectrum analyzer to observe signal level.

Sweep waveguides for return loss and provide sweep results to City. Sweeps for each waveguide to include waveguides terminated with an appropriate load and connected to the antenna.

Make final connections to equipment and confirm correct signal levels; Contractor to make final antenna adjustments at direction of City personnel.

2.20 FIELD QUALITY CONTROL AND TESTING

Path Design & Performance

RACOM will perform their own calculations and studies, including field verification as required to achieve path reliability and system performance objectives.

The annual one-way path propagation reliability for each path shall be a minimum of 99.999% based on a maximum BER of 10^{-6} .

Propagation outage and reliability shall be based on the Vigants model (Ref. “Space

Diversity Engineering”, Bell System Technical Journal, January 1975):

- $P = 2.5 \times 10^{-6} \times C \times f \times d^3 \times 10^{-A/10}$
Where:
- P = Fade Probability
- C = Climate/Terrain factor f = frequency in GHz
- d = path length in miles
- A = effective (composite) fade margin

A climate factor of C = 2 shall be assumed.

The effective or composite fade margin shall be calculated using: $A = -10 \times \log (10^{-DFM/10} + 10^{-TFM/10})$

Where: DFM = Dispersive Fade Margin TFM = Thermal Fade Margin

Rainfall outage calculations shall assume Crane 96, Zone C2.

Vendor shall indicate worst-case latencies for proposed MW Radio equipment; back-to-back means with effective zero transmission propagation delays between the two sets of connected equipment for the following scenarios:

- 1 Hop
- 2 Hops
- 3 Hops
- Full loop with the fiber links

with the following payloads

Ethernet: from the originating Ethernet port on the Core Switch Module to the end Ethernet port on the Core Switch Module at the far-end site.

Tests shall be conducted to verify that the digital microwave 155 mbps performance meets the following:

A 2-hour one-way (loopback) test shall be conducted and the resulting BER shall be equal to no more than 15 errored seconds during a 2-hour, one-way (loopback) test.

Jitter/Wander measurements shall indicate 150 ns for an observation time of 1000 seconds.

All test and measurement equipment utilized for installation, and testing of the system shall have been recently calibrated to the test equipment manufacturer's specifications by a recognized calibration laboratory.

2.21 CLEANUP

Upon completion of this section of work, remove debris. Repair damages due to installation of this section of work.

END OF SECTION

LAND MOBILE RADIO SYSTEMS

SUMMARY

3.1 SYSTEM DESCRIPTION

This Specification contains the requirements for the procurement, installation, configuration and testing of new VHF base station radio equipment that will make up a new VHF simulcast radio system with four base station repeater sites.

The RACOM shall provide and install, configure, test and document the radio systems at the new and existing sites described in this specification.

Radio system equipment including VHF base station radios, simulcast controllers, transmitter combiners and receiver multicouplers, monitoring and alarm units for the VHF and microwave radios, Ethernet switches, GPS reference, transmission lines and antennas, surge arrestors and other equipment required to provide a complete and functional simulcast system with voting will be provided and installed by RACOM, as described below.

All cabling and other ancillary equipment required to interconnect these items of equipment into fully functional systems shall be provided and installed by RACOM.

Microwave radio equipment and backup DC Power systems will also be installed under this contract, as described above.

The VHF analog/P25 base stations and all the other site equipment related to the radio system (GPS Reference, network equipment, transmitter combiner and receiver multicoupler) will be powered by -48 VDC. The goal based on the final frequencies is to fit everything into a single EIA 19" equipment rack (because of equipment space limitations at some of the repeater sites).

The frequencies and channel names that will be used are shown above in the system overview. RACOM will be responsible for the licensing of the changes to the City's existing licenses and any new licensed required for the system.

The configuration and locations of the sites that make up the new City of Moscow VHF simulcast radio system are shown above in the system overview. The overall system consists of one simulcast subsystem made up of the City Hall, KUID-TV, Well 10 and Moscow Mountain repeater sites.

The City Hall, KUID-TV and Well 10 simulcast subsystem has five channels: the MFD main dispatch channel, the MFD TAC channel, the MPD main dispatch channel (P25), TAC Channel 1 (P25) and TAC Channel 2 (P25). Moscow Mountain will include only the two MFD channels as part of that simulcast channel group.

The Public Works repeater in the Courthouse will remain a stand-alone repeater with no connection to dispatch or to the other subsystems.

3.2 VHF ANALOG/P25 NARROWBAND BASE STATIONS

VHF analog/P25 narrowband base station radios, configured as repeaters and programmed for operation on the frequencies and with the nominal transmit power output levels as outlined in

the Detail Design per the final FCC licenses.

City Hall, KUID TV and Well 10 will have all five channels and the Moscow Mountain Site will just have the two fire channels as outlined in the high-level drawing shown in the overview section of the SOW.

Install the base station repeaters in the radio equipment rack at each site, as outlined in the detail design document.

3.3 TX-RX SYSTEMS TRANSMITTER COMBINER/RECEIVER MULTICOUPLER SYSTEMS

Detailed specifications for the combining systems will be outlined in the detail design based on the final channel plan.

Transmitter combiner/receiver multicoupler systems will be able to be configured for a 19" rack-mounting for cavities and associated combining equipment.

RACOM shall be responsible for cables from the combining system to the surge arrestors at each site and from the radio equipment to the combiner input ports and the multicoupler output ports.

3.4 GPS MASTER OSCILLATOR EQUIPMENT (FREQUENCY REFERENCE)

The Frequency Reference at the sites will include the following items at each site.

- Orolia SecureSync
- Orolia Spectacom GPS Antenna
- Orolia Spectacom Antenna Line Surge Suppressor
- Provide and install 1/2" coaxial cables terminated in Type N male connectors between each GPS oscillator and its associated GPS antenna.

3.5 NETWORK EQUIPMENT

Provide and install new 16-port Ethernet switches (Cisco Switch or approved equivalent) at the simulcast repeater sites.

The provided Ethernet switch will be configured with a -48 VDC power supply.

RACOM will be responsible to configure the Ethernet switch and routers in coordination with the City's IT Department and as agreed to in the Detail Design.

3.6 TRANSMISSION LINES, JUMPERS, ENTRY PORTS, AND SURGE ARRESTOR

All connectors on all fixed station cables and antennas must be Type N or 7/16 DIN, constant impedance type connectors.

All exposed antenna hardware must be stainless steel, brass, or low silicon bronze. Hot dip zinc galvanized steel meeting ASTM A-123, A-153, A-385 and B-695 may be used for mounting brackets.

Transmission lines shall be 7/8" foam dielectric solid outer conductor coaxial cable. Transmission lines shall be one continuous length; splices are not allowed. All transmission lines shall be terminated at the antenna end with a Type N or 7/16 DIN female connector, for 7/8" transmission line, and at the surge arrestor end with a Type N or 7/16 DIN male Connector, for 7/8" transmission line.

All connections between antennas and jumpers shall be weatherproofed using the cold-shrink weatherproofing kit recommended by the manufacturer, for 1/2" and 7/8" transmission line to antenna or equipment connections.

All connectors shall be manufactured by the same manufacturer as the transmission line. All connectors shall be installed utilizing the manufacturer's recommended tooling following manufacturer's instructions.

The use of any adapters and/or splices is prohibited, with the exception of SMA to Type N adapters or cables required to connect base station radios with SMA connectors to transmitter combiner, receiver multicoupler or duplexer ports with Type N connectors.

Grounding Kits – Provide and install transmission line grounding kits recommended by the manufacturer to bond each transmission line and waveguide to the tower ground tab at the antenna end, to the ground bar at the base of the tower, and to the ground bar on the outside of the building at the transmission line entry port.

All transmission lines must be secured with the transmission line manufacturer's recommended stainless-steel hardware, with appropriate tower mounting hardware, and supported by transmission line bridges that will be supplied as part of this procurement. Hangers used to support transmission line on transmission line bridge, transmission line ladder, and other locations where support members with mounting holes are used shall attach to support members with a bolt installed through the mounting hole and a lock washer and nut on the back side of the support member.

Provide and install Site Pro transmission 6-port (2 X 3) 4" transmission line entry panels (or approved equivalent) with Site Pro boot kit (or approved equivalent) for the transmission lines at the following sites:

- Well 10
- KUID-TV

Cable Ladders –Provide and install cable ladder at the KUID-TV site from the tower to the shelter.

3.7 MOBILE AND PORTABLE RADIO CONFIGURATION

Program all City of Moscow portable mobile radios to operate on the new VHF simulcast system frequencies. Coordinate with the City to produce a template that includes new frequencies, CTCSS tones and Channel Names for the radio programming. Program radios to allow for a smooth cutover from the existing radio system to the new radio system.

3.8 COORDINATION WITH WHITCOM DISPATCH CENTER

Coordinate with the City and with the Whitcom Dispatch Center to incorporate the radio channels in the new VHF simulcast system into the dispatch consoles at Whitcom and to provide appropriate interconnections between the new system and the dispatch console.

3.9 NETWORK MANAGEMENT SYSTEM

Provide, install, and configure a new network management system to provide status, alarms and monitoring of the radios and associated equipment in the radio system. RACOM will provide a server for the Network Management System software and coordinate with City to implement the Network Management System.

3.10 CUTOVER PLAN

30 days prior to the beginning of any installation work provide a complete cutover plan, arranged by site, to the City of Moscow. The cutover plan shall describe how the systems described below will be installed, configured, and tested, and how cutover from the existing configuration of systems at the existing sites to the new system configuration and new sites will be accomplished. Submit the cutover plan for approval by the City.

PERFORMANCE REQUIREMENTS

Conform to all applicable code for manufacture and installation of land mobile radio systems and associated equipment and materials.

Install and configure land mobile radio systems in accordance with good engineering practices.

All proposed equipment shall be supported by the vendor for a minimum of seven years after product discontinuation. If necessary, parts are not available before the end of the seven years, a replacement will be provided at no additional cost to the City of Moscow which meets the contractual requirements and is compatible with the system. All applicable product discontinuations shall be promptly reported to the City of Moscow. This includes the equipment manufactured by the radio vendor as well as any third-party equipment provided by the radio vendor.

3.11 WARRANTY

The Vendor shall include warranty support for the first year, beginning at Final Acceptance or Beneficial Use, whichever comes first.

Warranty shall include the following services:

- Depot Advanced Repair: The spare replacement part will be used to fix the item before the broken part is shipped to Depot Repair.
- Technical Support: 24 x 7 phone support.
- At the end of the warranty period, one Preventative Maintenance (PM) shall be performed by the Vendor, and all equipment shall be brought to the latest software revision.

3.12 POST-WARRANTY SUPPORT REQUIREMENTS

The following items are provided as long as the City of Moscow's equipment is under a support agreement.

- All technical service bulletins shall be sent to the City of Moscow via email or another approved method.
- All software revisions shall be provided at no cost to the City of Moscow.

- Any known major defect with the products supplied by the Vendor shall be corrected at no cost. A major defect is defined as a defect degrading the performance of the product below its published specifications or causing outages.

3.13 TRAINING

RACOM will provide technical and system monitoring to the City's personnel based on the level of needs as it relates to the system.

For the End Users (radio and dispatchers) RACOM will work with the City of Moscow to determine what if any level of end user training is needed for the various users and assist the City putting together and end user training material for the City's trainers to use on the new system and its operation.

DOCUMENTATION SUBMITTALS

Submittal Drawings: Submit shop drawings showing details and location of Radio System equipment (VHF base station repeater radios, transmitter combiners and receiver multicouplers, GPS oscillators, DC power systems and associated equipment) at each site.

Provide rack elevation drawings for each site. Provide schematic line drawings showing configuration of radio equipment, network equipment, DC power equipment, microwave radio equipment and related equipment provided under this specification.

Submit elevation drawings showing antenna mounting locations for land mobile and microwave antennas.

Manufacturer's Installation Instructions: Submit preparation requirements, and special installation instructions.

Provide manuals for each type of equipment. Manuals may be provided electronically in Portable Documentation Format and/or as a hard-copy. For any manual supplied as a hard-copy, provide three copies.

3.14 CLOSEOUT SUBMITTALS

Project Record Documents: Submit as-built drawings recording actual locations, configuration, and installation details of all radio system components.

Provide a detailed on-site manual with complete documentation of all installed systems for each individual site. Provide an overall system manual that includes complete documentation of all installed systems for all the sites.

Provide all documentation in original .docx, .xlsx or .dwg formats, with PDF versions of each document.

PRODUCTS

3.15 GENERAL

Shown below are detailed specifications for the equipment items to be provided, installed, and tested by RACOM.

Specifications for base station repeater transceivers are shown below.

- Base station transceivers shall meet the following specifications as measured per the methods as described in TIA-603-E:
- Transmitters rated for continuous duty
- Maximum Transmit power 100 W
- Transmitter Spurious & Harmonic Emissions Attenuation ≥ 90 dB
- FM Hum and Noise > 45 dB
- RF Output Impedance = 50Ω
- Receiver Sensitivity 12 dB SINAD $\leq 0.25 \mu\text{V}$
- Receiver Adjacent Channel Rejection ≥ 80 dB
- Receiver Intermodulation Rejection ≥ 85 dB
- Receiver Spurious and Image Rejection ≥ 100 dB

EXAMINATION

Verify that field conditions are acceptable and are ready to receive work.

Beginning of installation means installer accepts existing conditions.

3.16 FIELD QUALITY CONTROL AND ACCEPTANCE TESTING

SYSTEM AND COVERAGE ACCEPTANCE TESTING

- In order to confirm proper adjustment and operation of the City of Moscow VHF simulcast system the radio system coverage tests described below will be based on an evaluation of the DAQ (“Delivered Audio Quality”) and Bit error Rate (BER) provided at test locations throughout the City of Moscow.
- Prior to the commencement of the Coverage Acceptance Tests, the Contractor shall provide the City with a documentation of field tests performed on the installed radio system, including:
 - Measured Base Station Transmitter Output Power (Watts/dBm)
 - Measured Base Station Receiver 12 dB SINAD Sensitivity (dBm)
 - Measured transmitter combiner and receiver multicoupler insertion loss for each channel.
 - Calculated Effective Radiated Power for each channel at each site.
 - Provide these measurement results to the City as a System Field Testing Report.

DAQ/BER Tests will be performed on an unused channel of simulcast subsystem that includes the City Hall, KUID-TV and Well 10 sites and then a second test with the Moscow Mountain included. The most likely channel for the tests is the MFD Tac. DAQ tests will also be performed on one of the two Shared Tactical Channels that make up the 3-site simulcast

system that includes the Well 10, KUID-TV and City Hall sites.

- DAQ/BER Tests will be performed within each area defined by the rectangular grid laid over the Moscow city limits. Each square in this grid defines an area within which a DAQ test must be performed as part of the coverage testing.
- DAQ/BER tests shall be performed on-board a City of Moscow vehicle equipped with a mobile radio with outboard speakers installed by the contractor to allow the evaluation team members to hear the audio produced by the system well enough to provide a reasonable evaluation of its quality.
- A Second radio will be configuration that includes 15 dB of attenuation between the antenna and the mobile radio to simulate a portable radio operating at belt level.

The contractor shall produce DAQ/BER measurement maps and shall provide them to the City in the form of a final coverage DAQ/BER test report.

3.17 CLEANING

Upon completion of this section of work, remove protective wraps and debris. Repair damages due to installation of this section of work.

3.18 PROTECTION OF FINISHED WORK

Protect radio systems work from damage after installation.

END OF SECTION

Exhibit 1 – Pricing and Payment Milestones

Total Pricing for System and Services \$1,110,167.50

City of Moscow, ID

EQUIPMENT PRICING

Site	Model Number	Description	Qty	Contract Price	Extended Contract Price
01 - Moscow Mountain	RACK-MISC	Rack & Miscellaneous Equipment	1	\$ 1,892.25	\$ 1,892.25
01 - Moscow Mountain	MP2P-NE	Microwave & Network Equipment	1	\$ 30,624.15	\$ 30,624.15
01 - Moscow Mountain	DC-POWER	DC Power Plant/Distribution	1	\$ 14,076.00	\$ 14,076.00
01 - Moscow Mountain	GPS	GPS Oscillator, 48VDC	1	\$ 6,380.00	\$ 6,380.00
01 - Moscow Mountain	TAIT-S	Tait TB9400 Base Stations Network	2	\$ 12,771.00	\$ 25,542.00
01 - Moscow Mountain	ANT-SYS	LMR RF Antenna System	1	\$ 34,534.20	\$ 34,534.20
02 - KUID-TV	RACK-MISC	Rack & Miscellaneous Equipment	1	\$ 3,784.50	\$ 3,784.50
02 - KUID-TV	MP2P-NE	Microwave & Network Equipment	1	\$ 30,624.15	\$ 30,624.15
02 - KUID-TV	DC-POWER	DC Power Plant/Distribution	1	\$ 14,076.00	\$ 14,076.00
02 - KUID-TV	GPS	GPS Oscillator, 48VDC	1	\$ 6,380.00	\$ 6,380.00
02 - KUID-TV	TAIT-CV	Tait TB9400 Base Stations Voter	5	\$ 16,984.50	\$ 84,922.50
02 - KUID-TV	TAIT-P25	Tait P25 Simulcast TXRX Site	2	\$ 7,176.75	\$ 14,353.50
02 - KUID-TV	ANT-SYS	LMR RF Antenna System	1	\$ 44,078.20	\$ 44,078.20
02 - KUID-TV	RAC-SI	Site Improvements	1	\$ 4,050.00	\$ 4,050.00
03 - Well 10	RACK-MISC	Rack & Miscellaneous Equipment	1	\$ 3,784.50	\$ 3,784.50
03 - Well 10	MP2P-NE	Microwave & Network Equipment	1	\$ 18,464.35	\$ 18,464.35
03 - Well 10	DC-POWER	DC Power Plant/Distribution	1	\$ 14,076.00	\$ 14,076.00
03 - Well 10	GPS	GPS Oscillator, 48VDC	1	\$ 6,380.00	\$ 6,380.00
03 - Well 10	TAIT-CV	Tait TB9400 Base Stations Voter	5	\$ 16,984.50	\$ 84,922.50
03 - Well 10	TAIT-P25	Tait P25 Simulcast TXRX Site	2	\$ 7,176.75	\$ 14,353.50
03 - Well 10	ANT-SYS	LMR RF Antenna System	1	\$ 44,078.20	\$ 44,078.20
04 - City Hall	RACK-MISC	Rack & Miscellaneous Equipment	1	\$ 1,892.25	\$ 1,892.25
04 - City Hall	MP2P-NE	Microwave & Network Equipment	1	\$ 9,540.50	\$ 9,540.50
04 - City Hall	DC-POWER	DC Power Plant/Distribution	1	\$ 14,076.00	\$ 14,076.00
04 - City Hall	GPS	GPS Oscillator, 48VDC	1	\$ 6,380.00	\$ 6,380.00
04 - City Hall	TAIT-S	Tait TB9400 Base Stations Network	5	\$ 12,771.00	\$ 63,855.00
04 - City Hall	TAIT-P25	Tait P25 Simulcast TXRX Site	2	\$ 7,176.75	\$ 14,353.50
04 - City Hall	ANT-SYS	LMR RF Antenna System	1	\$ 28,301.40	\$ 28,301.40
05 - Court House	RACK-MISC	Rack & Miscellaneous Equipment	1	\$ 1,892.25	\$ 1,892.25
05 - Court House	MP2P-NE	Microwave & Network Equipment	1	\$ 8,255.32	\$ 8,255.32
05 - Court House	DC-POWER	DC Power Plant/Distribution	1	\$ 14,076.00	\$ 14,076.00
05 - Court House	TAIT-S	Tait TB9400 Base Stations Network	2	\$ 12,771.00	\$ 25,542.00
05 - Court House	ANT-SYS	LMR RF Antenna System	1	\$ 34,534.20	\$ 34,534.20
06 - Whitcom	TAIT-EM	Tait EnableMonitor	1	\$ 14,264.25	\$ 14,264.25
06 - Whitcom	MP2P-NE	Microwave & Network Equipment	1	\$ 20,347.53	\$ 20,347.53
06 - Whitcom	DC-POWER	DC Power Plant/Distribution	1	\$ 14,076.00	\$ 14,076.00
06 - Whitcom	ZET-MRG	Zetron Radio Gateways w/ DFSI	6	\$ 3,370.80	\$ 20,224.80

Equipment Total \$ 792,987.50

City of Moscow, ID

SERVICES PRICING

Category	Per Hour	Total Hours	Labor Cost	Expenses	Total
Project Management	1 LS		\$ 65,190.00	\$ -	\$ 65,190.00
Engineering	1 LS		\$ 65,140.00	\$ -	\$ 65,140.00
Documentation	1 LS		\$ 31,800.00	\$ -	\$ 31,800.00
Coverage Testing	1 LS		\$ 18,850.00	\$ -	\$ 18,850.00
Technician Optimization	1 LS		\$ 48,750.00	\$ -	\$ 48,750.00
Training	1 LS		\$ 12,720.00	\$ -	\$ 12,720.00
Warranty Services	1 LS		\$ 17,000.00	\$ -	\$ 17,000.00
Estimated Bonds	1 LS		\$ 18,500.00	\$ -	\$ 18,500.00
Tower Work	1 LS		\$ 39,230.00	\$ -	\$ 39,230.00

Services Total

\$ 317,180.00

For the System and Services outlined in the SOW the following milestones will be used:

- 15% payment upon signing of the contract.
- 15% upon completion of the Detail Design
- 10% upon completion of the Factory Staging Test
- 40% on the delivery and installation of the equipment
- 5% upon completion of System Acceptance Testing
- 10% upon completion of Coverage Verification Testing
- 5% Final Acceptance.

Exhibit 2 – Equipment List – Bill of Materials

City of Moscow, ID
BOM

Component Part Number	Description	Qty
037-579808-050	50m HYBRID CABLE, 16AWG POWER PAIRS, SINGLE-MODE LC DUPLEX FIBER	12
079-422679-001	SFP+ OPT 10Gbit 1310nm SMF LC 1.4km LR/LW -40 to 85C	24
086-523304-113	External Coupler Assy AOD RADIO , 10/11 GHz Equal 3 dB, V and H Pole	6
AND-VHLP3-11W-GTU	ANTENNA, 10/11 GHz, 0.9 M (3FT), VALULINE, DIRECT MOUNT,DISH (STD: WHITE),	6
NSM-ICE-SHIELD3	ICE SHIELD FOR 3 FT DISH (ICE-SHIELD3)	5
Shipping	Shipping	8
W41-11H1-DP2	WTM 4100, 11 GHz, T-R 490/500/520/530MHz,	6
WZF-40500	WTM 4000 Radio Throughput License 500 Mbps	12
WZF-AM2	WTM 4000 Adaptive Modulation License up to 4096 QAM	12
WZL-BASE	WTM4000 Base License, inc CLI & GUI, IPv4 or IPv6, VLANs, 10Mbps	12
WZL-CE1	WTM4000 CE1 License, inc QoS, QinQ, Routed NMS, Traffic scheduling, Spanning Tree	12
ANT-CH	Transmission Line, Connectors, Surge Protectors, etc.	1
ANT-COURT	Transmission Line, Connectors, Surge Protectors, etc.	1
ANT-KUID	Transmission Line, Connectors, Surge Protectors, etc.	1
ANT-MM	Transmission Line, Connectors, Surge Protectors, etc.	1
ANT-W10	Transmission Line, Connectors, Surge Protectors, etc.	1
C9300L-24P-4GE	CISCO C9300L 24-PORT WITH POE	5
C9300-NM-4G	Cisco Catalyst 9300 Series Network Module - expansion module - Gigabit SFP x 4	6
DS1F06P36U-M	VHF Omnidirectional Antenna 150-164 MHz 5.5 dB Gain	5
DS1F03P36U-M	VHF Omnidirectional Antenna 150-164 MHz 2.9 dB Gain	5
SPD3403B-1	VHF RF Distribution System 1-CH with Duplexer Site	1
SPD3403B-2	VHF RF Distribution System 2-CH Site	1
SPD3403B-5	VHF RF Distribution System 5-CH Site	3
8226	GPS Surge protector	4
8230	GPS/GNSS Outdoor Antenna supporting GPS L1, GLONASS L1, BeiDou B1, Galileo E1, and QZSS L1	4
2400-HS-D2	Hot Swappable 24/48 VDC Power Supply	4
2402-613	SecureSync 2400 Time & Frequency synchronization system with 2 expansion slots for option cards	4
405-4355-0	19x19 battery tray	6
591-1210-0	100AH front terminal battery	24
C2BP	Centurion II Blank Panel	66
CMDR-II+	Commander II+ Shelf	6
CMDR-X	Circuit Breakers	66
RM3048HE	CII and CII+ 48V Rectifier 3000W	18
MASV-NMR1H	Rack,Open,86 in(Xtra Dp) with support	6
MISC	Miscellaneous Installation Materials	6
SI-KUID	Site Improvements - KUID-TV	1
219-01561-00	Cable cord 2m USA/CAD IEC black	17
T01-01103-BAAA	TB9400 Reciter 136-174MHz	17
T01-01121-BBBA	TB94 Linear PA 136-174MHz 100Watts	17
TB9435S-100T	TB9400 Single 100Watts Chassis Assembly	17
TBA30A4-4100	TB9000 Power Management Unit ACDC48volts with Aux12volts	17
TBAS050	P25 Common Air Interface (CAI)	9
TBAS060	Digital Fixed Station Interface	5
TBAS061	Central Voter	10
TBAS062	Simulcast Enable	17
TBAS065	P25 Linear Simulcast Modulation (LSM)	9
TBAS071	IP Networking Satellite	7
TE1000-0201-0001-AAAA	EnableMonitor Server AC Professional 100 Network Devices 1 Year Maintenance	1
901-9725	MAX Digital Radio Gateway	3
930-0270	P25 DFSI Interface License	6

Exhibit 3 – Coverage Maps & Guaranty

RACOM guarantees coverage to meet or exceed the coverage indicated on RACOM-provided, City of Moscow approved computer-predicted coverage plots agreed upon during detail design. The follow maps provided the baseline for the maps to be reviewed and signed off as part of the detail design.

RACOM shall submit a detailed Coverage Acceptance Test Plan (CAT) for approval by the City of Moscow not more than fifteen (15) business days before the time of the tests and shall be approved no later than ten (10) business days before testing starts.

The mobile and portable coverage shall be based on a passing DAQ threshold of 3.4 and a BER of 2% for the P25 channels for those areas within the City of Moscow boundary as outlined in the RFP provided boundary file. Once all fixed radio equipment is installed and commissioned the test can be performed.

For the portable coverage testing, besides outdoors, coverage testing for the additional requested loss level for indoor residential, an additional 15dB of loss will be used as outlined in the SOW.

Coverage acceptance testing shall adhere to the latest revision of TIA TSB-88 and shall conclusively demonstrate that radio coverage is being achieved in accordance with the specifications required by this SOW.

Talk-out coverage performance tests will be used for all testing. A talk-out versus talk-in signal level analysis, including field verification, proving that the system is talk-out limited or talk-in/talk-out balanced will be done before testing begins.

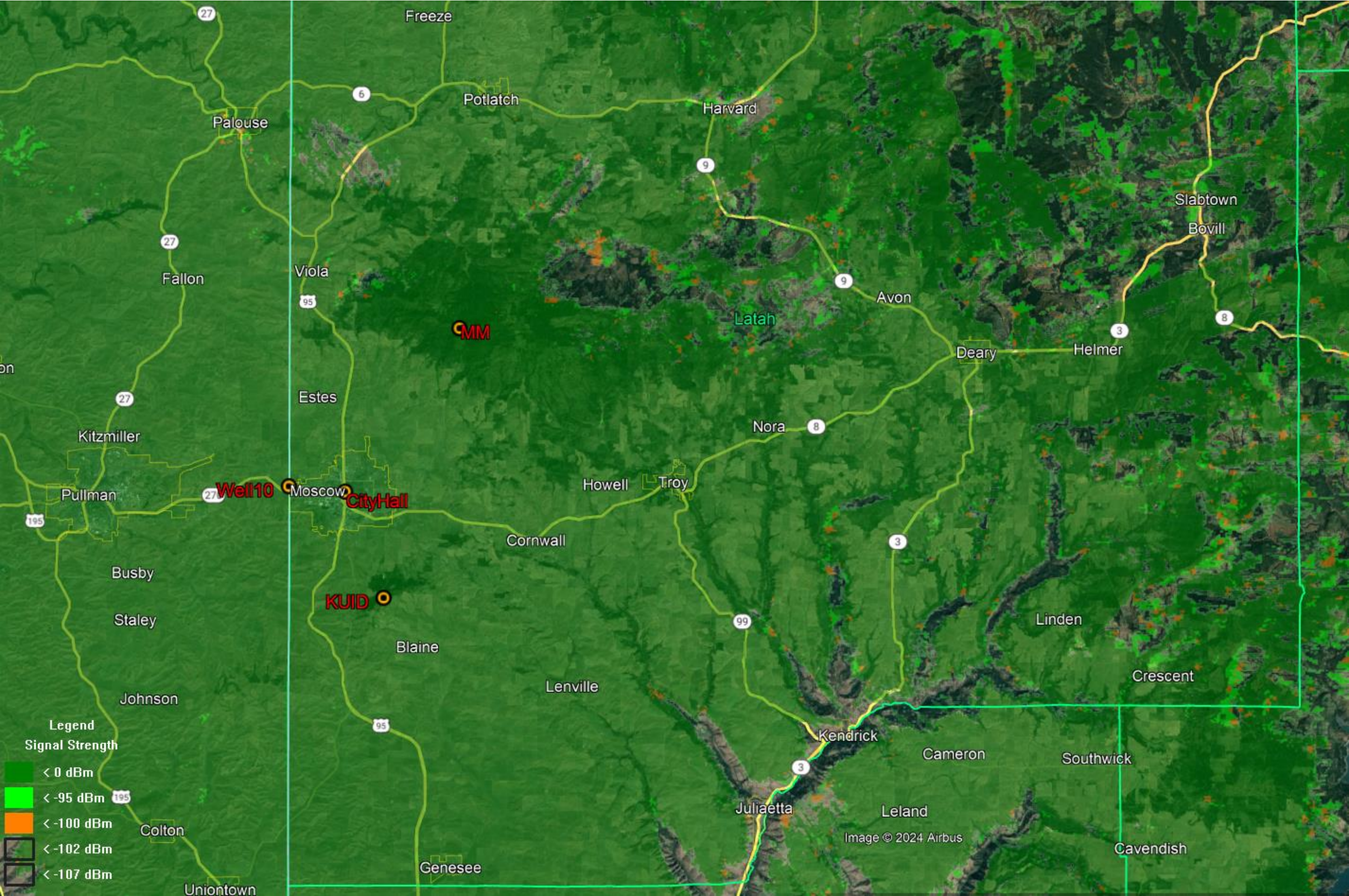
Three feet of spacing on the top of the vehicle between each of the receive antennas is recommended. Assuming a standard size SUV for testing, we are limited to testing only four different signals at once without so type of special antenna mounting setup.

RACOM will provide all equipment necessary to perform the coverage testing, including radios, power supplies, vehicles, and any other ancillary equipment. RACOM will verify proper calibration of all equipment used during the coverage testing as outlined in the CAT.

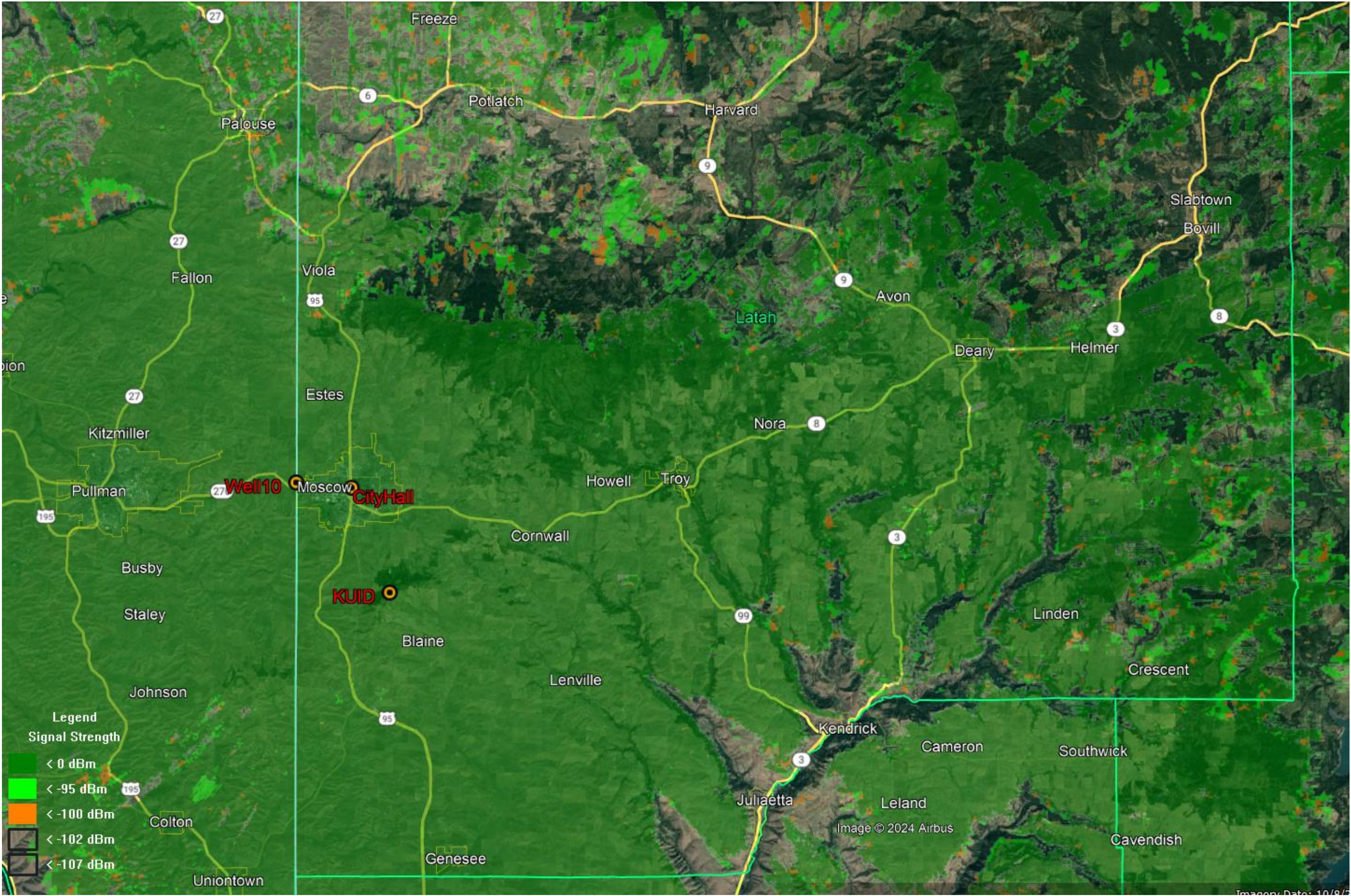
RACOM shall be responsible for the coverage guarantee provisions. If the coverage as depicted in the design review plots is not met, RACOM will undertake remedial actions at its expense. Remedies for coverage failure shall address the entire problem area(s) and not be limited to correcting a portion of the failed area. Remedies may not degrade areas of coverage that were previously accepted. A retest of coverage shall be conducted in any area (previously failed or not) potentially affected by the remedy to verify that the composite coverage is maintained.

All coverage test data and relevant records shall be provided to the City of Moscow in an electronic format readable with standard software (Word, Excel, Adobe Acrobat, or other - approved software).

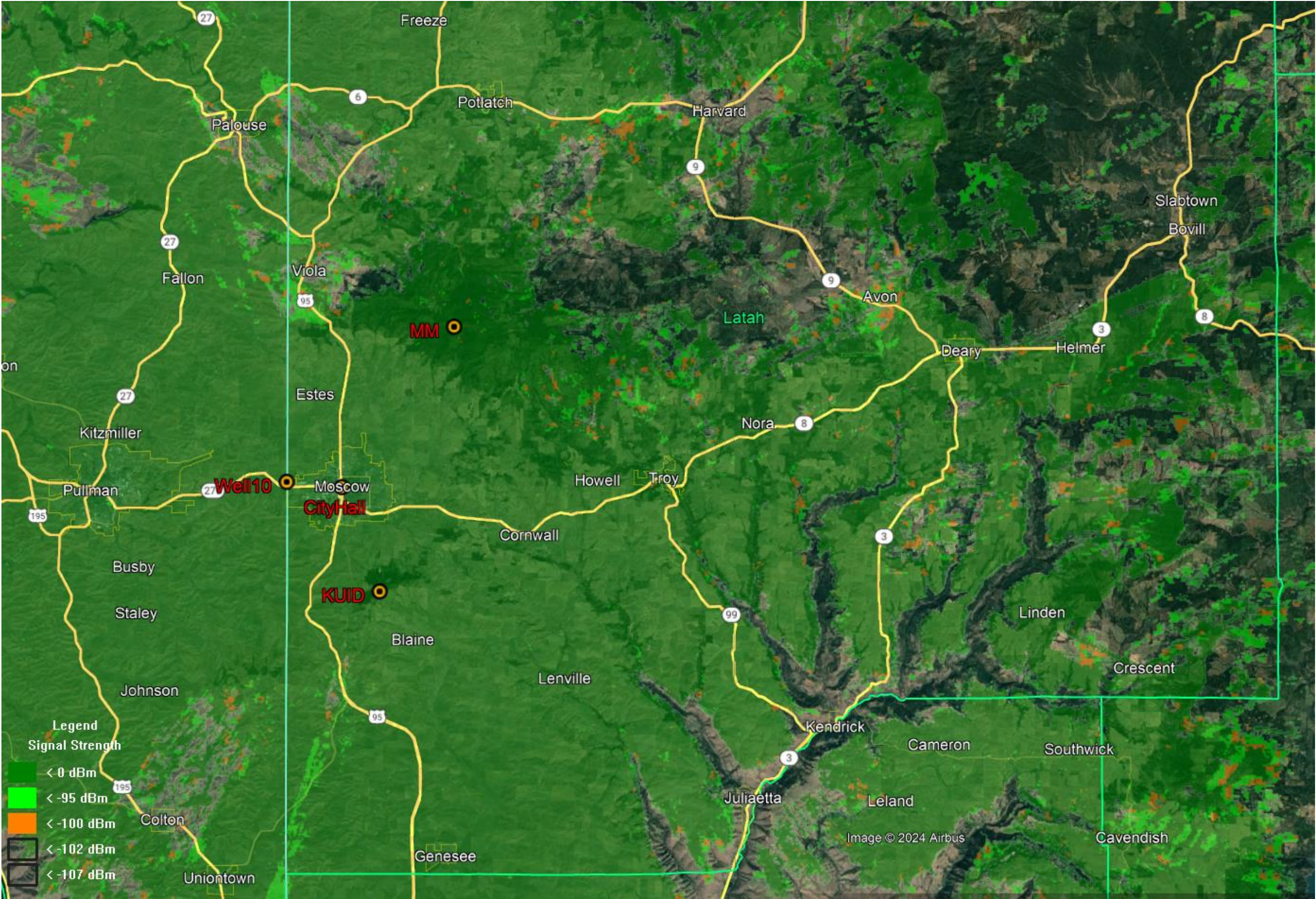
Mobile Talk Out (F1 & F2)



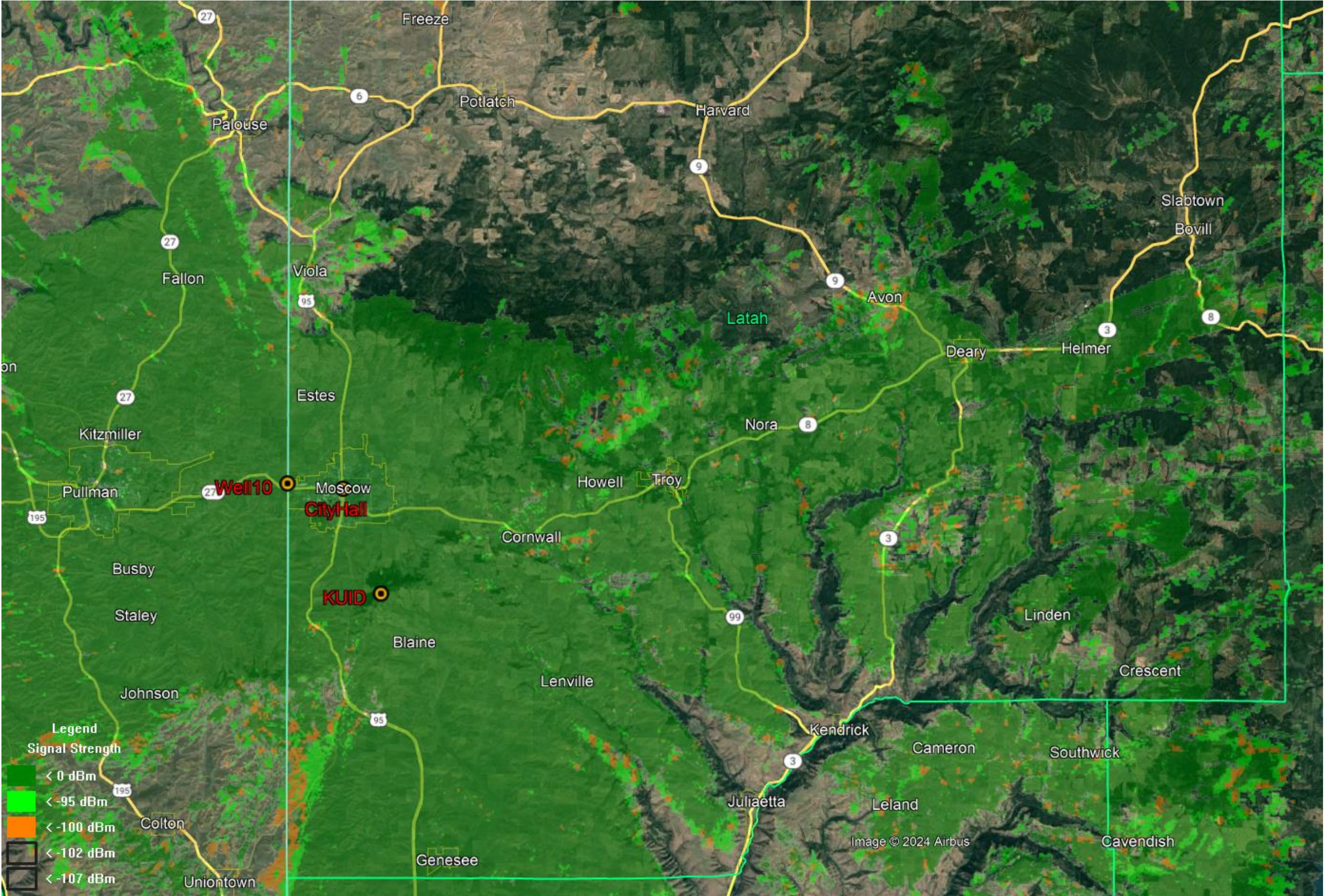
Mobile Talk Out (F3 F4 & F5)



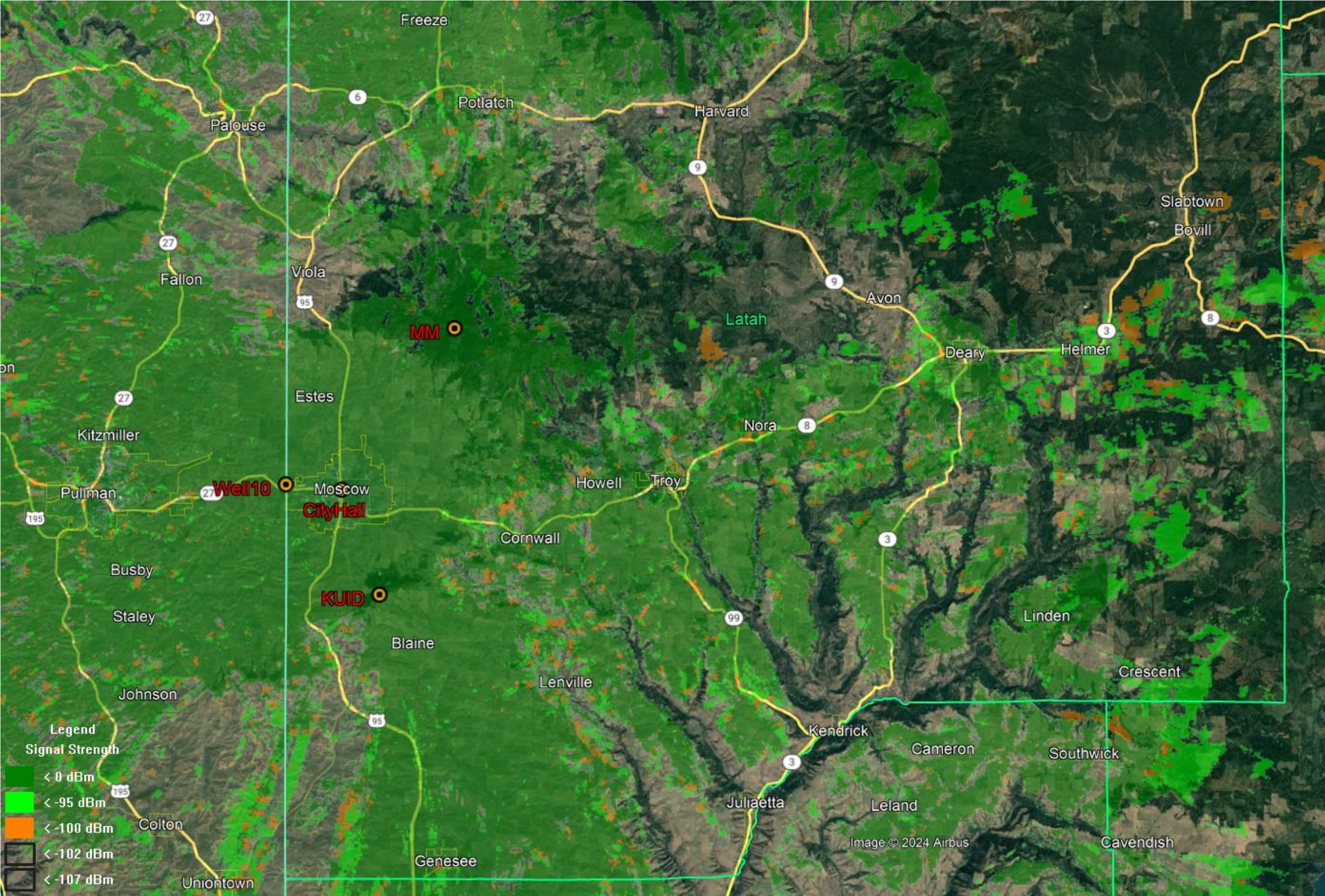
Portable (Street) Talk Out (F1 & F2)



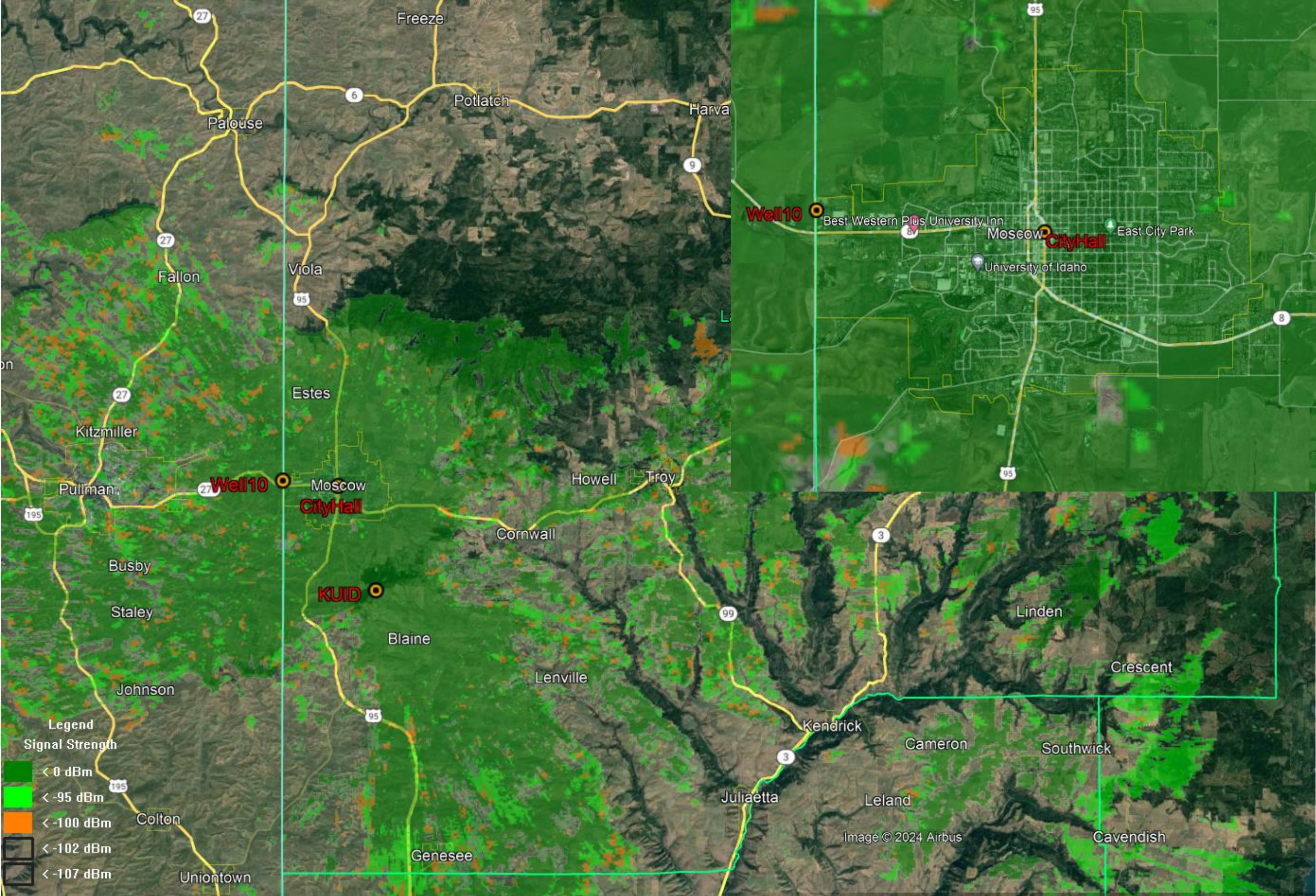
Portable (Street) Talk Out (F3 F4 & F5)



Portable (Indoors – 15dB) Talk Out (F1 & F2)



Portable (Indoors – 15dB) Talk Out (F3 F4 & F5)



Attachment 'D'

Thursday, November 2, 2023

ADDENDUM NO. 1

City of Moscow Project: **RADIO SYSTEM UPGRADE PROJECT**

Project No. **295-001**

The following changes, additions, clarifications, and/or deletions are hereby made a part of Moscow's project **RADIO SYSTEM UPGRADE PROJECT**, as fully and completely as if the same were entirely set forth in the Plans, Specifications, and Contract Documents. This addendum, as set forth herein, shall become an integral part of any contract entered into by and between the Owner and the Contractor.

1. DRAWINGS, SPECIFICATIONS, PROPOSAL, INVITATION TO BID:

Amend **BID OPENING DATE**.

Replace the current bid opening and due date of Tuesday, November 14th, 2023 with the bid opening and due date of Tuesday, January 9th, 2024 at 2:00 PM local time. This change is to be reflected on Page 1 – Invitation to Bid, and any and all other locations in the Drawings, Specifications, Proposal, and Invitation to Bid.

2.) DRAWINGS, SPECIFICATIONS, PROPOSAL, INVITATION TO BID:

Amend **CONTRACT TIME / SUBSTANTIAL COMPLETION / PERFORMANCE PERIOD**.

Replace the current Substantial Completion Date of Tuesday, December 31st, 2024 with the Substantial Completion Date of Friday, February 28th, 2025. This change is to be reflected in Article 3 of the Construction Agreement, IB-13 of the Instructions to Bidders, and any and all other locations in the Drawings, Specifications, Proposal, and Invitation to Bid.

SUBMITTED BY:

Receipt of **ADDENDUM NO. 1** must be acknowledged. This document must be signed and attached to the bid to acknowledge its receipt:

Firm Name of Bidder

Signature of Bidder

Title

Date

Tuesday, January 2, 2024

ADDENDUM NO. 2

City of Moscow Project: **RADIO SYSTEM UPGRADE PROJECT**

Project No. **295-001**

The following changes, additions, clarifications, and/or deletions are hereby made a part of Moscow's project **RADIO SYSTEM UPGRADE PROJECT**, as fully and completely as if the same were entirely set forth in the Plans, Specifications, and Contract Documents. This addendum, as set forth herein, shall become an integral part of any contract entered into by and between the Owner and the Contractor.

1. ADDENDUM NO. 1, DRAWINGS, SPECIFICATIONS, PROPOSAL, INVITATION TO BID:

Amend **BID OPENING DATE**.

Replace the current bid opening and due date of Tuesday, January 9th, 2024, last amended with Addendum No. 1, with the bid opening and due date of Tuesday, February 27th, 2024 at 2:00 PM local time.

2. DRAWINGS, SPECIFICATIONS, PROPOSAL, INVITATION TO BID:

Add Alternate to **BID SCHEDULE**.

In addition to Base Bid Total Price, include ADDITIVE/ALTERNATE PRICING for the 700/800 Mhz system as outlined herein, to fully include all provisions and components of SPECIFICATION SECTION 33 83 01 – LAND MOBILE RADIO SYSTEMS – 700/800 Mhz BID ALTERNATE, as well as Drawing #R039, Drawing #R040, and Drawing #R041.

SECTION 33 83 01 LAND MOBILE RADIO SYSTEMS – 700/800 MHz BID ALTERNATE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Contractor to provide and install voice radio systems, including all component parts reasonably incidental to providing a complete system.
2. The purpose of this Bid Alternate is to specify requirements and to obtain a separate cost proposal for the City of Moscow land mobile radio system with the VHF channels specified in Section 33 83 00 replaced with 700/800 MHz channels and analog operation replaced with P25 Phase 1 operation. All requirements specified in Section 33 83 00 and not related to the change in frequencies, combining systems and antennas shown in this Section are incorporated by reference into this Section, and still apply,
3. Land mobile radio systems are defined to include, but are not limited to the following components at the City of Moscow radio sites described in this Specification:

700/800 MHz P25 Phase 1 radio base stations
700/800 MHz P25 Phase 1 radio voting receivers
Receiver Voting Equipment
Site Controllers Required for Simulcast Operation and for Receiver Voting
Transmitter Combiners
Receiver Multicouplers
Monitoring and Alarm Systems
Ethernet switches
Equipment Racks
GPS Oscillators
Transmission Lines and Antennas
Surge Arrestors

B. Related Sections

1. Division 01 Sections.
2. Section 26 20 00 – DC Power and Alarm Systems
3. Section 33 83 40 Microwave Radio System
4. Section 16050 - Basic Electrical Materials and Methods
5. Section 16075 – Electrical Identification
6. Section 33 83 00 – Land Mobile Radio Systems

1.2 REFERENCES

A. ANSI/NFPA

1. ANSI/NFPA 70 - National Electrical Code

B. Federal Communications Commission:

1. 47 CFR 1.1310 – Radiofrequency Radiation Exposure Limits

RADIO SYSTTEM UPGRADE
CITY OF MOSCOW, IDAHO

700/800 MHz BID ALTERNATE
[33 83 01] - 1

1.3 SYSTEM DESCRIPTION

A. SYSTEM OVERVIEW

This Specification contains the requirements for the procurement, installation, configuration, and testing of new 700/800 MHz base station radio equipment that will make up a new 700/800 MHz P25 Phase 1 simulcast radio system with three base station repeater sites. The system will consist of a single 3-Site simulcast system, and a voting receiver system incorporating all of the receivers in the simulcast system.

The Contractor's responsibility shall be to provide and install, configure, test, and document the radio systems at the new and existing sites described in this specification.

Radio system equipment including 700/800 MHz P25 Phase 1 base station radios, site controllers, transmitter combiners and receiver multicouplers, monitoring and alarm units for the 700/800 MHz and microwave radios, Ethernet switches, GPS oscillators, transmission lines and antennas, surge arrestors and other equipment required to provide a complete and functional simulcast system with receiver voting will be provided and installed by the contractor, as described below.

All cabling and other ancillary equipment required to interconnect these items of equipment into fully functional systems shall be provided and installed by the contractor.

Microwave radio equipment and backup DC Power systems will also be installed under this contract, as described in Section 33 83 40 and Section 26 20 00. The microwave radio links from the Well 10 site to the two voting receiver sites at Residence Water Tower and Rotary Park Water Tower and the fiber link to the Vista Water Tank will not be implemented under this 700/800 MHz alternative, since these voting receiver sites will not be part of the 700/800 MHz radio system.

Section 33 83 00 contains the original requirements for a VHF analog simulcast radio system. Because VHF analog base stations are available from various vendors, and because some radios require -48 VDC power and some radios require 12 VDC (nominal 13.6 VDC) power, these specifications and the attached Contract Drawings show typical equipment configurations and equipment rack layouts for both -48 VDC equipment and for 12 VDC equipment. Proposers may specify a system configuration with either power supply alternative, provided that all of the radio equipment (excluding the transmitter combiner and receiver multicoupler equipment), microwave or fiber interconnect equipment and backup DC power equipment fits into a single EIA 19" equipment rack (because of equipment space limitations at some of the repeater sites). The configuration of equipment shown in the Contract Drawings is typical, and Proposers may provide a different configuration of equipment as long as it meets the space requirement described above. The same space constraints exist for the 700/800 MHz P25 Phase 1 system described in these specifications, and the proposed base station equipment and associated equipment described above must fit in the rack configurations show for the VHF system in the Contract Drawings associated with Section 33 83 00.

Existing City of Moscow Radio System

See Section 33 83 00 for a description of the existing City of Moscow radio system.

Proposed New City of Moscow Radio System

The channel names that will be used in the new 700/800 MHz P25 Phase 2 system are shown below in Table 1. Frequencies for the 700/800 MHz system will be obtained through the Region 12 Regional Planning Committee application and approval process, and licensed with the FCC based on Region 12 approval. The City of Moscow is proceeding with the Region 12 approval process for these channels and will file the FCC license applications for these channels once they are approved. The channels listed below should be considered provisional until they are approved by the Region 12 700 MHz Regional Planning Committee.

The City of Moscow Public Works Channel will operate on a separate VHF channel and will have its base station facilities replaced as part of the radio system upgrade project, as shown in Table 2 below. The equipment required to upgrade the Public Works facilities at the Latah County is described in Section 33 83 00.

City of Moscow 700 MHz Simulcast TX Channels	
769.29375	MFD Main Dispatch Channel - TX
769.56875	MFD TAC Channel #1 - TX
770.55625	MPD Main Dispatch Channel - TX
771.28125	Shared TAC Channel #1 - TX
771.45625	Shared TAC Channel #2 - TX
City of Moscow 700 MHz Simulcast RX Channels	
799.10625	MFD Main Dispatch Channel - RX
799.29375	MFD TAC Channel #1 - RX
800.55625	MPD Main Dispatch Channel - RX
801.28125	Shared TAC Channel #1 - RX (Well 10 and Courthouse Sites Only)
801.45625	Shared TAC Channel #2

Table 1 – 700 MHz Frequencies and New System Channel Names

The configuration and locations of the sites that make up the new City of Moscow 700/800 MHz simulcast radio system are shown below in Table 2. The overall system consists of a simulcast system made up of the Moscow Mountain, KUID-TV and Well 10 repeater sites, and a voting receiver system made up the base station repeater receivers at those three sites.

The Moscow Mountain, KUID-TV and Well 10 simulcast system has five channels: the MFD main dispatch channel, the MFD TAC channel, the MPD main dispatch channel, and the two shared TAC channels, as shown above in Table 1.

The VHF Public Works repeater in the Courthouse will remain a stand-alone repeater with no connection to dispatch or to the simulcast system or the interconnect system. The requirements for upgrade of the Public Works repeater at the Courthouse site are shown in Section 33 83 00.

Site	Geographical Coordinates	Elevation (Feet AMSL)	Shelter Type	Antenna Support Structure
<i>700/800 MHz Simulcast System (TX Frequencies: TBD)</i>				
Moscow Mountain	46-44-14.6 N 116-59-44.6 W	4485	Existing Shelter	Existing Lattice Tower
KUID-TV	46-40-54.0 N 116-58-17.0 W	3567	Existing Shelter	Existing Lattice Tower
Well 10	46-44-06.7 N 117-02-22.9 W	2625	Existing Well House Building	New Monopole
<i>Public Works Repeater (TX Frequency: 153.9800 MHz) Stand-Alone Repeater</i>				
Latah County Courthouse	46-43-50.3 N 116-59-48.6 W	2648	Courthouse Building	Existing Guyed Tower

Table 2 – Configuration and Location of City of Moscow Repeater Sites

The antennas used at each site, along with antenna elevations above ground, nominal transmitter output power and Effective Radiated Power for each channel at each repeater site are shown below in Table 3. Cut sheets for the antennas shown in Table 3 are shown in Appendix 1A of Section 33 83 01.

Antenna Requirements, Antenna Height, ERP and Delay Offset Parameters for City of Moscow 700/800 MHz Simulcast System							
Repeater Site	TX Antenna	Azimuth (* True)	Simulcast System ERP (Watts)	TX/RX Antenna Elevation (Meters AGL)	TX/RX Antenna Elevation (Meters AMSL)	TX Antenna AHAAT (Meters)	Delay Offset (µSec)
Moscow Mountain	TX Antenna - OMNI - 6.5 dBd [Sinclair SC466HF1LDF (D03-PIP) - 3" Downtilt]	N/A	150.0	16.8	1294	402	0.0
	RX Antenna - OMNI - 6.5 dBd [Sinclair SC466HF1LDF (D03-PIP) - 3" Downtilt]	N/A	N/A	36.6	1314	N/A	N/A
Well 10	TX Antenna - OMNI - 6.5 dBd [Sinclair SC466HF1LDF (D00-PIP) - 0" Downtilt]	N/A	100.0	16.8	804	-50	0.0
	RX Antenna - OMNI - 6.5 dBd [Sinclair SC476HF1LDF (D00-PIP) - 0" Downtilt]	N/A	N/A	24.4	812	N/A	N/A
KUID-TV (Paradise Ridge)	TX Antenna - OMNI - 6.5 dBd [Sinclair SC466HF1LDF (D02-PIP) - 2" Downtilt]	N/A	50.0	16.8	1113	264	7.0
	RX Antenna - OMNI - 6.5 dBd [Sinclair SC466HF1LDF (D02-PIP) - 2" Downtilt]	N/A	N/A	57	1153	N/A	N/A

Figure 3 – Frequencies, Antennas, and Effective Radiated Power by Site – 700/800 MHz Repeater Sites

The geographical coordinates of each of the simulcast repeater sites and the Whitcom site are shown below in Table 4.

Site name	Latitude	Longitude
KUID-TV (Paradise Ridge)	46 40 54.00 N	116 58 17.00 W
Moscow Mountain	46 48 40.95 N	116 55 02.94 W
Well10	46 44 06.70 N	117 02 21.70 W
Whitcom	46 45 05.96 N	117 10 03.00 W

Table 4 – Site Geographical Coordinates

- B. The subsystems and system components to be provided installed, configured, and tested as described in this Specification include:
1. 700/800 MHz P25 Phase 1 base station radios, consisting of the following equipment:
 - a.) 700/800 MHz P25 Phase 1 base station radios, configured as repeaters and programmed for operation on the frequencies and with the nominal transmit power output levels listed in Table 2 above, as follows:
 - b.) Moscow Mountain Site – 5 base station repeaters
 - c.) KUID-TV Site – 5 base station repeaters
 - d.) Well 10 Site – 5 base station repeaters
 - e.) Courthouse Site – Provide and install new Public Work VHF analog repeater as described in Section 33 83 00.
 - f.) General product specifications for the base station repeaters are shown below in Section 2.1.B
 - g.) Install the base station repeaters in the radio equipment rack at each site, as shown in the Contract Drawings.
 2. Provide and install transmitter combining equipment at the three simulcast repeater sites, consisting of the following equipment:
 - a.) dB Spectra DSCC-75-05N transmitter (or approved equivalent).
 - b.) Detailed specifications for these units are shown below in Section 2.1.G.
 - c.) The contractor shall be responsible for cables from the combining system to the surge arrestors at each site and from the radio equipment to the combiner input ports and from the combiner antenna output port to the surge arrestor at the building entry port.
 - d.) Install the combining systems and the duplexer in EIA 19" racks (either racks included with combining systems or a new rack for the duplexer), as shown in the Contract Drawings.
 3. Provide and install transmitter combining and receiver multicoupling equipment at the three simulcast repeater sites, consisting of the following equipment:
 - a.) dB Spectra DS7TMD-17 Tower Top Amplifier (or approved equivalent)
 - b.) dB Spectra DSX7P05-DT Receiver Multicoupler (or approved equivalent)
 - c.) Detailed specifications for these units are shown below in Section 2.1.H and 2.1.I.

- d.) The contractor shall be responsible for cables from the multicoupler system to the surge arrestors at each site and from the radio equipment to the multicoupler output ports.
 - e.) Install the combining systems and the duplexer in EIA 19" racks (either racks included with combining systems or a new rack for the duplexer), as shown in the Contract Drawings.
4. Courthouse Site – VHF Coaxial Switch
- See Section 33 83 00 for VHF coaxial switch requirements for Public Works VHF repeater VHF Switch and Power Combiner.
5. Provide and install GPS master oscillator equipment consisting of the following items at the three simulcast sites (Moscow Mountain, KUID-TV, and Well 10).
- 1. GPS Master Oscillator
 - a.) Orolia SecureSync 1200-433 Master Oscillator (or approved equivalent) – Quantity – 1 per site
 - b.) Orolia Spectacom 8230AJ GPS Antenna (or approved equivalent) – 1 per site
 - c.) Orolia Spectacom 8226 Antenna Line Surge Suppressor (or approved equivalent) – 1 per site
 - d.) Orolia Spectacom 1204-1C 10 MHz Frequency Output Option Module Card with 3 outputs per card (or approved equivalent). Quantities: 2 at Moscow Mountain site, Well 10 and KUID-TV sites
 - e.) Install GPS antennas as shown in the Contract Drawings.
 - f.) Provide and install 1/2" coaxial cables terminated in Type N male connectors (LMR-400 or approved equivalent) between each GPS oscillator and its associated GPS antenna.
 - g.) Detailed specifications for these GPS oscillators and associated components are shown in Section 2.1.E below.
6. Provide and install new 16-port Ethernet switches (Cisco CBS250-16P-2P Stackable Managed Switch or approved equivalent) at the simulcast repeater sites, and at the Whitcom site, as shown in the Contract Drawings. (These switches are specified because they are the same switches used in the City of Moscow IP network, so the City has an inventory of spares and City IT personnel are familiar with these units.)
- a.) Connect the AC power cord for each Ethernet switch to an outlet on the -48 VDC to 120 VAC inverter at each site. (See Section 26 20 00 – DC Power and Alarm Systems for detailed specifications for the DC-AC inverters.)

- b.) Detailed specifications for these Ethernet switches are shown in Section 2.1.F below.
7. Provide and install new 19" EIA equipment racks at the following sites, as shown in the Contract drawings. Racks shall be EIA 19 inch 2-post racks [Cooper B-Line SB506084XUYZ (or approved equivalent)] with zinc chromate finish and universal panel hole pattern, rated for Seismic Design Category B (minimum) with a 900 pound load.
- a.) Moscow Mountain – 2 racks
 - b.) KUID-TV – 2 racks
 - c.) Well 10 – 2 racks
 - d.) Whitcom – 1 rack
 - e.) XU in the model number shown above indicates a universal hole pattern for the panel mounting holes; YZ in the model number shown above indicates a zinc chromate finish; Confirm with Cooper B-Line that the part number shown above is the correct part number for a 7-foot 19" rack with zinc chromate finish and universal hole pattern.
 - f.) Install racks following manufacturer's installation instructions, anchor racks to floor and as shown in the drawings.
 - g.) Provide a "Framework Ground Conductor System" for the equipment racks consisting of framework ground conductors that connect from the framework ground in each equipment rack directly to the Master Ground Bar ("MGB"). Implement Framework Ground System in a "tree" form. The "trunk" of the framework ground conductor starts at the Master Ground Bar and is run over the racks with a tap conductor connecting to each rack. Tap conductors are connected to the main conductor using irreversible compression "C-clip" taps. Use 1/0 AWG wire for the main conductor. Main conductor may be either bare or green jacketed (THHN) stranded copper wire. Tap conductors from each rack to the framework ground feeder are green jacketed (RHW or THHN) 6 AWG wires terminated with two-hole irreversible compression lugs.
 - h.) Bond main ground conductor runs to cable tray at 3-foot intervals, as shown in the Contract Drawings.
 - i.) Details of the locations and mounting details for the racks are shown in the Contract Drawings.
 - j.) Detailed specifications for these equipment racks are shown in Section 2.1.H below.
8. Provide and install site/channel controllers to provide simulcast system timing and receiver voting at the following sites. (These controllers are not required if simulcast timing control and receiver voting functionality is incorporated into the base station equipment provided in response to these Specifications.)

- a.) Moscow Mountain Simulcast Site
 - b.) KUID-TV Simulcast Site
 - c.) Well 10 Simulcast Site
 - d.) Detailed specifications for the site controllers are not included in these Specifications, since the specifications for this equipment is specific to the vendor supplying the base station radio equipment.
 - e.) Install the site controllers (if required) as shown in the Contract Drawings.
9. Provide and Install transmission lines, transmission line jumpers, transmission line entry ports, surge arrestor frames and ground bars at the three simulcast repeater sites as shown below.
- a.) All connectors on all fixed station cables and omnidirectional antennas must be Type N or 7/16 DIN, constant impedance type connectors.
 - b.) All exposed antenna hardware must be S31600 stainless steel, brass, or C65100 low silicon bronze. Hot dip zinc galvanized steel meeting ASTM A-123, A-153, A-385 and B-695 may be used for mounting brackets.
 - c.) Transmission lines shall be CommScope AVA5P-50-C (or approved equivalent) 7/8" foam dielectric solid outer conductor coaxial cable Determine the correct transmission line lengths for each antenna. Transmission lines shall be one continuous length; splices are not allowed. All transmission lines shall be terminated at the antenna end with a Type N female connector, CommScope 78EZNF (or approved equivalent) for 7/8" transmission line, and at the surge arrestor end with a Type N male Connector, CommScope 78EZNM (or approved equivalent) for 7/8" transmission line.
 - d.) All connections between antennas and jumpers shall be weatherproofed using the cold-shrink weatherproofing kit recommended by the manufacturer, CommScope 221213 (or approved equivalent) for 1/2" and 7/8" transmission line to antenna or equipment connections].
 - e.) GPS Antenna Transmission Lines - for transmission lines to the GPS antennas, use CommScope LDF4-50A 1/2" (or approved equivalent) foam dielectric coaxial cable with Type N male connectors (or appropriate connector for existing GPS antenna and surge arrestor). All connections between antennas and jumpers shall be weatherproofed using the cold-shrink weatherproofing kit recommended by the manufacturer, CommScope 221213 (or approved equivalent) for 1/2" transmission line to antenna connections].
 - f.) Connections between the antenna end of each transmission line and the antenna connector shall be made using CommScope F4A-NMNM (or approved equivalent) or F4ANMDM (or approved equivalent) foam dielectric superflexible jumpers terminated with Type N connectors male connectors or 7/16" DIN connectors (as appropriate for each antenna).

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- g.) Transmission Line Connectors – Transmission line connectors shall be CommScope or approved equivalent Type N connectors designed specifically to fit the cable on which the connector is installed. Connections between line sections, antennas, and jumpers shall be weatherproofed using the weatherproofing kit recommended by the manufacturer. All transmission lines shall be terminated at the antenna end with a Type N female connector, CommScope 78EZNF (or approved equivalent) for 7/8" transmission line, and at the surge arrestor end with a Type N male Connector, CommScope 78EZNM (or approved equivalent) for 7/8" transmission line. All connections between line sections and jumpers shall be weatherproofed using the weatherproofing kit recommended by the manufacturer, CommScope 221213 (or approved equivalent) for 7/8" transmission line to 1/2" jumper connections.
- h.) All connectors shall be manufactured by the same manufacturer as the transmission line. All connectors shall be installed utilizing the manufacturer's recommended tooling following manufacturer's instructions.
- i.) The use of any adapters and/or splices is prohibited, with the exception of SMA to Type N adapters or cables required to connect base station radios with SMA connectors to transmitter combiner, receiver multicoupler or duplexer ports with Type N connectors.
- j.) Grounding Kits – Provide and install transmission line grounding kits recommended by the manufacturer to bond each transmission line and waveguide to the tower ground tab at the antenna end, to the ground bar at the base of the tower, and to the ground bar on the outside of the building at the transmission line entry port. Use CommScope CSG78-12B2U (or approved equivalent) universal Grounding Kit (with 45" ground lead and two-hole lugs) for 7/8" transmission line runs. Use CommScope CSG12-06B1A (or approved equivalent) universal Grounding Kit (with 45" ground lead and two-hole lugs) for 1/2" transmission line runs.

Choose ground lead length to be appropriate for the installation situation using the shortest practical route. Ground lead cable bends shall be sweeping and have a bend radius of no less than 8 inches. Bends shall not form an included angle of less than 90 degrees. Install kit following manufacturer's instructions. Weatherproof connections between grounding kit and transmission line using the weatherproofing materials provided with the grounding kit.

Connect ground lead at tower base ground bar and building ground bars with 2 each 5/16"x18 x1" bolt with flat washer between bolt and lug and flat washer, split lock washer and nut behind ground bar or ground plate near antenna. Hardware to be C65100 Low-Silicon Bronze. Use conductive grease between lug and ground bar or ground plate.

- k.) All transmission lines must be secured with the transmission line manufacturer's recommended stainless-steel hardware, with appropriate tower mounting hardware, and supported by transmission line bridges that will be supplied as part of this procurement. Hangers used to support transmission line on transmission line bridge, transmission line ladder, and other locations where support members with mounting holes are used shall attach to support members with a bolt installed through the

mounting hole and a lock washer and nut on the back side of the support member. "Snap-in" hangers are not permitted.

- l.) Detailed specifications for the transmission lines and associated equipment shown above are shown in Section 2.1.I through 2.1.P below.
- m.) Provide and install Site Pro E1449 transmission 6-port (2 X 3) 4" transmission line entry panels (or approved equivalent) with Site Pro BA121M boot kit (or approved equivalent) for the transmission lines, as described in Section 2.15.S below, and as shown in the Contract Drawings. Install panels at the following sites:
 - 1.) Well 10
 - 2.) KUID-TV
 - 3.) Detailed specifications for these entry ports are shown in Section 2.1.Q below
- n.) Entry Port Grounding Assembly - Moscow Mountain, KUID-TV and Well 10 simulcast repeater sites,

Provide and install an CommScope AT-K306-U (or approved equivalent) grounding bar trapeze assembly to mount surge suppressors immediately inside building entry port, as shown in the drawings. Mount grounding bar trapeze assembly to both the ceiling and the wall of the building, as shown in the drawings, to assure structural stability. Connect ground bar assembly to Master Ground Bar ("MGB") using 2 AWG tinned solid copper wire with irreversible compression 2-hole lugs, as shown in drawings. Attach lugs to MGB using 2 each 3/8"x 18 x 1" bolt with flat washer between bolt and lug and flat washer, split lock washer and nut behind ground bar. Hardware to be C65100 Low-Silicon Bronze. Connect exterior ground bar to building buried ground ring using 3" wide 0.032" thick copper strap, as shown in drawings. Attach to-hole lugs from transmission line ground kits to external ground bar, using 2 each 3/8"x 18 x 1" bolt with flat washer between bolt and lug and flat washer, split lock washer and nut behind ground bar. Use conductive grease between ground kit mounting hardware and external ground bar.

Detailed Specifications for the Surge Arrestor Trapeze are shown below in Section 2.1.T below.

- o.) Surge Suppressors –Provide and install surge suppressors (Polyphaser IS-B50HN-C2 or approved equivalent) on incoming transmission lines. Mount surge suppressors directly to AT-K306-U grounding bar assembly at the Moscow Mountain, KUID-TV and Well 10 simulcast repeater sites using integral surge side Type N Connectors and appropriate lock washers and nuts and integral bulkhead flange plate with #10 stainless steel hardware.

Detailed specifications for these surge suppressors are shown below in Section 2.1.U and 2.1.V below.

- p.) Cable Ladders –Provide and install cable ladders (B-Line SB17U12BYZ or approved equivalent) at the KUID-TV site, as shown in the drawings.

Detailed specifications for these cable ladders are shown below in Section 2.1.W below.

- q.) Assume that antennas are mounted to minimize, as much as possible, the pattern distortion effects caused by close proximity to tower members, transmission lines, other antennas, and other metallic objects located near the antenna. Antenna mounting structures and devices shall be mechanically compatible with the antenna support structures at each site, and shall be adequate to support each antenna on the tower or other antenna support structure.
 - r.) Antennas shall meet or exceed the requirements of ANSI/EIA/TIA-329-C. Antenna bandwidths shall allow an antenna to be used for receive or transmit for each transmit/receive frequency pair (or frequency pairs in the case of combined antennas). Pattern tilt (other than electrical beam tilt if applicable) across this band shall be minimized to the degree that this is possible.
 - s.) Transmission lines shall have their outer conductors bonded to the tower at the antenna end, as close to the antenna as possible, to the ground bars at the base of the tower and at the building entry port, using the manufacturer's recommended grounding kit. Grounding kit wires used to connect transmission line and waveguide ground kits to tower ground lugs or ground bars shall be continuous lengths of wire supplied by the manufacturer as part of the ground kit. Splices in ground kit wires are not permitted.
10. Provide and install transmit and receive antennas at all simulcast repeater sites. Any substitutions with antennas equivalent to the model numbers shown in Table 3 must be approved by the City.
- a.) Mount antennas on towers or monopoles, as shown in the Contract Drawings.
 - b.) At the Courthouse site, replace the existing VHF duplex antenna mounted on the rooftop guyed tower with the new antenna shown in Table 3 of Section 33 83 00.

C. Network Interconnect Configuration and Documentation

- 1) Coordinate with City IT personnel to assign IP address to the base station repeaters, voting receivers, microwave radios and site controllers (if site controllers are required) at each site. Connect base station repeaters and voting receivers to the IP backbone interconnect system via the Ethernet switches at each site. Coordinate with City IT personnel to connect to the City fiber backbone at the Well 10 simulcast repeater site, the City Hall simulcast repeater site, and the Vista voting receiver site.

D. Simulcast System Alignment

- 2) Adjust the launch time for each new simulcast repeater site to minimize audio distortion in the non-capture overlap zones among the new sites making up the two simulcast sub-systems, using the initial delay settings shown in Table 3, which have been determined via modeling of the simulcast delay spread and simulcast system performance in the system coverage area within and around the City of Moscow.

- 3) Provide written results of the simulcast system optimization showing final system simulcast settings to the City.

E. Voting Receiver Configuration

- 1) Configure voting receivers to select the best received signal among all the receive sites in the system, as follows:
 - a.) Moscow Mountain Simulcast Repeater Site
 - b.) KUID-TV Simulcast Repeater Site
 - c.) Well 10 Simulcast Repeater Site

F. Fire Alerting System

Use the existing primary VHF Fire Dispatch repeater at Moscow Mountain, which operates on 153.8000 MHz TX/155.8875 MHz RX, to transmit tones for the existing Fire Alerting System. Cross-connect the audio for these tones so that they are simultaneously transmitted over the 700/800 MHz Fire Dispatch Channel and the existing VHF Fire Dispatch repeater simultaneously.

G. Mobile and Portable Radio Configuration

Program all City of Moscow portable mobile radios to operate on the new 700/800 MHz simulcast system frequencies. Coordinate with the City to produce a template that includes new frequencies, CTCSS tones and Channel Names for the radio programming. Program radios to allow for a smooth cutover from the existing radio system to the new radio system.

H. Coordination with Whitcom Dispatch Center

Coordinate with the City and with the Whitcom Dispatch Center to incorporate the radio channels in the new 700/800 MHz simulcast system into the dispatch consoles at Whitcom and to provide appropriate interconnections between the new system and the dispatch consoles at Whitcom.

I. Network Management System

Provide, install, and configure a new network management system to provide status, alarms and monitoring of the radios and associated equipment in the radio system. City will provide a server for the Network Management System software. Coordinate with City to implement the Network Management System.

J. Cutover Plan

30 days prior to the beginning of any installation work provide a complete cutover plan, arranged by site, to the City. The cutover plan shall describe how the systems described below will be installed, configured, and tested, and how cutover from the existing configuration of systems at the existing sites to the new system configuration and new sites will be accomplished. Submit the cutover plan for approval by the City.

1.4 PERFORMANCE REQUIREMENTS

- A. Conform to all applicable code for manufacture and installation of land mobile radio systems and associated equipment and materials.
- B. Install and configure land mobile radio systems in accordance with good engineering practices.
- C. All proposed equipment shall be supported by the vendor for a minimum of seven years after product discontinuation. If necessary parts are not available before the end of the seven years, a replacement will be provided at no additional cost to the City of Moscow which meets the contractual requirements and is compatible with the system. All applicable product discontinuations shall be promptly reported to the City of Moscow. This includes the equipment manufactured by the radio vendor as well as any third-party equipment provided by the radio vendor.

1.5 WARRANTY

- A. The Vendor shall include warranty support for the first year, beginning at Final Acceptance or Beneficial Use, whichever comes first.
- B. Warranty shall include the following services:
 - 1. Depot Advanced Repair: The replacement part is to be shipped overnight to the field before the broken part is shipped to Depot Repair.
 - 2. Technical Support: 24 x 7 phone support.
- C. At the end of the warranty period, one Preventative Maintenance (PM) shall be performed by the Vendor, and all equipment shall be brought to the latest software revision.

1.6 POST-WARRANTY SUPPORT REQUIREMENTS

- A. All technical service bulletins shall be sent to the City of Moscow via email or another approved method.
- B. All software revisions shall be provided at no cost to the City of Moscow.
- C. Any known major defect with the products supplied by the Vendor shall be corrected at no cost. A major defect is defined as a defect degrading the performance of the product below its published specifications or causing outages.
- D. Proposer shall offer post-warranty services matching 1.5.B.

1.7 TRAINING

- A. The Proposer shall describe the available training related to this system.

1.8 PRICING SHEETS

- A. Pricing sheets shall be formatted as below. Line-item pricing for both the equipment at the line-item level and services pricing broken out into the categories below shall be presented. Proposals with any pricing rolled up into larger categories shall be considered non-compliant and rejected.

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- B. Reference any contractual agreements being used for discounts. Pricing incentives may also be utilized. Pricing shall be valid for one year after system acceptance.

C. Equipment Pricing

SITE	MODEL NUMBER	DESCRIPTION	QTY	LIST PRICE	DISCOUNT %	CONTRACT PRICE	EXTENDED CONTRACT PRICE
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D. Services Pricing

CATEGORY	PER HOUR	TOTAL HOURS	LABOR COST	EXPENSES	TOTAL
PROJECT MANAGEMENT					
ENGINEERING					
DOCUMENTATION					
COVERAGE TESTING					
TECHNICIAN OPTIMIZATION					
TRAINING					
WARRANTY SERVICES					
OTHER (DESCRIBE)					

POST WARRANTY SERVICE	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9	YR 10
TECHNICAL SUPPORT									
DEPOT REPAIR									
OTHER (DESCRIBE)									

1.9 SUBMITTALS

- A. Submittal Drawings: Submit shop drawings showing details and location of Radio System equipment (700/800 MHz base station repeater radios, transmitter combiners and receiver multicouplers, GPS oscillators, DC power systems and associated equipment) at each site. Provide rack elevation drawings for each site. Provide schematic line drawings showing configuration of radio equipment, network equipment, DC power equipment, microwave radio equipment and related equipment provided under this specification. Submit elevation drawings showing antenna mounting locations for land mobile and microwave antennas (see Section 33 83 40 Microwave Radio System for microwave antenna requirements).
- B. Manufacturer's Installation Instructions: Submit preparation requirements, and special installation instructions.
- C. Provide manuals for each type of equipment. Manuals may be provided electronically in Portable Documentation Format and/or as a hard-copy. For any manual supplied as a hard-copy, provide three copies.

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1.10 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Submit as-built drawings recording actual locations, configuration, and installation details of all radio system components.
- B. Provide a detailed on-site manual with complete documentation of all installed systems for each individual site. Provide an overall system manual that includes complete documentation of all installed systems for all the sites.
- C. Provide all documentation in original .docx, .xlsx or .dwg formats, with PDF versions of each document.

1.11 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with a minimum of five (5) years demonstrated experience in the installation of land mobile and microwave radio equipment, antennas, and waveguides/transmission lines with a documented history of neat and workmanlike installation practices. Provide photo documentation of previous installation work comparable to the work called for in these specifications. Provide project references (including customer contact information) for at least three (3) previous projects with work comparable to the work called for in these specifications.

1.12 KICK-OFF MEETING

- A. Vendor shall meet with City of Moscow personnel to verify the design and the Bill of Materials (BOM). The Vendor will visit each site with City personnel to confirm space, power, and other considerations needed for installation. An initial cutover plan will be developed and mutually agreed upon. From this, the Vendor shall provide the County with an installation document including but not limited to:
 - 1. Overall system block diagram
 - 2. Equipment rack elevations
 - 3. Equipment (cabling) interconnections, with references to any cable labels as needed
 - 4. Power/breaker requirements
 - 5. System Interconnect Diagram and Interconnect System Details (see Section 33 83 40 for interconnect network requirements)
 - 6. Any other information required to successfully install the provided equipment
 - 7. Installation and User Manuals for all provided equipment
- B. Attendance is to include all parties directly affecting, or affected by work of this section, including electrical sub-contractor, and installers responsible for installation of DC power systems and microwave radio at the City of Moscow sites.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products with adequate protection against damage. Avoid breakage, denting and scoring finishes. Do not install damaged equipment.
- B. Deliver material to work site in original factory packaging.
- C. Store radios, transmitter combiners and receiver multicouplers, GPS receivers, transceivers and site controllers, equipment racks, and other components and accessories in original cartons or shipping containers and in a clean dry space; protect from weather and construction traffic. Wet materials should be unpacked and dried before storage.

1.14 FIELD MEASUREMENTS

- A. Verify field measurements prior to equipment installation.

1.15 SEQUENCING

- A. Sequence work to allow for installation of electrical systems, cable tray systems, site grounding systems, DC power systems and other work required before installation of radio systems.

1.16 COORDINATION

- A. Coordinate work with sub-contractors installing electrical systems, site grounding systems, cable tray systems, tower work and site construction work.

PART 2 PRODUCTS

2.1 GENERAL

- A. Shown below are detailed specifications for the equipment items to be provided, installed, and tested by the Contractor.
- B. Specifications for base station repeater transceivers are shown below.

1. Base station transceivers shall meet the following specifications as measured per the methods as described in TIA-603-E:
 2. Transmitters rated for continuous duty
 3. Maximum Transmit power 100 W (including external power amplifier if required)
 4. Transmitter Spurious & Harmonic Emissions Attenuation ≥ 90 dB
 5. FM Hum and Noise > 45 dB
 6. RF Output Impedance = 50Ω
 7. Receiver Sensitivity (5% BER) $\leq 0.25 \mu\text{V}$ (-119 dBm)
 8. Receiver Adjacent Channel Rejection ≥ 80 dB
 9. Receiver Intermodulation Rejection ≥ 85 dB
 10. Receiver Spurious and Image Rejection ≥ 100 dB
- C. Specifications for the VHF duplexer for the Public Works base station at the Courthouse site are shown In Section 33 83 00:
- :
- D. The specifications for the Manual RF Switch, Power Divider and RG-213 Jumper Cables for Public Works main/backup repeater switching at Courthouse site are shown in Section 33 83 00.
- E. The specifications for the GPS oscillators at the simulcast repeater sites (Orilia Securesync 1200-433 [-48 VDC power, Rubidium Oscillator, Multi-GNSS] or approved equivalent are shown below:
1. Network Services
- Timing*
- NTP v2, v3, v4: Conforms with or exceeds RFC 1305 and 5905. Supports Unicast, Broadcast, Multicast, MD5 encryption, Peering, Stratum 2, Autokey
 - SNTP v3, v4: Conforms with or exceeds RFC 1769, 2030, 4330, and 5905
 - Time (RFC 868)
 - Daytime (RFC 867)
 - IEEE-1588v2 (PTP) via option card(s)
 - NTP over Anycast
- Management*
- IPv4/IPv6: Dual stack
 - DHCPv4/DHCPv6 (AUTOCONF)/SLAAC: Automatic IP address assignment
 - Authentication: LDAP, RADIUS, TACACS+
 - Syslog: Logging
 - SNMP: Supports v1, v2c, and v3 (no auth/auth/priv) with Enterprise MIB

Communications

- HTTP: Browser-based configuration and monitoring
- Telnet: Remote configuration
- FTP Server: Access to files (logs, etc.)
- SMTP: Email

Security Features

- Enable/Block Protocols
- Set SNMP Community Names and Network Access
- Password Protected
- Standard encryption/authentication protocols
- SSL Web-based Interface: SSL is used to secure HTTPS protocol to access configuration and status web pages.
- SSH: SSL and data compression technologies provide a secure and efficient means to control, communicate with, and transfer data to or from the time server remotely.
- SCP: Securely transfers files to and from the time server over an SSH session.
- SFTP: FTP replacement operates over an encrypted SSH transport
- SNMP v3: Remotely configure and manage over an encrypted connection
- Alert notifications via SNMP Traps and e-mail

2. GNSS Receiver

- Connector: Type N, +5V to power active antenna
- Frequency: GPS L1 (1575.42 MHz), Galileo E1 (1575.42 MHz), GLONASS L1 (1602.0 MHz), BeiDou B1 (1561.1 MHz), QZSS L1 (1575.42 MHz); optional SAASM: GPS L1 & L2 (1227.6 MHz)
- Satellite tracking: 1 to 72, T-RAIM satellite error management
- Synchronization time: Cold start < 15 minutes (includes almanac download), warm start < 5 minutes (assumes almanac download)

3. Option Module Cards

a.) Frequency Output (1, 5, 10 MHz)

The 1, 5, and 10 MHz SecureSync option cards provide three (3) sine wave BNC outputs. Outputs are phased-locked to the SecureSync's disciplined oscillator

Specifications

Frequency Output	Quantity 3 per card
Signal Type and Connector	+13 dBm (10 MHz) into 50 ohm, BNC
Spurious	-70 dBc (10 MHz)
Harmonics	-40 dBc
Maximum Number of Cards:	4 total (1 MHz, 5 MHz or 10 MHz)

4. Antenna system – Model 8230AJ

Electrical

Type: Active
Frequency: 1559 to 1606 MHz
Out-of-Band Rejection:
• < 1500 MHz: > 50 dB
• > 1650 MHz: > 50 dB
Gain: 40 dB from internal LNA
Antenna Pattern: 0 dB at zenith
15 dB or more rejection at < 30 degrees elevation
Connector: N type, female
Recommended Cable: Low Loss LMR-400 Equivalent
Maximum Cable Length: 125 meters (400 ft.) maximum with most Orolia equipment and LMR-400 equivalent cable; 250 meters (800 ft.) maximum with Inline Amplifier - Model 8227
Power: 2.5 to 16 Volts, 19 milliamps (typical), powered by receiver

Mechanical

Size: 100 mm dia. (3.9");
101.5 mm H (4") from base to top;
127.2 mm H (5") including "N" connector
Enclosure: Radome: High Temperature UV Resistant Polycarbonate.;
Base: Zamak White Metal
Weight: 370g (13.1oz)
Compliance: IP67 and RoHS
Temperature Range: -40° to +85° C (-40° to +185° F)
Mounting: L-bracket (included) for vent pipe/pole mounting
via hose clamps (included), PVC pipe sold separately

Warranty

1-Year Limited

- F. Specifications for the 16-port Ethernet switches (Cisco CBS250-16P-2P Stackable Managed Switch or approved equivalent) at the simulcast repeater sites and at the voting receiver sites are shown below:

Network Ports	16 X 1G
Uplink Ports	2 x 1G SFP
Power over Ethernet (POE)	120 Watts
Fan	Fanless
Power Supply	Internal (120 VAC, 50/60 Hz)
Features	Layer 2 switching, VLAN support, Spanning Tree Protocol (STP), access control list (ACL), quality of service (QoS), IPv4/IPv6 static routing
Network Management	On-device UI, Cisco Business Dashboard and mobile app
Warranty	Limited lifetime warranty

- G. 700/800 MHz Transmitter Combiners

Specifications for the 5-channel 700 MHz transmitter combiners to be installed at the three 700/800 MHz simulcast repeater sites (dB Spectra DSCC75-05-N or approved equivalent) are shown below:

Specifications

Electrical Specifications	
Frequency Range	See Ordering Information for models
TX Frequency Separation	150 kHz Minimum
Number of TX Channels	2-12
Channel Power Maximum	110 W
<u>Isolation</u> TX to TX ANT to TX	>65 dB >50 dB
Isolation at Transmit Frequencies	>45 dB at 30 MHz Offset
Insertion Loss	See Insertion Loss Table
Return Loss	>19 dB
Mechanical Specifications	
Construction/Finish	5" Cavities with Ceramic Resonator, Chem Film and Paint Black
Mounting Brackets	AL Clear Chem Film
Mounting Chassis Front Panel	AL panel, black powdercoat
Input Connectors	N- Female
Mounting	EIA 19-inch rack
Temperature Range	-10° C to +60° C **
Dimensions and Weight	
Width	19.0 in
Depth	12.5 in
Height	See Height & Weight Table
Weight / Shipping Weight	See Height & Weight Table

Insertion Loss Table

No. of Channels	Frequency Separation – KHz		
	150-250	250-500	>500
2	3.6	3.1	2.9
3	4.0	3.2	2.9
4	4.3	3.4	3.0
5	4.6	3.4	3.1
6	4.7	3.6	3.1
7	4.7	3.6	3.1
8	5.0	3.7	3.2
9	5.0	3.8	3.2
10	5.1	3.8	3.3
11	5.2	3.9	3.4
12	5.4	4.1	3.5

H. 700/800 MHz Tower-Top Amplifiers

Specifications for the 700/800 MHz tower top amplifiers to be installed at the three 700/800 MHz simulcast repeater sites (dB Spectra DS7TMD-17 or approved equivalent – DIN Connectors) are shown below. Provide and install one additional run of ½” test line coax cable from the receiver multicoupler to the tower top preamplifier for testing. Provide and install a DC block surge

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arrestor (the Polyphaser IS-B50HN-C2 or approved equivalent) in the test line and the main feed line between the TTA and the RX multicoupler at the building entry port.

ELECTRICAL SPECIFICATIONS	
Frequency Range	See Ordering Information
TTA Gain (typical)	21 dB
TTA System Noise Figure (typical)	3 dB
System Input IP3	+15 dBm min
Return Loss (typical)	14 dB
Test Port Coupling (typical)	30 dB
Power Supply Input (nominal)	18 and 24 VDC
Operating Current (typical)	600 mA
Surge Suppression	18 KA ANSI C62.1, 8/20 waveform, 110 joules
LNA SPECIFICATIONS	
Type	Quadrature Coupled Redundant Amps (A & B)
Dual Redundancy	Two independent amps with automatic backup amplifier switching
Amplifier Bypass	Automatic or manual bypass of amps in case of amp alarms or power failure
LNA Gain	30 dB
LNA Noise Figure	0.8 dB
FILTER SPECIFICATIONS	
Filter Bandwidth	See Frequency Range in Ordering Information
Filter Isolation	> 120 dB @ 851-869 MHz and 763-776 MHz
MECHANICAL SPECIFICATIONS	
Construction	Aluminum; OPTIONAL: SS304 Stainless 11 gauge with 0.120" thickness
Environmental / Finish	Weatherproof canister, UV protected, powder coat white
RX Antenna Connector	TMA models – N (F); TMD models – DIN (F)
RX Output Connector	TMA models – N (F); TMD models – DIN (F)
Test Port Input Connector	TMA models – N (F); TMD models – DIN (F)
Temperature Range	-30° C to +60° C
Mounting Hardware	DB380 clamps for up to 3.5" OD pipe
DIMENSIONS	
Width	9 in (228.6 mm)
Height	21.25 in (539.75 mm)
Depth	13.25 in (336.55 mm)
Weight (Aluminum Enclosure)	21 lbs (9.5 kg)
Weight (Stainless Steel Enclosure)	45 lbs (20.5 kg)

I. 700/800 MHz Receiver Multicoupler Systems

Specifications for the 700/800 MHz receiver multicouplers to be installed at the three 700/800 MHz simulcast repeater sites (dB Spectra DSX7P05-DT or approved equivalent) are shown below. Connect the main feed line and the test line from the TTA to the RX multicoupler.

Specifications

Electrical Specifications	
Frequency Range	799-824 MHz
Number of Channels	8-32 Channels **
Internal Post Filter Passband	See Ordering Information
Isolation at offset from edge of Multicoupler Input Filter Passband (See Plots Page 2)	Standard Filter: >60 dB at 25 MHz from 25 MHz Passband Cavity Filter: >15 dB at 3 MHz from 3 MHz Passband >20 dB at 6 MHz from 6 MHz Passband >25 dB at 9 MHz from 9 MHz Passband >25 dB at 12 MHz from 12 MHz Passband
Insertion Loss (Of Multicoupler Input Filters)	Standard Filter: <2.5 dB at 25 MHz Passband Cavity Filters: <2.0 dB at 3 MHz Passband <1.5 dB at 6 MHz Passband <1.2 dB at 9 MHz Passband <1.0 dB at 12 MHz Passband
Gain (With 799-824 MHz Standard Filter)	Expansion Ports: 20 dB Minimum Splitter Outputs: 799-818 MHz: 8 dB (+/-1 dB) * 818-824 MHz: 8 dB (+/-1.5 dB) * (0 dB pre & post attenuator settings)
Noise Figure	6.8 dB Maximum (0 dB pre & post attenuator settings, NF includes Post filter loss)
Input/output Return Loss	14 dB in Passband
Input IP3	+15 dBm
Low Noise Amplifier	Quadrature Coupled
Test Port Instrument Connection	Front Panel BNC
Post-LNA Filter Connections	Available on Rear Panel
Pre & Post -LNA Adjustable Attenuators	Electronic, 0 – 15 dB, 0.5 dB steps
RX – RX Port Isolation	>20 dB
Power Input	90-240 VAC or -48 VDC (36-72 VDC isolated) models available
Output DC Voltages to TTA	Transmission Line Port: 18-24 VDC Test Port: 6 VDC
User Interface	Web Browser or Front panel Touchscreen display
IP Interface	IPV4, TLS Security Layer, SNMP Alarms V2C/V3
Mechanical Specifications	
RF Connectors	✓ RF Input: N Female ✓ RF Outputs: BNC Female (rear) ✓ Test Port --Instrument: BNC Female (front) ✓ Test Port Out to TTA: N Female (rear) ✓ RF External Filter Ports: N female
IP Interface Connector	RJ45
Dry Contact Alarm Connector	Block Type
Mounting	19" x 3.5" 2 RU Panel, depth 11.5" including connectors
Grounding Provision	¼-inch stud at rear
Temperature Range (no degradation)	0°C to +50° C
Weight / Shipping Weight	8 lbs. / 12 lbs.

- J. The specifications for the equipment racks to be installed at the base station repeater sites, as described above, are shown below. These racks are Two Post Seismic Relay Rack 19" Panel Mounting, Welded Steel (Copper B-Line SB506084XUYZ, or approved equivalent).

a.) 84" x 20-5/16" x 15" (Height x Overall Width x Overall Depth).

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- b.) Independently tested to the NEBS GR-63-CORE Seismic Zone 4 standard and rated for 900 lbs. (408kg) of equipment
 - c.) Conformance to EIA/ECA-310-E.
 - d.) Mounting rail spacing is adjustable from 3" (76mm) to 8" (203mm).
 - e.) 45 rack mounting units.
 - f.) Open top, bottom, and sides permit unlimited cable management options.
 - g.) Industry standard mounting holes on sides allow attachment of vertical cable managers.
 - h.) #12-24 panel mounting screw holes (universal pattern)
 - i.) Top angles drilled for runway attachment.
 - j.) Openings in front and rear of base for duplex receptacle mounting.
 - k.) Holes for grounding provided in four locations.
 - l.) Tubular steel frame provides a high degree of strength to weight ratio.
 - m.) Zinc chromate finish.
- K. CommScope AVA5P-50-C, HELIAX® Foam Coaxial Cable, corrugated copper, 7/8" in, black PE jacket (or approved equivalent)

Construction Materials

Jacket Material	PE
Outer Conductor Material	Corrugated copper
Dielectric Material	Foam PE
Flexibility	Standard
Inner Conductor Material	Copper tube
Outer Conductor	Corrugated Copper
Jacket Color	Black

Dimensions

Nominal Size	7/8 in
Cable Weight	0.302 lb/ft 0.45 kg/m
Diameter Over Dielectric	24.13 mm 0.950 in
Diameter Over Jacket	27.991 mm 1.102 in
Inner Conductor OD	9.449 mm 0.372 in
Outer Conductor OD	25.4 mm 1.0 in

Electrical Specifications

Cable Impedance	50 ohm ±1 ohm
Capacitance	22.25 pF/ft 73 pF/m

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dc Resistance, Inner Conductor	0.473 ohms/kft 1.435 ohms/km
dc Resistance, Outer Conductor	0.340 ohms/kft 1.116 ohms/km
dc Test Voltage	6000 V
Inductance	0.184 µH/m 0.056 µH/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	8000 V
Operating Frequency Band	1 – 5000 MHz
Peak Power	91 kW
Velocity	91%

Environmental Specifications

Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)

Mechanical Specifications

Bending Moment	19 Nm 168.164 in lb
Flat Plate Crush Strength	72.97 lb/in 1.3 kg/mm
Minimum Bend Radius, Multiple Bends	254 mm 10 in
Minimum Bend Radius, Single Bend	127 mm 5 in
Number of Bends, minimum	15
Number of Bends, typical	30
Tensile Strength	159 kg 350.535 lb

Note

Performance Note Values typical, unless otherwise stated

Standard Conditions

Attenuation, Ambient Temperature	20 °C 68 °F
Average Power, Ambient Temperature	40 °C 104 °F
Average Power, Inner Conductor Temperature	100 °C 212 °F

Regulatory Compliance/Certifications

Agency	Classification
CENELEC	EN 50575 Compliant, Declaration of Performance (DoP) available
China RoHS	Below Maximum Concentration Value (MCV)
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

- L. CommScope LDF4-50A, HELIAX® Low Density Foam Coaxial Cable, corrugated copper, 1/2 in, black PE jacket (or approved equivalent)

Construction Materials

Jacket Material	PE
Outer Conductor Material	Corrugated copper
Dielectric Material	Foam PE
Flexibility	Standard
Inner Conductor Material	Copper-clad aluminum wire
Jacket Color	Black

Dimensions

Nominal Size	1/2 in
Cable Weight	0.148 lb/ft 0.22 kg/m
Diameter Over Dielectric	12.954 mm 0.51 in

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Diameter Over Jacket	15.875 mm 0.625 in
Inner Conductor OD	4.826 mm 0.190 in
Outer Conductor OD	13.97 mm 0.550 in

Electrical Specifications

Cable Impedance	50 ohm ±1 ohm
Capacitance	23.104 pF/ft 75.8 pF/m
dc Resistance, Inner Conductor	0.451 ohms/kft 1.480 ohms/km
dc Resistance, Outer Conductor	0.820 ohms/kft 2.690 ohms/km
dc Test Voltage	4000 V
Inductance	0.190 µH/m 0.058 µH/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	8000 V
Operating Frequency Band	1 – 8800 MHz
Peak Power	40 kW
Velocity	88%

Environmental Specifications

Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)

Mechanical Specifications

Bending Moment	3.8 Nm 33.633 in lb
Flat Plate Crush Strength	111.995 lb/in 2.0 kg/mm
Minimum Bend Radius, Multiple Bends	127 mm 5 in
Minimum Bend Radius, Single Bend	50.8 mm 2 in
Number of Bends, minimum	15
Number of Bends, typical	50
Tensile Strength	113 kg 249.122 lb

Standard Conditions

Attenuation, Ambient Temperature	20 °C 68 °F
Average Power, Ambient Temperature	40 °C 104 °F
Average Power, Inner Conductor Temperature	100 °C 212 °F

Regulatory Compliance/Certifications

Agency	Classification
CENELEC	EN 50575 Compliant, Declaration of Performance (DoP) available
China RoHS	Below Maximum Concentration Value (MCV)
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

- M. CommScope F4A-NMNM-P (or approved equivalent) or F4ANMDM-P (or approved equivalent) foam dielectric superflexible jumpers terminated with Type N connectors male connectors or 7/16" DIN connectors, as appropriate.

Produce Classification

Product Type	Shureflex®
Body Style	Straight
Product Series	RSJ4-50

General Specifications

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Body Style – Connector A	Straight
Body Style – Connector B	Straight
Interface – Connector A	N Male
Interface – Connector B	N Male or 7-16 DIN Male
Cable Impedance	50 ohm
3rd Order IMD, Static	-112 dBm
3rd Order IMD Test Method	Two +43 dBm carriers
VSWR/Return Loss	30.04 dB

Regulatory Compliance/Certifications

Agency	Classification
RoHS	Compliant
China-RoHS	Below Maximum Concentration Value (MCV)
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

- N. CommScope L4NF-F or L4NM-F, Type N Female or Type N Male for 1/2 in LDF4-50A cable (or approved equivalent)

General Specifications

Interface	N Female or N Male
Body Style	Straight
Brand	HELIAX®
Mounting Angle	Straight

Electrical Specifications

Connector Impedance	50 ohm
Operating Frequency Band	0 – 8800 MHz
Cable Impedance	50 ohm
3rd Order IMD, typical	-159 dBc @ 900 MHz
3rd Order IMD Test Method	Two +43 dBm carriers
RF Operating Voltage, maximum (vrms)	707 V
dc Test Voltage	2000 V
Outer Contact Resistance, maximum	0.25 mOhm
Inner Contact Resistance, maximum	1.00 mOhm
Insulation Resistance, minimum	5000 MOhm
Average Power	0.6 kW @ 900 MHz
Shielding Effectiveness	-110 dB

Mechanical Specifications

Outer Contact Attachment Method	Clamp
Inner Contact Attachment Method	Captivated
Outer Contact Plating	Trimetal
Inner Contact Plating	Silver
Interface Durability	500 cycles
Interface Durability Method	IEC 61169-16:9.5
Connector Retention Tensile Force	600 N 134.885 lbf
Connector Retention Torque	4.5 N-m 39.828 in lb

Dimensions

Nominal Size	1/2 in
Diameter	23.0 mm 0.906 in
Length	61.7 mm 2.429 in

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Environmental Specifications

Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-65 °C to +125 °C (-85 °F to +257 °F)
Immersion Depth	1 m
Immersion Test Mating	Mated
Immersion Test Method	IEC 60529:2001, IP68
Mechanical Shock Test Method	IEC 60068-2-27
Thermal Shock Test Method	IEC 60068-2-14
Vibration Test Method	IEC 60068-2-6
Corrosion Test Method	IEC 60068-2-11

Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
0-1000 MHz	1.08	28.30 - Male
0-1000 MHz	1.05	32.26 - Female

- O. CommScope 78EZ NF or 78EZNM, Type N Female or Type N Male for 7/8 in AVA5-50 cable (or approved equivalent)

General Specifications

Interface	N Female or N Male
Body Style	Straight
Brand	HELIAX®
Mounting Angle	Straight

Electrical Specifications

Connector Impedance	50 ohm
Operating Frequency Band	0 – 5000 MHz
Cable Impedance	50 ohm
3rd Order IMD, typical	-116 dBm @ 1800 MHz
3rd Order IMD Test Method	Two +43 dBm carriers
RF Operating Voltage, maximum (vrms)	707 V
dc Test Voltage	2000 V
Outer Contact Resistance, maximum	0.30 mOhm
Inner Contact Resistance, maximum	2.00 mOhm
Insulation Resistance, minimum	5000 MOhm
Peak Power, maximum	10.0 kW

Mechanical Specifications

Outer Contact Attachment Method	Clamp
Inner Contact Attachment Method	Captivated
Outer Contact Plating	Trimetal
Inner Contact Plating	Silver
Interface Durability	500 cycles
Interface Durability Method	IEC 61169-16:9.5
Connector Retention Tensile Force	1334.47 N 300 lbf
Connector Retention Torque	8.14 N-m 72.001 in lb

Dimensions

Nominal Size	7/8 in
Diameter	37.08 mm 1.46 in
Length	52.07 mm 2.05 in

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Environmental Specifications

Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-65 °C to +125 °C (-85 °F to +257 °F)
Immersion Depth	1 m
Immersion Test Mating	Mated
Immersion Test Method	IEC 60529:2001, IP68
Mechanical Shock Test Method	IEC 60068-2-27
Thermal Shock Test Method	IEC 60068-2-14
Vibration Test Method	IEC 60068-2-6
Corrosion Test Method	IEC 60068-2-11

Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
50-1000 MHz	1.02	40.09

- P. Specifications for ground kits for ½" coaxial cable (CommScope CSG12-06B1A or approved equivalent are shown below:

General Specifications

Bonding Conductor Jacketing Material	PVC
Bonding Conductor Material	Copper
Bonding Conductor Wire Size	16 mm ²
Cable Type	Corrugated Smoothwall
Color	Black
Grounding Kit Type	Compact SureGround® Grounding Kits
Grounding Strap Material	Tinned copper
Lug Attachment	Factory attached
Lug Type	One-hole lug
Thread Size	3/8 in

Dimensions

Enclosure Width	25.4 mm 1 in
Bonding Conductor Length	609.6 mm 24 in
Enclosure Length	55.88 mm 2.2 in
Compatible Diameter, maximum	16.256 mm 0.64 in
Compatible Diameter, minimum	15.367 mm 0.605 in
Nominal Size	1/2 in

Electrical Specifications

Current Handling	Tested to withstand 100,000 amps peak current surge
Current Handling	Test Method MIL-STD-1757
Grounding, Bonding and Shielding Test Method	MIL-STD-188-124A
Lightning Protection Test Method	IEC 1024-1

Material Specifications

Locking Bail Material	Stainless steel
Rivet Material	Tinned copper

Environmental Specifications

Operating Temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Storage Temperature	-40 °C to +80 °C (-40 °F to +176 °F)
Blowing Rain Test Method	MIL-STD-810, Method 506
Corrosion Test Method	MIL-STD-1344, Method 1001

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Freezing Rain/Icing Test Method	MIL-STD-810, Method 521
Humidity Test Method	MIL-STD-1344, Method 1002
Immersion Test Method	IEC 60529:2001, IP68
UV Resistance Test Method	MIL-STD-810, Method 505
Vibration Test Method	MIL-STD-202, Method 214
Weatherproofing Method	Tinned copper strap contact overmolded with EPDM rubber

Q. Specifications for ground kits for 7/8" coaxial cable (CommScope CSG78-12B2U or approved equivalent are shown below:

General Specifications

Bonding Conductor Jacketing Material	PVC
Bonding Conductor Material	Copper
Bonding Conductor Wire Size	6 gauge
Cable Type	Corrugated Smoothwall
Color	Black
Grounding Kit Type	Compact SureGround® Grounding Kits
Grounding Strap Material	Tinned copper
Lug Attachment	Field attached
Lug Type	Two-hole lug
Thread Size	3/8 in

Dimensions

Enclosure Width	40.64 mm 1.6 in
Bonding Conductor Length	1143 mm 45 in
Enclosure Length	63.5 mm 2.5 in
Compatible Diameter, maximum	28.372 mm 1.117 in
Compatible Diameter, minimum	27.559 mm 1.085 in
Nominal Size	7/8 in

Electrical Specifications

Current Handling	Tested to withstand 100,000 amps peak current surge
Current Handling Test Method	MIL-STD-1757
Grounding, Bonding and Shielding Test Method	MIL-STD-188-124A
Lightning Protection Test Method	IEC 1024-1

Material Specifications

Locking Bail Material	Stainless steel
Rivet Material	Tinned copper

Environmental Specifications

Operating Temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Storage Temperature	-40 °C to +80 °C (-40 °F to +176 °F)
Blowing Rain Test Method	MIL-STD-810, Method 506
Corrosion Test Method	MIL-STD-1344, Method 1001
Freezing Rain/Icing Test Method	MIL-STD-810, Method 521
Humidity Test Method	MIL-STD-1344, Method 1002
Immersion Test Method	IEC 60529:2001, IP68
UV Resistance Test Method	MIL-STD-810, Method 505
Vibration Test Method	MIL-STD-202, Method 214

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Weatherproofing Method

Tinned copper strap contact overmolded with EPDM rubber

- R. Specifications for the CommScope 221213 Weatherproofing Kit (or approved equivalent) are shown below:

General Specifications

Application Provides additional moisture seal for cable connections
Applications per Kit Four 1/2 in–7/8 in | Twelve 1/2 in–1/2 in | Twelve 1/2 in–7/8 in to device | Two 1/2 in–2-1/4 in
Harmonized System (HS) Code 854420 (Coaxial cable and other coaxial electric conductors)
Dimensions Nominal Size 1-1/4 in | 1-5/8 in | 1/2 in | 1/4 in | 2-1/4 in | 3/8 in | 5/8 in | 7/8 in

Material Specifications

Material Type Butyl rubber tape | PVC tape

Environmental Specifications

UV Resistance Test Method Butyl test method in QUV weatherometer cycle of 8 hours UV at 150 °F then 4 hours of condensation at 104 °F | PVC tape test method UL 510, ASTM D1000
UV Resistance, minimum with no degradation ≥1000 hours
Weather Resistance Test Method 04AS00-03.6.0 | MIL-STD-1344A, Method 1002

- S. Specifications for 6-Port transmission line entry panels (Site Pro E1449 transmission 6-port (2 X 3) 4" transmission line entry ports (or approved equivalent) with Site Pro BA121M (or approved equivalent) boots are shown below:

Port Size 4"
Port Layout 2 x 3 • # of Ports = 6
Overall Size 17.5" x 23"
Wall Opening 9.5" x 15"
Manufactured from heavy gauge T6 Aluminum.
Baked-on powder coat finish
Sealing caps and mounting hardware included.

Boots

of Holes 3
Cable Size Mixed (1) 1/2" Foam Coax (2) 7/8" Coax.
One piece design for easy installation.
Kit includes rubber boot, insert, and hose clamps.

- T. Specifications for the CommScope AT-K306-U Arrestor Trapeze Kit (or approved equivalent) are shown below:

Product Classification

Product Type Arrestor trapeze kit

General Specifications

Mounting Ceiling | Walls

Dimensions

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Height	76.2 mm 3 in
Width	457.2 mm 18 in
Length	1,219.2 mm 48 in
Material Thickness	7.62 mm 0.3 in

- U. Specifications for the Polyphaser IS-B50HN-C2 DC Block bulkhead mount surge suppressor (or approved equivalent) ground bar are shown below:

Insertion Loss:	$\leq 0.1\text{dB}$
Freq. Range:	125-1000 MHz
Mounting:	Bulkhead Flange
Protected Side Connector:	N Female 50 Ω
RF Power:	500 Watts
Surge Side Connector:	N Female 50 Ω
Throughput Energy:	$\leq 800\text{ }\mu\text{J}$
Throughput Voltage:	$\leq 12\text{ Vpk}$
Unit Impedance:	50 Ω
Voltage Standing Wave Ratio:	1.1:1

- V. Specifications for the Polyphaser DC-Pass bulkhead mount surge suppressor (Polyphaser DGXZ+06NFNF-A or approved equivalent)

Unit Technical Specifications:
Current: 4Adc
Insertion Loss: $\leq 0.1\text{dB}$
Freq. Range: 800-2500 MHz
Mounting: Bulkhead Flange
User Voltage: +6.0 VDC Max
Usage Current <4.0 Amps Continuous
Polarity: +
Protected Side Connector: N Female 50 Ω
Surge Side Connector: N Female 50 Ω
Throughput Energy: $\leq 175\text{ }\mu\text{J}$ for 3kA @ 8/20 μs Waveform
Turn-On Voltage: 7.0 VDC
Turn-On Time: 4 ns for 2 kV/ns
Unit Impedance: 50 Ω
Voltage Standing Wave Ratio: 1.1 : 1
UL Approved and Listed UL497B.

- W. Specifications for the cable ladders at the KUID-TV site [Eaton B-Line SB17U12BYZ (or approved equivalent)] are shown below:

Tubular Stringer Style - 1 1/2" (Boxed)

- Ladder type cable runway for communication cabling pathways
- Mounts to ceilings, walls, floors, relay racks, and electronic enclosures
- 3/8" (9mm) x 1 1/2" (38mm) x 0.049" (1.2mm) tubular steel stringers
- 3/8" (9.5mm) x 1 1/2" (38.1mm) steel tube welded rungs spaced 12" (305mm) on center
- All finishes are UL Classified as suitable as an equipment grounding conductor (File number E60548)
- Material: ASTM A513 grade 1008 steel tube

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- Finish ____: Yellow zinc (YZ)

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

- A. Install equipment racks, VHF base station radios, transmitter combiner and receiver multicoupler systems, GPS oscillators and other radio system equipment as described in this specification and as shown in the Contract Drawings. Install all required interconnecting cable in compliance with all applicable electrical codes.
- B. Coordinate installation radio system equipment with other electrical and DC power system work as necessary to properly integrate installation of radio system work with other work.

3.3 PROJECT MANAGEMENT

- A. The Vendor shall create a Work Breakdown Structure (WBS). From the WBS, the Vendor shall derive a Schedule, Risk Management Plan, Quality Management Plan, and Communication Plan to be delivered and approved by Con Fire. The WBS shall describe which party has which responsibilities for each task.
 1. The schedule should be in PERT form and be updated as needed.
 2. A Risk Registry should be updated and maintained.
 3. Updates to the Schedule and Risk Registry should be communicated at each status update meeting as well as a list of issues that require resolution.
 4. Periodic Status meetings shall be included in the Communication Plan. The Vendor may suggest the frequency of these calls, the frequency is allowed to vary based on the project activity.
- B. Change Orders: Either Party may request changes within the general scope of this Agreement. If a requested change causes an increase or decrease in the cost or time required to perform this Agreement, the Parties will agree to an equitable adjustment of the Contract Price, Performance Schedule, or both, and will reflect the adjustment in a change order. Neither Party is obligated to perform requested changes unless both Parties execute a written change order.

The Change Order Form shall describe the details of the change of scope, the reason why the change is needed, and the cost of the change broken out by materials and time and expenses for each discipline (PM, engineering, technician, etc.), and any other applicable costs on a line item bases with any labor costs showing both hours, travel, and

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total cost. Delays causes include but are not limited to; Acts of God, site issues, and supply chain delays shall not be a reason for a Change Order other than to update the Project Schedule.

3.4 FIELD QUALITY CONTROL AND ACCEPTANCE TESTING

A. SYSTEM AND COVERAGE ACCEPTANCE TESTING

- 1) In order to confirm proper adjustment and operation of the City of Moscow VHF simulcast system the radio system coverage tests described below will be based on an evaluation of the DAQ ("Delivered Audio Quality") provided at test locations throughout the City of Moscow.
- 2) Prior to the commencement of the Coverage Acceptance Tests, the Contractor shall provide the City with a documentation of field tests performed on the installed radio system, including:
 - a.) Measured Base Station Transmitter Output Power (Watts/dBm)
 - b.) Measured Base Station Receiver 5% BER Sensitivity (dBm)

(Perform this measurement through an ISO-T or coupler with the input to the coupler terminated in a 50 ohm load and with the input connected to the receiver multicoupler.)
 - c.) Measured transmitter combiner and receiver multicoupler insertion loss for each channel.
 - d.) Calculated Effective Radiated Power for each channel at each site (which should correspond to the values shown in Table 3 for each channel at each site).
 - e.) To ensure that antennas and transmission lines meet specifications after installation, sweep antennas and transmission lines for return loss (with 50-ohm load and with antenna at antenna end of each line) and distance-to-fault (with short and antenna at antenna end of line. Perform return loss measurements for TX and RX antennas as mounted on the tower or monopole at each repeater site. For the tests of the 700/800 MHz RX antenna, put the Tower Top Amplifier in bypass mode. Submit a detailed test plan to City for approval in advance of these tests. Record and sign tests and present tests to City in printed and PDF format.
 - f.) Provide these measurement results to the City as a System Field Testing Report in printed and PDF format.
- 3) DAQ Tests will be performed on an unused channel that is part of the 3-site simulcast subsystem that includes the Moscow Mountain, KUID-TV and Well 10 sites. Perform these tests on one of the conventional channels on the 3-site simulcast system that includes the Well 10, KUID-TV and City Hall sites.
- 4) DAQ Tests will be performed within each area defined by the rectangular grid laid over the Moscow city limits. Each square in this grid defines an area within which a DAQ test

must be performed as part of the coverage testing. A map showing this grid (which is based on squares 500 meters on a side) is shown in Drawing R38.

- 5) DAQ tests shall be performed on-board a City of Moscow vehicle equipped with a mobile radio with outboard speakers installed by the contractor to allow the evaluation team members to hear the audio produced by the system well enough to provide a reasonable evaluation of its quality. The configuration of the mobile radio shall include 15 dB of attenuation between the antenna and the mobile radio to simulate a portable radio operating at belt level.
- 6) The evaluation team will be made up of at least 5 members, at least three of whom shall be City of Moscow representatives.
- 7) At each test location, a test team member located at the Whitcom dispatch center with audio access to the channel being tested shall read a random selection from the Harvard Sentences (shown in Appendix 3 of Section 33 83 00), and each evaluation team member on the vehicle shall rate the audio quality of the received transmission on a DAQ scale from DAQ 1 to DAQ 5, based on the descriptions of these DAQ levels shown in Table 2 below (from *TSB 88.1-C, Wireless Communications Systems Performance in Noise Limited Situations; Part 1 – Recommended Methods for Technology Independent Performance Modeling; February 2008*):

Table 2 Delivered Audio Quality

DAQ Delivered Audio Quality	Faded Subjective Performance Description	Static SINAD equivalent intelligibility^{1,2}
1	Unusable, Speech present but unreadable	<8 dB
2	Understandable with considerable effort. Frequent repetition due to Noise/Distortion	12 ± 4 dB
3	Speech understandable with slight effort. Occasional repetition necessary due to Noise/Distortion	17 ± 5 dB
3.4	Speech understandable with repetition only rarely needed. Some Noise/Distortion	20 ± 5 dB ³
4	Speech easily understood. Occasional Noise/Distortion	25 ± 5 dB
4.5	Speech easily understood. Infrequent Noise/Distortion	30 ± 5 dB
5	Speech easily understood.	>33 dB

- 8) One of the evaluation team members shall record the results provided by each team member at each measurement location, as well as the location of each DAQ test. An example of the test sheet used in the similar tests to record results is shown in Appendix 3 of Section 33 83 00. Perform a DAQ test on each of the simulcast subsystems (described above) at each test grid location.
- 9) An average result for each measurement location shall be determined by discarding the highest and lowest results and taking the average of the remaining results. Both this weighted average and the average of all five results shall be shown in the table of results.

- 10) The results of these tests shall be compiled into a coverage test map showing the coverage grids tested and using color –coding to depict the coverage results obtained in each grid, as follows:

GREEN	Good Coverage - DAQ 3.4 to DAQ 5.0
YELLOW	Marginal Coverage – DAQ 2.0-DAQ 3.0
RED	Poor Coverage - Below DAQ 2.0

- 11) The contractor shall produce DAQ test result sheets, DAQ tabulated measurement result sheets, and DAQ measurement maps and shall provide them to the City in the form of a final coverage DAQ test report.

3.1 CLEANING

- A. Upon completion of this section of work, remove protective wraps and debris. Repair damages due to installation of this section of work.

3.2 PROTECTION OF FINISHED WORK

- A. Protect radio systems work from damage after installation.

END OF SECTION 33 83 01

APPENDIX 1A

700/800 MHz ANTENNA CUT SHEETS

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700/800 MHz BID ALTERNATE
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SC466-HF1LDF(DXX-YYY) Aurora™ collinear omni, 6.5 dBd, Low PIM, PIP rated, HD, 746-869 MHz

- Patent-pending Aurora™ balanced design covers the 746-869 MHz frequency range
- Industry-Leading -150dBc PIM rating for low noise characteristics, ideal for trunking sys.
- Heavy-duty construction with outstanding 240 mph wind rating for harsh environments
- 500W power handling

The Aurora™ SC family is Sinclair's next generation of collinear antennas. The patent-pending antenna utilizes cutting-edge, field-proven balanced design to deliver an unparalleled combination of higher gain, wider bandwidth, highly consistent RF pattern, higher wind rating, and lighter weight, all in a small form factor. Designed according to IEC62305 Part 1-4, VDE0855-300, and fulfilling the requirements of lightning protection class II, these antennas are fully DC-grounded and protected with a lightning spike through the top of the radome. Unbeatable, heavy-duty construction along with the enhanced wind rating, means these antennas can last for years in the most challenging environments. The new Aurora SC series is ideal for public safety applications as it offers reliability, durability, and easy installation in a lightweight and compact package.

When ordering, please refer to the chart below for the model number (subject to various prices).

Model Number	PIP rating	Downtilt	CTM
SC466-HF1LDF(D00-PIP)	25kW	0°	006872
SC466-HF1LDF(D01-PIP)	25kW	1°	006931
SC466-HF1LDF(D02-PIP)	25kW	2°	006931
SC466-HF1LDF(D03-PIP)	25kW	3°	006931
SC466-HF1LDF(D04-PIP)	25kW	4°	006931
SC466-HF1LDF(D05-PIP)	25kW	5°	006931
SC466-HF1LDF(D06-PIP)	25kW	6°	006931
SC466-HF1LDF(D07-PIP)	25kW	7°	006931
SC466-HF1LDF(D08-PIP)	25kW	8°	006931
SC466-HF1LDF(D09-PIP)	25kW	9°	006931
SC466-HF1LDF(D10-PIP)	25kW	10°	006931
SC466-HF1LDF(D00)	-	0°	006872
SC466-HF1LDF(D01)	-	1°	006931
SC466-HF1LDF(D02)	-	2°	006931
SC466-HF1LDF(D03)	-	3°	006931
SC466-HF1LDF(D04)	-	4°	006931
SC466-HF1LDF(D05)	-	5°	006931
SC466-HF1LDF(D06)	-	6°	006931
SC466-HF1LDF(D07)	-	7°	006931
SC466-HF1LDF(D08)	-	8°	006931
SC466-HF1LDF(D09)	-	9°	006931
SC466-HF1LDF(D10)	-	10°	006931

Application Notes

- SC466-HF1LDF(D00-PIP) and SC466-HF1LDF(D00) can be mounted either upright or inverted, other models upright only.

Region	United States	Europe, Middle East, and Africa	Canada, Caribbean, and Latin America	Asia-Pacific
Telephone	1 800 263 3275	+1 905 727 0165 ext 232	Canada: 1 905 726 7676 International: +1 905 726 7676	+1 905 727 0165 ext 287
E-mail	salesusa@sinctech.com	salesemea@sinctech.com	salescan@sinctech.com	salesasia@sinctech.com
Product Specification Sheet		SC466-HF1LDF(DXX-YYY)	Issue: 1	Dated: 24-03-23

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RADIO SYSTTEM UPGRADE
CITY OF MOSCOW, IDAHO

700/800 MHz BID ALTERNATE
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Electrical Specifications

Frequency Range	MHz	746 to 869	
Bandwidth	MHz	123	
Connector		7/16 DIN-Female	
Gain (nominal)	dBd (dBi)	6.5 (8.6)	*1
Input VSWR (max)		1.5:1	
Polarization		vertical	
Impedance	Ω	50	
Pattern		Omni-directional	
Vertical beamwidth (typ)	degrees	13	
Average Input Power (max)	W	500	
Passive intermod. (2x20W, 3rd ord.)	dBc	-150	
Lightning protection		DC ground	

Notes

- *1 : Gain variance ± 0.5 dB.
*2 : Weight variance ± 3 lb.
*3 : Qty:2
*4 : D00 model can be installed upright or inverted, downtilt models upright only.
*5 : Not included, complies w/ EIA/TIA-329 standard.

Mechanical Specifications

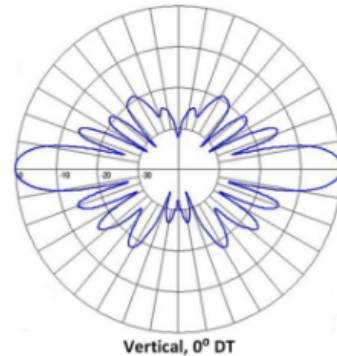
Width	in (mm)	3.5 (89)	
Depth	in (mm)	3.5 (89)	
Length/ Height	in (mm)	89.6 (2276)	
Base pipe diameter	in (mm)	3.5 (89)	
Base pipe mounting length	in (mm)	16 (406)	
Radome material		fiberglass (UV protected)	
Weight	lbs (kg)	21 (9.53)	*2
Weight iced (1/2" ice)	lbs (kg)	37 (16.8)	
Mounting Hardware (Optional)		Clamp006B, Clamp147, or Clamp147M	*3
Mounting configurations		upright, inverted	*4
Kit for Offset Side Mount (straight tower leg)		SMK-225-A3 or SMK-225-A7	*5
Estimated Shipping Weight	lbs (kg)	30 (13.62)	
Shipping dimensions	in (mm)	102x6x6 (2591x152x152)	

Ordering Information

Clamps to be purchased separately.

Environmental Specifications

Temperature range	$^{\circ}\text{F}$ ($^{\circ}\text{C}$)	-40 to +140 (-40 to +60)
Wind Loading Area (Flat Plate Equivalent)	ft^2 (m^2)	1.2 (0.11)
Wind Loading Area (1/2" ice)	ft^2 (m^2)	1.6 (0.15)
Rated wind velocity (no ice)	mph (km/h)	240 (386)
Rated wind velocity (1/2" radial ice)	mph (km/h)	200 (322)
Lateral Thrust (100 mph No Ice)	lbs (N)	46 (204.6)
Bending moment (100 mph No Ice)	ft-lbs (Nm)	107 (144.5)
Tip deflection (100 mph No Ice)	degrees	0.1



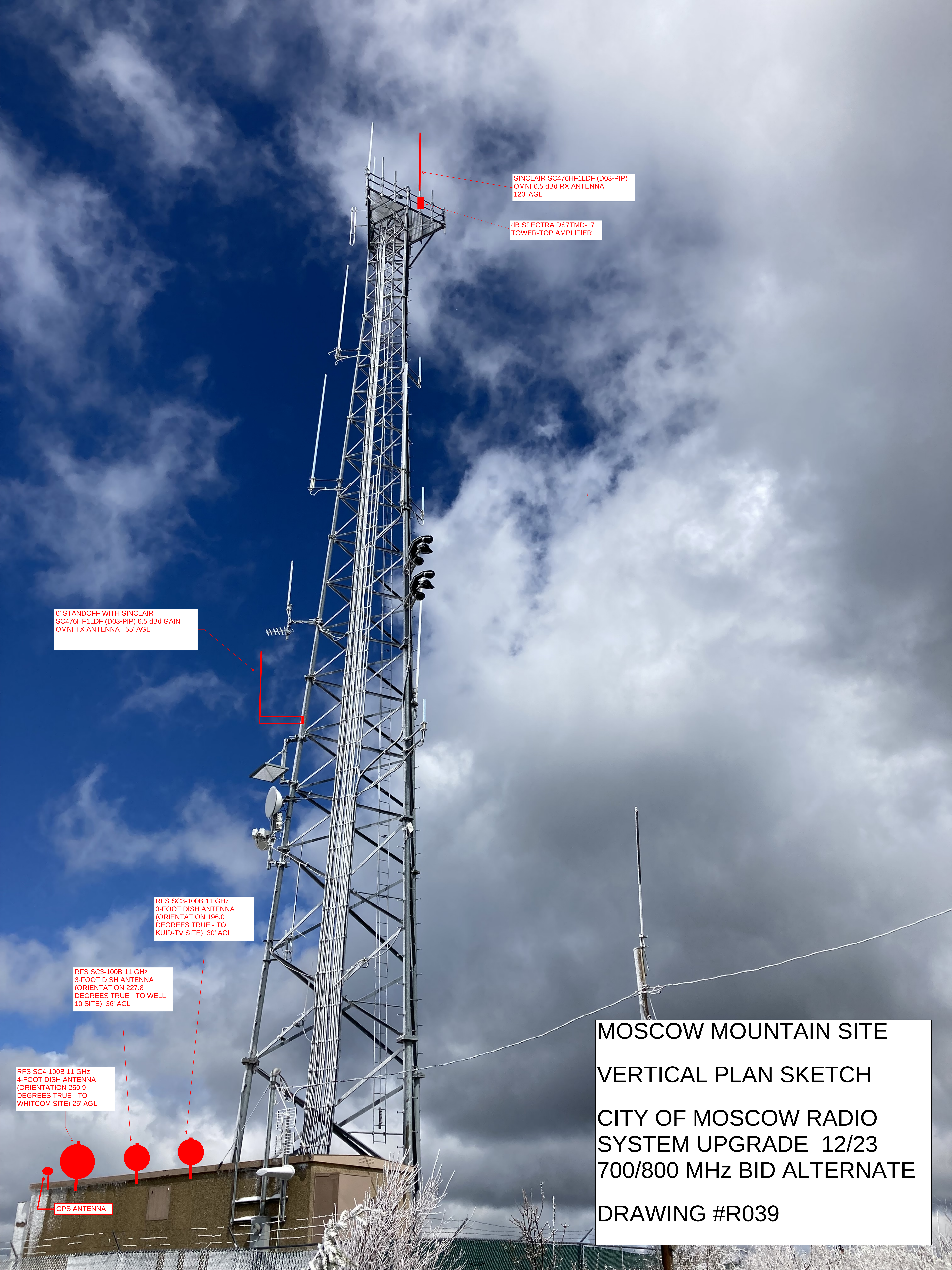
Region	United States	Europe, Middle East, and Africa	Canada, Caribbean, and Latin America	Asia-Pacific
Telephone	1 800 263 3275	+1 905 727 0165 ext 232	Canada: 1 905 726 7676 International: +1 905 726 7676	+1 905 727 0165 ext 287
E-mail	salesusa@sintech.com	salesemea@sintech.com	salescan@sintech.com	salesasia@sintech.com
Product Specification Sheet		SC466-HF1LDF(DXX-YYY)	Issue: 1	Dated: 24-03-23

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RADIO SYSTTEM UPGRADE
CITY OF MOSCOW, IDAHO

700/800 MHz BID ALTERNATE
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SINCLAIR SC476HF1LDF (D03-PIP)
OMNI 6.5 dBd RX ANTENNA
120' AGL

dB SPECTRA DS7TMD-17
TOWER-TOP AMPLIFIER

6' STANDOFF WITH SINCLAIR
SC476HF1LDF (D03-PIP) 6.5 dBd GAIN
OMNI TX ANTENNA 55' AGL

RFS SC3-100B 11 GHz
3-FOOT DISH ANTENNA
(ORIENTATION 196.0
DEGREES TRUE - TO
KUID-TV SITE) 30' AGL

RFS SC3-100B 11 GHz
3-FOOT DISH ANTENNA
(ORIENTATION 227.8
DEGREES TRUE - TO WELL
10 SITE) 36' AGL

RFS SC4-100B 11 GHz
4-FOOT DISH ANTENNA
(ORIENTATION 250.9
DEGREES TRUE - TO
WHITCOM SITE) 25' AGL

GPS ANTENNA

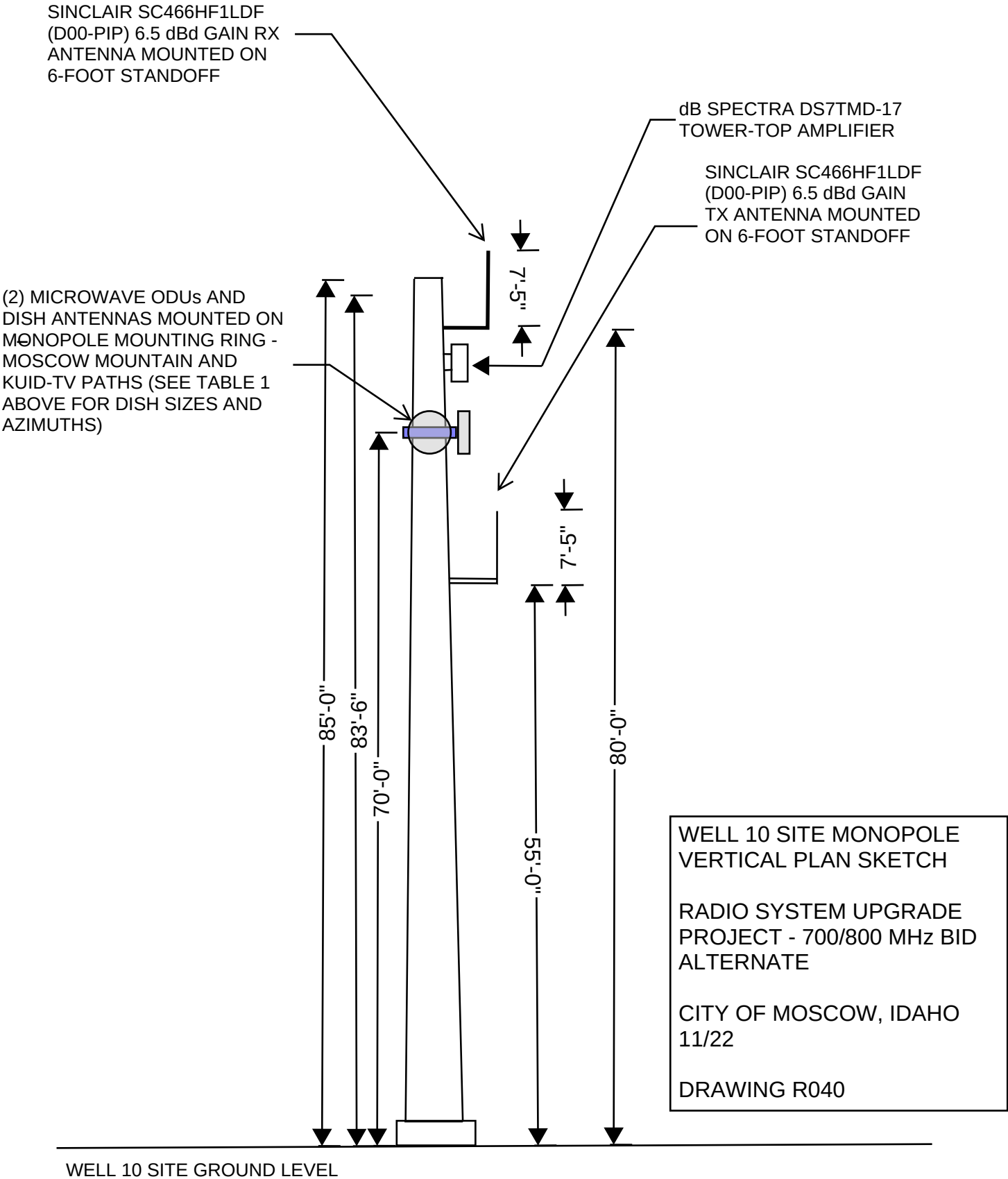
MOSCOW MOUNTAIN SITE

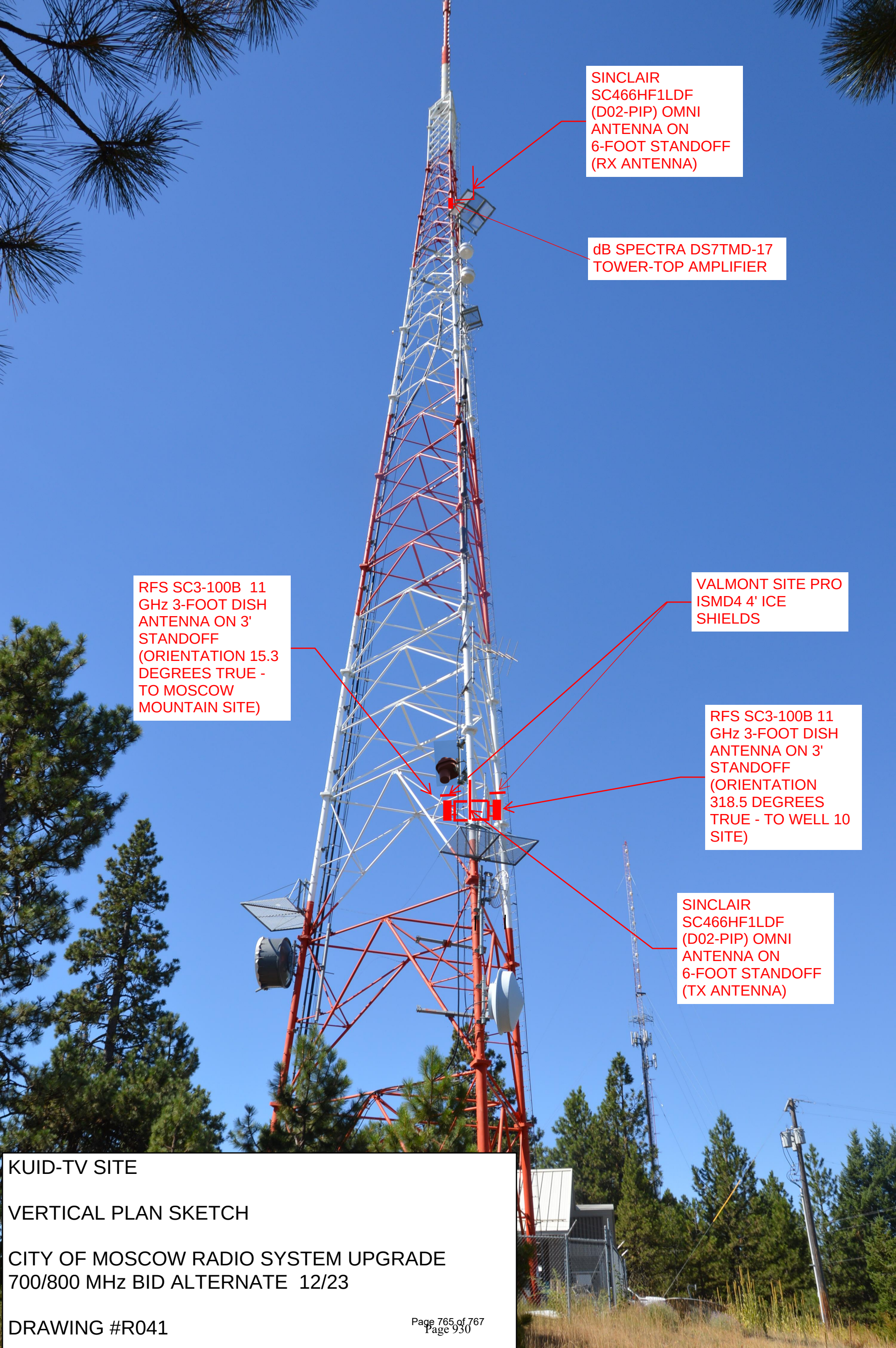
VERTICAL PLAN SKETCH

CITY OF MOSCOW RADIO
SYSTEM UPGRADE 12/23
700/800 MHz BID ALTERNATE

DRAWING #R039

TABLE 1 - Well 10 Microwave Dish Antennas					
Path	Azimuth (Degrees True)	Antenna Model #	Frequency Band (GHz)	Dish Size (feet)	Elevation On Tower (feet)
Moscow Mountain	47.7	RFS SC3-W100B	11	3.0	70
KUID-TV Site (Paradise Ridge)	138.8	RFS SC3-W100B	11	3.0	70





SINCLAIR
SC466HF1LDF
(D02-PIP) OMNI
ANTENNA ON
6-FOOT STANDOFF
(RX ANTENNA)

dB SPECTRA DS7TMD-17
TOWER-TOP AMPLIFIER

RFS SC3-100B 11
GHZ 3-FOOT DISH
ANTENNA ON 3'
STANDOFF
(ORIENTATION 15.3
DEGREES TRUE -
TO MOSCOW
MOUNTAIN SITE)

VALMONT SITE PRO
ISMD4 4' ICE
SHIELDS

RFS SC3-100B 11
GHZ 3-FOOT DISH
ANTENNA ON 3'
STANDOFF
(ORIENTATION
318.5 DEGREES
TRUE - TO WELL 10
SITE)

SINCLAIR
SC466HF1LDF
(D02-PIP) OMNI
ANTENNA ON
6-FOOT STANDOFF
(TX ANTENNA)

KUID-TV SITE

VERTICAL PLAN SKETCH

CITY OF MOSCOW RADIO SYSTEM UPGRADE
700/800 MHz BID ALTERNATE 12/23

DRAWING #R041

Wednesday, January 10, 2024

ADDENDUM NO. 3

City of Moscow Project: **RADIO SYSTEM UPGRADE PROJECT**

Project No. **295-001**

The following changes, additions, clarifications, and/or deletions are hereby made a part of Moscow's project **RADIO SYSTEM UPGRADE PROJECT**, as fully and completely as if the same were entirely set forth in the Plans, Specifications, and Contract Documents. This addendum, as set forth herein, shall become an integral part of any contract entered into by and between the Owner and the Contractor.

1. ADDENDUM NO. 2, DRAWINGS, SPECIFICATIONS, PROPOSAL, INVITATION TO BID:

Amend **33 83 01-3**

Replace: **33 83 01-3 (Page 3)** pertaining to 700 Mhz Simulcast TX Channels and 700 Mhz Simulcast RX Channels with the updated **33 83 01-3** attached below.

The channel names that will be used in the new 700/800 MHz P25 Phase 2 system are shown below in Table 1. Frequencies for the 700/800 MHz system will be obtained through the Region 12 Regional Planning Committee application and approval process, and licensed with the FCC based on Region 12 approval. The City of Moscow is proceeding with the Region 12 approval process for these channels and will file the FCC license applications for these channels once they are approved. The channels listed below should be considered provisional until they are approved by the Region 12 700 MHz Regional Planning Committee.

The City of Moscow Public Works Channel will operate on a separate VHF channel and will have its base station facilities replaced as part of the radio system upgrade project, as shown in Table 2 below. The equipment required to upgrade the Public Works facilities at the Latah County is described in Section 33 83 00.

City of Moscow 700 MHz Simulcast TX Channels	
769.29375	MFD Main Dispatch Channel - TX
769.56875	MFD TAC Channel #1 - TX
770.55625	MPD Main Dispatch Channel - TX
771.28125	Shared TAC Channel #1 - TX
771.45625	Shared TAC Channel #2 - TX
City of Moscow 700 MHz Simulcast RX Channels	
799.29375	MFD Main Dispatch Channel - RX
799.56875	MFD TAC Channel #1 - RX
800.55625	MPD Main Dispatch Channel - RX
801.28125	Shared TAC Channel #1 - RX (Well 10 and Courthouse Sites Only)
801.45625	Shared TAC Channel #2

Table 1 – 700 MHz Frequencies and New System Channel Names

The configuration and locations of the sites that make up the new City of Moscow 700/800 MHz simulcast radio system are shown below in Table 2. The overall system consists of a simulcast system made up of the Moscow Mountain, KUID-TV and Well 10 repeater sites, and a voting receiver system made up the base station repeater receivers at those three sites.

The Moscow Mountain, KUID-TV and Well 10 simulcast system has five channels: the MFD main dispatch channel, the MFD TAC channel, the MPD main dispatch channel, and the two shared TAC channels, as shown above in Table 1.

The VHF Public Works repeater in the Courthouse will remain a stand-alone repeater with no connection to dispatch or to the simulcast system or the interconnect system. The requirements for upgrade of the Public Works repeater at the Courthouse site are shown in Section 33 83 00.