Agenda #____12____
Commission Meeting Date:
October 21, 2014

CITY OF GREAT FALLS
COMMISSION AGENDA REPORT

Item:	Professional Services Contract Amendment: Water Treatment Plant Facility Upgrades, O. F. 1519.0
From:	Engineering Division
Initiated By:	Public Works Department
Presented By:	Jim Rearden, Public Works Director
Action Requested:	Approve Professional Services Contract Amendment

Suggested Motion:

1. Commissioner moves:

   "I move the City Commission approve the Professional Services Contract Amendment between the City of Great Falls and Black and Veatch Corporation for engineering services for the Water Treatment Plant Facility Upgrades, O. F. 1519.0 for a fee not to exceed $4,474,649.00, and authorize the City Manager to execute the agreements."

2. Mayor calls for a second, discussion, public comment, and calls for the vote.

Staff Recommendation: Approve Professional Services Contract Amendment.

Background:

Significant Impacts

City Staff entered into a professional services contract with Black and Veatch in July of 2012 to evaluate and design infrastructure upgrades recommended at the Water Treatment Plant (WTP) from the 2006 Water Master Plan. During the evaluation of existing facilities multiple items were identified to be added into the scope of the project. The most significant design additions include equipping the Ultraviolet (UV) Treatment system, removal of the seasonal clearwell, addition of a surge tank, replacement of the Northwestern Energy substation and increasing facility sizing to preserve the plant maximum hydraulic capacity of 66 MGD. Design features to accommodate future improvements, such as suction piping and a utility tunnel to accommodate future backwash supply pumps, will also be included in the design.

Items were also removed from the original scope of the project to address affordability concerns. Reductions in scope include eliminating the Machine Shop, Low Service pump upgrades, postponing the replacement of the Motor Control Centers and making the

Administration Building an optional item.

The changes in scope will result in an approximate doubling in the costs associated with the construction scope and design services. The original design contract was $2,562,715.00. The current proposed design services are listed as $5,244,138.00. There are $769,489.00 remaining in the current contract which will be used for final design, reducing the contract amendment value to $4,474,649.00.

Workload Impacts

Black and Veatch, along with their partner firms Thomas Dean and Hoskins (TD&H) and L'Heureux Page Werner (LPW), will proceed with the design and the construction phase of the upgrades identified during the evaluation and conceptual design phase. City engineering and WTP staff will assist with project administration duties.

Purpose

The work originally considered by this contract focused on items identified in the 2006 Water Master Plan. These items included designing replacement of the over 50 year old electric switch gear with more reliable, redundant and serviceable equipment, designing a new administration building, designing a new chemical feed building with an ammonia feed system, designing the replacement of low service pumps and building a wall around the electrical substation to address vulnerability concerns.

During the detailed evaluation of these items at the WTP, other components of the treatment system were identified for improvement. The first of these was the addition of a UV Treatment system in the first phase of improvements. The City conducted a filter study at the WTP to determine if improvements to the existing system could be made to reach compliance with the Long Term 2 Enhanced Surface Water Treatment Rule. The result of this study combined with staff operation experience indicated that the current facilities could not reliably meet the new rule standards and that UV treatment would be required by the Montana Department of Environmental Quality. The selection and design of a UV treatment system was added to the design effort in order to meet the new rule requirements. With the installation of a new UV system, a surge tank must be designed to relieve pressure that could damage the UV system. An upsized surge tank will replace the existing seasonal clearwell that was recently identified for replacement during a condition analysis.

The next major item that was added to the design project was the replacement of the Northwestern Energy Substation. During the evaluation of the substation, the age and location were identified as risks. Replacing the substation in an enclosed area with new equipment was identified as an improvement that would increase the reliability of the power feed to the WTP.

With the improvements identified above and other lesser items that were identified, the project construction cost estimate grew from an original estimate of 10 to 12 million dollars to an updated estimate of 25 million dollars. With this increase in scope and construction cost, the engineering fees for the completion of design and construction management services also increased significantly.

Project Work Scope

The Black and Veatch team will proceed with the final design phase of the accepted infrastructure upgrades and conduct bidding and construction phase services for the project. Bidding is currently scheduled for January of 2016 with construction starting in the spring of 2016.

Initial Evaluation and Selection Process

The team led by Black and Veatch was selected for this project based on the engineering selection policy used by the City of Great Falls. An invitation to submit proposals was advertised in the Tribune detailing the project, selection process, submittal deadline and interview dates. Two consultant teams submitted written proposals and each gave a presentation to a selection committee of Public Works staff. Based on these proposals and presentations, the Black and Veatch/ TD&H/ LPW team scored the highest based on their ability to complete the work and past performance with similar projects. The professional services contract was then negotiated. Black and Veatch is a national firm with the majority of their work to be carried out by its offices and staff located in Denver, Colorado and Kansas City, Missouri. TD&H is a Great Falls based firm with offices located throughout Montana and neighboring states. TD&H's workload will be completed entirely by staff located in Montana. LPW is a Great Falls based architecture firm and their workload will be completed by staff located in Great Falls.

Conclusion

City staff recommends approval of the Professional Services Contract Amendment No. 1 to Black and Veatch in the amount of $4,474,649.00.

Fiscal Impact

This contract will be funded through Water Treatment Plant funding secured through a loan from the State Revolving Fund (SRF).

Alternatives:

The City Commission could vote to deny the approval of the Professional Services Contract Amendment No. 1.

Attachments/Exhibits:

1. Professional Services Contract Amendment No. 1.

AMENDMENT NO.1

PROFESSIONAL SERVICES AGREEMENT

OFFICE FILE 1519.0
Great Falls Water Treatment Plant Facility Upgrades

This AMENDMENT made this ____ day of October, 2014 by and between the CITY OF GREAT FALLS (OWNER), and Black & Veatch Corporation (ENGINEER) shall amend the Agreement for Professional Services dated July 17, 2012 between the aforementioned parties, whereby the ENGINEER shall remove an activity authorized by the original contract. Services covered under this amendment pertain to Additional Services tasks provided by the ENGINEER to the City of Great Falls.

Amendments to the original Agreement are as follows:

1. Replace the scope of services and associated fees for the following tasks from the Agreement for Professional Services with the scope of services and fees contained in Attachment A: Task Nos. 310, 320, 330, 340, 345, 350, 360, 361, 410, 420, 430, 440, 450, and 451.
2. Add the scope of services and associated fees for the following tasks contained in Attachment A: Task Nos. 110A, 190D, 190E, 260, 261, 262, 263, 264, 265, 289A, 290A, 294B, 295, 301, 302A, 303, 304, 306, 308, and 425.
3. Perform the scope of services for this Amendment in accordance with the schedule presented in Attachment A.
4. Increase the total not-to-exceed fee of $2,562,715.00 for the Agreement for Professional Services by $4,474,649.00 for an amended total not-to-exceed fee of $7,037,364.00.

IN WITNESS THEREOF, the Parties hereto have executed this Agreement on the ___ day of October, 2014.

CITY OF GREAT FALLS

_____
Gregory T. Doyon, City Manager

REVIEWED FOR LEGAL CONTENT

_____
Sara R. Sexe, City Attorney

ATTEST:

_____
Lisa Kunz, City Clerk

(Seal of the City)

Black & Veatch Corporation

Peter J. Cohlmia

Peter J. Cohlmia, Vice President

STATE OF COLORADO)

County of Arapahoe : ss.

On this 10 day of October, 2014, before me, a Notary Public in and for the State of Colorado, personally appeared Peter J. Cohlmia, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledged to me that he executed the same.

In WITNESS THEREOF, I have hereunto set my hand and affixed my official seal the day and year in this certificate first above written.

Notary Public for the State of

Colorado

(NOTARIAL SEAL)

Printed Name: Michael Sawyer

My Commission Expires: 3/22/2016

MICHAEL SAWYER
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20044010060
MY COMMISSION EXPIRES 03/22/16

END

City of Great Falls, Montana

Water Treatment Plant Facility Upgrades, OF 1519.0

Amendment No. 1

Attachment A

Project Description

The Water Treatment Facility Upgrades Project (Project) has been broken down into a number of phases to be constructed over time. The engineering services described herein are for Phase 1 of the Water Treatment Facility Upgrades. Phase 1, including the two alternate bid items, is defined in the preliminary drawings prepared for Task 282C and presented in Appendix A. The floor plan of the Administration Building Addition and the site plan was revised to reflect the review comments received from the City of Great Falls (Owner) at the August 27, 2014 Review Meeting and the revised floor and site plans are presented in Appendix A. Alternate Bid Item No. 1 is the replacement of the NW Energy Substation and Alternate Bid Item No. 2 is the construction of the Administration Building Addition.

Other features of the Phase 1 Project include: 1) The Chemical Feed and UV Disinfection Building will be designed to accommodate the installation of the Merrick Storage and Feed System for lime in a future phase, 2)The Owner has selected the Wedeco K143 12/5(6) UV Reactor for inactivation of Cryptosporidium and Giardia, 3) A utility crossing of the existing railroad line will require coordination with the BNSF Railroad, 4) Industrial Automation Consulting, Inc. (IAC) has been selected by the Owner to provide the programming and integration services for Phase 1.

The preliminary list of drawings for Phase 1 is shown in Appendix B and the Table of Contents for the Project Manual is shown in Appendix C. Drawings will be prepared using the Revit software. The 2013 Engineers Joint Contract Documents Committee front end and technical specifications and Black and Veatch's BIM Workflow Model will be used for the Project.

Existing Medium Voltage Motors, Motor Starters and Cables Condition Assessment

Some of the existing medium voltage motor starters and cables for the Low and High Service Pumps were installed in 1959 with others being installed more recently. Included as part the Project is the replacement of the existing medium voltage motors, motor starters, and cables for the Low Service Pumps and the existing medium voltage motor starters and cables for the High Service Pumps. This upgrade, however, has been deferred to a future phase and the existing equipment will be used in the Phase 1 of the Project.

A condition assessment of the existing medium voltage motors, starters and cables will be conducted for the purpose of identifying problems that can be corrected as part of Phase 1. The intent is to prolong the life and improve the reliability of the existing equipment.

Hazardous Materials Assessment

A pre-renovation and pre-demolition asbestos inspection must be completed in accordance with Administrative Rules of Montana (ARM) 17.74.354, and in accordance with National Emissions Standards for Hazardous Air Pollutants (NESHAP), which require that an asbestos inspection be completed prior to a planned renovation or demolition of any facility or portion thereof.

Programmable Logic Controller Migration Plan and Performance Test of Partial Conversion

The Water Treatment Plant Facility Upgrades Project includes the installation of new programmable logic controllers (PLCs) for new equipment and replacement of some of the existing PLCs. The existing PLCs used at the water treatment plant (WTP) and remote sites are a mixture of GE 90-30 and GE Versamax Micro PLCs. The existing PLCs in the WTP are about 15 years old and the GE 90-30 PLCs are expected to be obsolete in the near future. For the long term, new PLCs will be needed to replace existing ones. In response to this situation, the Owner wants to develop a plan to migrate the existing PLC system to one of a modern platform.

The manufacturer of the existing PLCs has developed a new PLC, the GE PACSystem™ RX3i (RX3i). The RX3i has the capability to communicate with the existing PLCs and it can be used as a direct replacement for the existing 90-30 PLCs.

The Owner has selected the GE PACSystem RX3i as the manufacturer and model of the new PLCs for the WTP Facility Upgrade Project.

The migration plan is to determine how and when the existing PLCs need to be replaced and present the estimated construction costs for installing the new PLCs. To test the concept of incorporating the RX3i PLCs into the existing system, a partial conversion to a new PLC and subsequent performance tests of the conversion will be conducted. The partial conversion will consist of converting the existing Filter Building 90-30 PLC program to run on a GE RX3i PAC. The performance tests will be conducted through off-site bench-top testing. The existing Filter Building 90-30 PLC has been chosen for the partial conversion and performance test for the following reasons:

1. The filter building 90-30 has the most complex communications. It uses a programmable communications card with a custom program written in basic by Horner Electric that allows the PLC to be a Modbus Master. The card will be eliminated and the RX3i will become the new Modbus Master and it needs to directly interface with the MDS 9790B master radio in the control room. The RX3i will require some new programming to make that connection work. Without doing that first it cannot communicate with the RTUs that will be involved with the partial migration.

2. Almost all of the data used by the HMI and Historian in the Control Room is read or written to the 90-30 in the Filter Building now. The RX3i replacing the 90-30 will need to do the same. The HMI application will be changed to some extent, as will the PLC program, to duplicate that functionality. Again, the partial migration will depend on this part of the SCADA system working.

3. The RX3i at the Filter Building will need to demonstrate that it can reliably communicate with the different types of PLCs used in the RTUs. These include 90-30, Versamax, and other RX3i PLCs.

4. The 90-30 in the filter building has a lot of local I/O that will be moved to new Bases. As soon as the converted 90-30 program is installed in the RX3i, all of the I/O needs to be tested and validated.

5. Rather than work from the "outside in", meaning that RTUs are converted before the Master PLC, it would be prudent to get the core of the SCADA system (Master radio, Master PLC, HMI, and Historian) converted and working first and then move on to the RTUs.

As part of the migration plan the existing radio telemetry system will be evaluated to identify any potential deficiencies that would need to be addressed as part of PLC migration plan.

The Owner currently has the following PLCs in service:

WTP PLCS	REMOTE SITE PLCS
Filter Building Control Room	33rd Street Booster
Chlorine Room	Skyline Elevated Tank
Backwash Clarifier	Ella Elevated Tank
Headhouse	Gore Hill Booster Station[1]
	Gore Hill Elevated Tank
	Boston Heights Standpipes
	MAFB Flow Meter Pit
	Fire Station 1 Basement

1. The Boston Heights Components may be removed as this will be taken out of service.

Scope of Services

This scope of services specifically excludes services for detailed design, bidding, construction and commissioning phases for the improvements identified in:

- Task No. 262 – Develop Migration Plan for PLC Conversion
- Task No. 264 – Perform a Partial Conversion of Existing System to a RX3i PLC Based System and Test Performance
- Task 301 – Conduct Hazardous Materials Assessment
- Task 308 – Testing of Electrical Grounding

Detailed Design and Bidding Phase

Task 110A - Amend Project Work Plan

Activities

Distribute critical success factors; baseline scope; schedule; budget; staffing plan; communication plan; Quality Control Review Comment Procedures; Choice, Change, and Decision Impact on Baseline Project Scope, Schedule and Cost Register Procedures; and QA/QC plan to Owner and Consultant project team.

Deliverables

Electronic copy of Project Work Plan

Task 190 D – Continued Project Management & Controls

Deliverables

- Bi-Weekly Progress Meetings and Schedule Updates via Telephone
- Monthly Invoicing and Budget Status
- Updates to the Choice, Change, and Decision Impact on Baseline Project Scope, Schedule and Cost Register

Task No. 260 – Review Existing Documents & Data

Activities:

- Review information that Industrial Automation Consulting, Inc. (IAC) has on the existing system and determine the gaps in the information.
- Gather drawings and information on the existing control systems at the Water Plant, including those in the Filter Building, Pump Station, Head House, and Backwash Clarifier.
- Gather drawings and information for the remote sites comprising the water system infrastructure including Fire Station 1, Malmstrom AFB, Boston Heights, 33rd St, Ella, Gore Hill, and Skyline. These sites are generally either water storage structures, pump stations, or pressure/flow monitoring stations.

Information and Support from Owner:

- Electronic copy of Control Block Diagram/System Architecture, P&IDs, and schematics of existing control system.

Task No. 261 – Prepare As-built Drawings for Existing SCADA System

Activities:

- Conduct site visits to WTP and remote sites to review changes and confirm configuration of existing system.
- Where it is determined that the as-built documentation is incomplete, inaccurate, or simply unavailable, conduct additional site visits as required to obtain the information necessary for complete as-builts.
- Develop as-built drawings for the entire Supervisory Control and Data Acquisition (SCADA) system, end to end.
- Depending on the magnitude of the as-builts task, allow deferring some of the Work until a later time provided that it does not impede the migration to the RX3i PAC platform at the Filter Building.
- Prepare as-built drawings including Control Block Diagram/System Architecture, P&IDs, and schematics.

Deliverables:

- Electronic copy of as-built Control Block Diagram/System Architecture, P&IDs, and schematics.

Information and Support from Owner:

- Services of a technician employed by the Owner who has intimate knowledge of the SCADA system to assist with gathering information needed for the as-builts.

Task No. 262 – Develop Migration Plan for PLC Conversion

Activities:

- Develop a migration plan for effecting the change from the existing PLCs to the PACSystem RX3i PLCs, including an implementation plan that is phased over time. The migration plan will be based on the information and schematics on the existing SCADA system shown in Appendix D.
- Provide value engineering to determine where a different GE PLC platform, such as the GE Versamax or Durus PLC, would be more cost effective and appropriate replacement for certain existing PLCs than the RX3i, while satisfying all communications and control requirements.
- Address integration with HMI, changes to tagging structure, and communications.
- Define how the existing PLCs are to be replaced and what other control system modifications will be needed to accommodate the change in PLCs.
- Determine where the RX3i PAC, Versamax PLC, Durus PLC or other GE PLC platform should be used.
- Determine the protocols that are most suitable for each type of communications link used by the SCADA system.
- Evaluate the existing telemetry system including the Master telemetry radio, Repeater, and everything communicating with the Repeater (i.e., the 9710b and 9810b radios).
- Develop the performance requirements for any new telemetry equipment that will be used by the SCADA system.
- Develop a plan for what to do with the telemetry system, and define the steps involved with getting it done.
- Define the benefits and possible risks associated with replacing the telemetry system.

- Obtain accurate GPS coordinates and antenna heights for all telemetry antennas and towers.
- Conduct a complete software based radio path study.
- Prepare Summary Memorandum to include results of evaluations and recommendations for conversion of the existing PLCs.

Deliverables:

- Electronic copy of Summary Memorandum.

Information and Support from Owner:

- Consolidated, written review comments on summary memorandum.

Task No. 263 – Migration Plan for PLC Conversion Review

Activities:

- Review Migration Plan for PLC Conversion.
- Select preferred approach for migration.

Deliverables:

- Review workshop at Owner facilities.
- Review workshop agenda and minutes.

Task No. 264 – Perform a Partial Conversion of Existing System to a RX3i PLC Based System and Test Performance

Activities:

- Convert the Filter Building 90-30 PLC program to run on a GE RX3i PAC.
- Through bench-top testing, verify that the Wonderware Intouch application running on the HMI computer in the Filter Building Control Room is exchanging data properly with the Filter Building RX3i PAC.
- Through bench-top testing, verify that the Historian application running on computers in the Filter Building is still referencing the correct data in RX3i PAC as previously referenced in the 90-30 PLC.
- Through bench-top testing, verify that all real-time/historical trends displayed by the Historian for the previous 90-30 are still functioning properly with the RX3i PAC.
- After successfully migrating the Filter Building RX3i PAC, perform a similar bench-top test of the conversion/migration for a single RTU that is in direct communications with the Filter Building RX3i PAC.
- If a controller other than the RX3i PAC, such as the GE Versamax PLC, will be used as a 90-30 PLC, perform a migration to the alternate platform and validate the results.
- Prepare an opinion of probable construction costs (OPCC) for conversion of the existing PLCs.
- Amend the Migration Plan for PLC Conversion to incorporate the results and recommendations of the performance test of the partial conversion and to include the OPCC for conversion of the existing PLCs. The OPCC will be a Class 3 Estimate as defined by the Association for the Advancement of Cost Engineering.

Deliverables:

- Converted Filter Building 90-30 PLC program.
- Converted 90-30 PLC or VersaMax PLC program.

- If modifications are required to the Wonderware Intouch HMI application for the Filter Building control room the updated application will be provided.
- If modifications are required to data Historian and Historian Client applications the updated applications will be provided.
- Opinion of Probable Construction Costs to migrate the existing PLC system to an RX3i PLC based system.
- Amended Migration Plan.
- Electronic copy of amended Summary Memorandum.

Information and Support from Owner:

- Consolidated, written review comments on summary memorandum.
- All RX3i PAC, Rxi PAC, and alternate platform components furnished by Owner.
- Proficy Machine Edition programming Software for the PAC platform and alternate platforms furnished by the Owner.

Task No. 265 – Partial Conversion of Existing System and Performance Test Review

Activities:

- Review results of partial conversion and performance test.
- Review revised summary memorandum.

Deliverables:

- Conference call.
- Electronic copy of conference call agenda and minutes.

Task 289A - Owner Commission Presentations

Activities

Present Preliminary Engineering Report and Proposal for Detailed Design and Construction Phase Services to Owner Commission.

Deliverables

Two Owner Commission presentations.

Task 290A –Continued Determination of Location of Existing Buried Utilities

Continuation of hydro-vac excavation of assumed buried utility locations beyond those identified in the fall of 2013. Approximately 75 utilities are identified for exposure and field measurement. The initial locations of the buried utilities will be based on historical records and are only as accurate as the information available. This task does not ensure that we have accurately depicted all buried utilities.

Activities

- Identification of locations where existing piping, direct buried conduits, ground cables, handholes, and electrical duct banks is to be potholed and exposed.

- Inspection of external condition of exposed piping, ground wires, conduits, handholes, and duct banks.
- Surveying to determine coordinates and elevation of exposed pipe, conduits, and duct banks.

Deliverables

Horizontal locations and elevation of exposed pipe, conduits, flume and duct bank.

Information and Support Provided By Owner

- Equipment and labor to excavate and expose existing piping, conduits and ductbank, and backfill of excavation.
- Coordination with survey.

Task 294B – Continued Coordination with NW Energy

Initial authorization for services performed on a time and materials basis has been expended. Continued coordination is necessary to resolve conceptual design issues.

Black & Veatch proposes to spend up to 708 hours of professional time in coordinating with NW Energy to work through the modifications and/or replacement of the existing substation on a time and materials basis. The estimated fee associated with the708 hours of time is $105,336. Estimated travel related expenses are $14,124. The total fee is 119,460. This work will be performed on a time and materials basis.

Activities:

- Coordinate with NW Energy to obtain information needed: for design of the WTP electrical system, and either modification or replacement of the existing substation; and to resolve access into substation, required substation and easement area, service disconnect and metering facilities, physical dimensions and layout of the facilities.

Information and Support Provided By Owner:

- The Owner will contract with NW Energy to provide engineering services, cost estimates, drawings, layouts, specifications, information, and to coordinate with Black & Veatch.

Task 295 – Review of Design Deliverables by Industrial Automation Consulting

Activities

- Industrial Automation Consulting (IAC) will review and provide comments on the Phase 1 Drawings; and the 15%, 30%, 60% and 90% Detailed Design Documents.
- IAC will review P&ID drawings, control panel related drawings and specifications, instrument detail drawings, and specifications (narratives, loops, equipment).
- IAC will provide information on the Owner preferences for instrumentation and control features and equipment.

- IAC will participate in conference calls to answer questions, provide input and clarify review comments.

Deliverables

Electronic copy of review comments on design deliverables and information on instrumentation control features and equipment.

Task 301 – Conduct Hazardous Materials Assessment

The only hazardous materials anticipated are lead in paint and asbestos. An asbestos and lead paint inspection will be performed for the areas anticipated to be included in any future renovation.

Activities

- Industrial hygiene staff accredited as asbestos inspectors through the Montana Department of Environmental Quality (MDEQ) will perform the asbestos inspection of the interior and exterior of the buildings.
- The number of samples collected is dictated by law based on the number of homogeneous areas of suspect ACM. Based on a site visit, we have assumed the total number of bulk samples to be collected will not exceed 120 on a layer basis. The bulk buildings material samples will be shipped under chain-of-custody protocol to a laboratory recognized by the MDEQ and accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) for analysis using polarized light microscopy (PLM) for asbestos. Repair of sampling locations other than any minimal encapsulation necessary to prevent release of asbestos fibers will not be performed.
- In addition to field inspection and lab testing for asbestos materials, provide a document review of all available design drawings, as-recorded drawings, specifications and reports in search of indications asbestos-concrete (AC) pipe exists within the treatment plant site. Findings will ultimately be included in the investigation report including exhibits illustrating the pipe location, size and any other information identified in the research.
- Assess lead in paint using an X-ray fluoroscope (XRF). This instrument is the primary lead survey tool in accordance with the guidance developed by the U.S. Department of Housing and Urban Development (HUD) and applicable to work place safety regulations of the Occupational Safety and Health Administration (OSHA). Occasionally, interferences result in inconclusive XRF readings that require collection of paint chips for laboratory analysis. For purposes of this proposal, it is assumed that there will be no inconclusive result. The LBP data obtained during the inspection will be adequate to determine the proper handling and disposal of buildings components with LBP.
- To the extent feasible, inspect all areas for suspect materials. However, inaccessible spaces, potentially including confined spaces, may require additional investigation in the future when they become accessible. Areas not included in the inspection survey and/or sampling program will be identified in the report.
- A single report will be prepared to include the areas affected by the plant upgrade. Figures will be drafted to show sampling locations and locations of hazardous materials. Recommendations will be provided based on the survey results.

- Prepare mitigation opinion of construction cost estimates that are as concise as possible based on as-built documents and the results of the hazardous materials survey. Cost opinions will be a Class 5 Estimate as defined by the Association for the Advancement of Cost Engineering.

Deliverable(s)

- Electronic copy of report summarizing the results of the investigation and including an Opinion of Probable Construction Costs.

Information and Support from Owner

- Provide access to all existing facilities and specific locations identified for sample collection.

Task 302A – Continued Permitting Assistance and Coordination with Montana Department of Environmental Quality

Black & Veatch proposes to spend up to 468 hours of professional time in coordinating with MDEQ on the permitting related activities for the WTP Facilities Upgrade. The estimated fee associated with the 468hours of time is $74,744. Estimated travel related expenses are $4,504. The total fee is $79,248. This work will be performed on a time and material basis.

Activities

- Coordinate with MDEQ to address comments, provide information, and facilitate permitting of the modifications associated with the WTP Facility Upgrades Project.
- Prepare Public Water Supply Deviation Requests as requested by MDEQ.
- Develop documents that will need to be submitted to MDEQ for UV permit approval, including deliverables noted below.
- Assist MDEQ with development of permit language.
- Remote assistance with pre- or post-permit trial operating period if required by MDEQ.
- As needed SRF loan assistance
- Conduct and attend one four hour long meeting in Helena with MDEQ with two Black & Veatch professionals attending.

Deliverable(s)

- **UV Operations Plan** - Document reviewing the operating strategy and control philosophy for the UV system, specifically reviewing the following topics: (1) Monitoring strategy, algorithm development and UVDGM compliance; (2) Target pathogen and disinfection strategy; (3) Review of UV facility design conditions and treatment capacity; (4) UV system routine operating procedures; (5) Alarm conditions and system responses; (6) Off-specification avoidance, operation and response procedures; (7) Lamp break and mercury release concerns; (8) Maintenance and regular calibration check requirements; (9) Routine monitoring and data recording.
- **Lamp Break Standard Operating Procedure** – Development of standard operating procedures for the in the event of off-line or on-line lamp break events and response to mercury release concerns.

- **Startup/Commissioning Memorandum** – Memorandum outlining results of startup and performance testing confirming proper system operations via comparison of test data to expected performance from the reactor validation.
- **Monthly Reporting Format / Tables** – Development of tables used by Great Falls WTP staff for monthly reporting to MDEQ. Tables will be developed based on the recommendations of the UVDGM and input from MDEQ, modified where necessary to reflect the specific operating parameters of the Wedeco K143 12/3 UV system.
- **List of Spare Parts** – Prepare a list of recommended spare parts to be kept on hand for the UV disinfection system.
- **Recording Keeping** – Prepare a memorandum describing the records to be kept for the operation and maintenance of the UV disinfection system.
- **Safety** – Prepare memorandum outlining safety precautions and procedures for operating, maintaining and cleaning the UV disinfection system.

Information and Support from Owner

- Review and input on draft deliverables above outlined prior to submittal to MDEQ.

Task 303 – On-call Surveying

Black & Veatch proposes to budget $9,510.00 for professional engineering and surveying tasks associated with miscellaneous topographic surveying not anticipated for typical detailed design activities. This work will be performed on a time and material basis in accordance with contract labor rates and expenses.

Activities

- Office preparation and processing electronic survey files.
- Topographic surveying of surface features for establishing base drawings.

Deliverables

- Electronic copy of topographic maps and field data.

Information and Support from Owner

- Provide access to all existing facilities and specific locations identified for topographic surveying.

Task 304 – Prepare Contractor Information Package for IAC Construction Services

Activities

- Prepare a Contractor Information Package consisting of the scope of services, terms of conditions, and the schedule for performing the services for construction to be included as part of the Project Manual.
- Prepare a list of preferred equipment to be used on the project.
- Prepare a proposal to the Owner containing the scope of services, schedule, fee, and terms of conditions for construction services.

Deliverables

- Electronic copy of draft and final Contractor Information Package
- Electronic copy of draft and final proposal to Owner
- List of preferred equipment

Information and Support from Owner

- Written review comments on the Contractor Information Package consolidated and listed in the Reviewer portion of the Quality Control Review Comments.
- Written review comments on the proposal to Owner consolidated and listed in the Reviewer portion of the Quality Control Review Comments.

Task 306 – Prepare Contractor Information Package for Wedeco K143 12/5(6) UV Reactors

A Contractor Information Package, as defined in Section 13700, Paragraph 1-4.02 of the Project Manual for the UV Light Disinfection Equipment Pre-selection will be prepared and included in the Project Manual for Phase 1 of the Water Treatment Facility Upgrades Project. In addition, the submittal for the UV Disinfection Equipment will be submitted to and reviewed by Black & Veatch. The revised submittal will be included in the Contractor Information Package. The general contractor will be required to submit the revised submittal for approval.

Activities

- Prepare and submit a Contractor Information Package, as defined in Section 13700, Paragraph 1-4.02 of the Project Manual for the UV Light Disinfection Equipment Pre-selection.
- Prepare and submit the Submittal for UV Disinfection Equipment. Submittal to be in accordance with the Project Manual for the UV Light Disinfection Equipment Pre-selection.
- Revise the Submittal and the Contractor Information Package for the UV Light Disinfection Equipment to address review comments from the Owner and Black and Veatch.

Deliverables

- Electronic copy of draft and final Submittal and Contractor Information Package

Information and Support from Owner

- Consolidated, written review comments on the draft Submittal and Contractor Information Package

Task 308 – Testing of Electrical Grounding

Activities

- Perform testing of the electrical grounding of the existing motor starters and motors for the Low and High Service Pumps, motors for the High Service Pumps, and the cables between the motors and motor starters for the Low and High Service Pumps.
- Conduct Fall of Potential Test in accordance with IEEE 81 Standard.

- Conduct point-to-point ground verification for motor starters and motors for Low and High Service Pumps.

Deliverables

- Electronic copy of report summarizing the results of the testing of the electrical grounding..

Information and Support from Owner

- Access to all equipment to perform testing.

Task 310 - 15% Detailed Design & Basis of Design Memorandum

Activities

- Prepare Schematic and Spatial Design Package Containing: Equipment Lists, Process Equipment Info & Control Functions, Process Flow Diagrams, P&IDs and Control Strategy/Descriptions, Control System Block Diagram, Hydraulic Profile, Updated Facility Layouts / Floor plans, Updated Site Plan, Preliminary Geotechnical & Foundation Drain Information, Chemical Storage and Feed Schematics, Chemical Storage and Feed Criteria Tables, Equipment Tagging Standards, Communication Systems, Security Systems, Utility Requirements, Discipline Design Guidelines and Criteria, Consolidated Basis of Design Memo, Topographic Survey of areas that are known to be needed.
- Coordinate with BNSF Railroad on the utility crossing of the existing rail line.
- Investigate location of future sludge line through Bid Alternate No. 2 improvements.
- Conduct a workshop to define control system standards.
- Conduct internal quality control review.

Deliverables

- Control Systems Workshop. Workshop to be four hours long. Two representatives from Black & Veatch and one representative from IAC will attend the workshop.
- Electronic copy of agenda and minutes for Control Systems Workshop
- Electronic copy of 15% Design Package
- 15% Design Review Meeting. Meeting to be four hours long and conducted using Live Meeting. A representative from Black & Veatch, TD&H Engineering and LPW Architects will attend the meeting and other Consultant Team members will participate via Live Meeting.
- Electronic copy of agenda and minutes of Review Meeting
- Electronic copy of Designer Response to Quality Control Review Comments received from Owner on draft Phase 1 Drawings

Information and Support from the Owner

- Written review comments on the 15% design package consolidated and listed in the Reviewer portion of the Quality Control Review Comments.

Task 320 - 30% Detailed Design

Activities

- Prepare 30% Design Package Containing: Front End Contract Documents, Civil/Site Drawings & Details, Geotechnical Report, Final Hydraulic Profile, Facility Equipment & Piping Sections, Process Equipment Specifications, Architectural CAD Plans for Buildings, Architectural Elevations, Major Building Sections, Prelim Structural Design (preliminary foundation, floor and roof plans), Column Row Locations & Floor Elevations, Code Classification Table, Locate HVAC & Plumbing Equipment, Locate Electrical & I&C Equipment, Updated Power Distribution Diagram, Update Control System Block Diagram, Updated P&IDS and Control Descriptions, I&C I/O Lists & Device Schedules, Updated Opinion of Probable Construction Cost (AACE Class 3 Estimate).
- Provide in the specifications a list of the permits that must be obtained by the construction contractor including those for railroad crossings, fire protection, and utility services.
- Conduct internal quality control review.

Deliverables

- Electronic copy of 30% Design Package
- 30% Design Review Meeting. Meeting to be four hours long and conducted using Live Meeting. A representative from Black & Veatch, TD&H Engineering and LPW Architects will attend the meeting and other Consultant Team members will participate via Live Meeting.
- Electronic copy of agenda and minutes of Review Meeting
- Electronic copy of Designer Response to Quality Control Review Comments received from Owner on 15% Design Package

Information and Support from the Owner

- Written review comments on the 30% design package consolidated and listed in the Reviewer portion of the Quality Control Review Comments.

Task 330 - 60% Detailed Design

Activities

- Prepare 60% Design Package Containing: Updated Civil/Site Drawings & Details, Yard Piping & Underground Utility Drawings, Updated Equipment & Piping Floor Plans, Process Equipment Sections & Details, Updated Process Equipment Specifications, Pipe, Valve, Bldg Material, Concrete Specs, Architectural Floor/Roof Plans, Architectural Wall Sections, Architectural Schedules, Structural Foundation and Framing Plans & Sections, Plumbing & Fire Protection System Drawings, Plumbing Schedules, HVAC Plans & Equipment Schedules, Power Plans, Lighting Plans, Electrical Fixture Schedules, Duct Bank & Site Lighting Drawings, Final Equipment Control Descriptions, Final P&IDs, Final I/O Lists, Instrument Device Schedules, Updated Opinion of Probable Construction Cost (AACE Class 3 Estimate).
- Conduct internal quality control review.

Deliverables

- Electronic copy of 60% Design Package
- 60% Design Review Meeting. Meeting to be four hours long and conducted using Live Meeting. A representative from Black & Veatch, TD&H Engineering and LPW Architects will attend the meeting and other Consultant Team members will participate via Live Meeting.
- Electronic copy of agenda and minutes of Review Meeting
- Electronic copy of Designer Response to Quality Control Review Comments received from Owner on 30% Design Package

Information and Support from the Owner

- Written review comments on the 60% design package consolidated and listed in the Reviewer portion of the Quality Control Review Comments.

Task 340 - 90% Detailed Design

Activities

- Prepare 90% Design Package Containing: Complete Front End Documents, Complete Technical Specifications, Complete Drawings & Details, And Updated Opinion of Probable Construction Cost (AACE Class 2 Estimate).
- Conduct internal quality control review.

Deliverables

- Electronic copy 90% Design Package
- Electronic copy of submittal of Permitting Application Packages to Required Agencies.
- Electronic copy of Designer Response to Quality Control Review Comments received from Owner on 60% Design Package

Information and Support from the Owner

- Written review comments on the 90% design package consolidated and listed in the Reviewer portion of the Quality Control Review Comments.

Task 345 - 90% QA/QC Review & Permitting Agency Reviews

Activities

- Submit electronic copy of drawings, specifications, and contract documents to regulatory and code agencies for review and approval.
- Conduct Owner Review.

Deliverables

- 90% Internal QA/QC Review

- 90% Design Review Meeting. Meeting to be four hours long and conducted using Live Meeting. A representative from Black & Veatch, TD&H Engineering and LPW Architects will attend the meeting and other Consultant Team members will participate via Live Meeting.
- Electronic copy of agenda and minutes of Review Meeting
- Designer Response to Quality Control Review Comments received from Owner on 90% Design Package

Task 350 - 100% Detailed Design

Activities

Incorporate 90% review comments and prepare bid ready drawings, specifications, and contract documents.

Deliverables

- Electronic copy of 100% Design Package
- Designer Response to Quality Control Review Comments received from Permitting Agencies on 90% Permitting Review Design Package

Task 360 – Bidding Assistance and Contracting

Activities

- Assist and advise Owner in placing the Invitation to Bid.
- Distribute copies of the Invitation to Bid.
- Reproduce copies of construction contract documents and geotechnical report for distribution to potential bidders.
- Distribute construction contract documents to potential bidders.
- Maintain list of bidders.
- Administer pre-bid conference.
- Respond to bidder questions and requests for clarification.
- Prepare addenda to contract to answer bidder questions. Distribute addenda to potential bidders.
- Attend bid opening.
- Review bids and prepare bid evaluation
- Review bidder qualifications and project experience, contact bidder references, review proposed equipment and material manufacturers, etc.
- Meet with Owner to discuss preliminary evaluation of bids and bidders.
- Tentative award recommendation

Deliverables

- Copies of construction contract documents.

- Electronic copy of addenda
- Bid evaluation
- Recommendation of award

Task 361 – Contingency Task for Detailed Design and Bidding Phases

Activities and deliverables will be provided on an as-needed basis and authorized by the Owner to cover additional services, including those for the detailed design and construction phase services related to the Hazardous Materials Assessment, PLC Conversion, testing of the electrical grounding system, Potholing of buried utilities or other unforeseen engineering activities.

Construction and Commissioning Phase

Task 190 E – Continued Project Management & Controls

Deliverables

- Bi-Weekly Progress Meetings and Schedule Updates via Telephone
- Monthly Invoicing and Budget Status

Task 410 - Construction Admin Support Services

Engineer will perform services during the construction phase of the project. By performing these services, Engineer shall not have authority or responsibility to supervise, direct, or control the Contractor's work or the Contractor's means, methods, techniques, sequences, or procedures of construction. Engineer shall not have authority or responsibility for safety precautions and programs incident to the Contractor's work or for any failure of the Contractor to comply with laws, regulations, rules, ordinances, codes, or orders applicable to the Contractor furnishing and performing the work.

Activities

- Contractor’s Schedule ~ Determine if Contractor’s schedule is consistent with the construction contract documents with emphasis on milestone dates, construction sequencing, and operation of existing facilities during construction. Engineer’s review shall not include an analysis of Contractor’s approach, means or methods of construction to perform the work specified in the construction contract documents.
    - Review and comment upon the Contractor's initial construction schedule
    - Review and comment upon updated schedules monthly
- Contractor’s Estimates of Monthly Payments ~ Review the Contractor's initial and updated schedule of estimated monthly payments and advise Owner as to acceptability.
- Contractor’s Guarantees, Bonds, and Certificates ~ Receive guarantees, bonds, and certificates of inspection, and tests and approvals that are to be assembled by the Contractor. Review for completeness in accordance with the construction contract documents and transmit them to Owner.
- Shop Drawing Review ~ Review drawings and other data submitted by the Contractor as required by the construction contract documents. Engineer's review shall be for general conformity to the construction contract documents and shall not relieve the Contractor of any

of his contractual responsibilities. Such reviews shall not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions and programs incident thereto.

10. Requests for Information, Change Orders, and Claims ~ The level of effort included for the following services is 400 work hours. Any additional effort related to this task shall be considered as supplemental services.

    a. Requests for Information. ~ Interpret construction contract documents when requested by Owner or the Contractor. Requests for clarification or information shall be in writing and copies of Engineer's response shall be distributed to Owner.

    b. Change Orders ~ Review Owner or Contractor requests for project changes.

    - Review documentation
    - Prepare any additional documentation required
    - Administer the processing of change orders
    - Review applications for extension of construction time.
    - Evaluate the cost and scheduling
    - Submit recommendations to Owner
    - Assist Owner in negotiations with Contractor to obtain a fair price for the work.

    c. Claims ~ Act on claims of Owner and the Contractor relating to the acceptability of the work or the interpretation of the requirements of the construction contract documents.

- Performance Testing of Equipment ~ Analyze data from performance testing of equipment by the Contractor or supplier when the construction contract documents require the equipment to be tested after installation. Submit conclusions to Owner.
- Contractor Pay Requests ~ Review and process the Contractor's monthly payment requests, and forward to Owner if appropriate. Engineer's review shall be for the purpose of making a full independent mathematical check of the Contractor's payment request. Engineer is responsible for verifying the quantities of work which are the basis of the payment requests.
- Drawings Conformed to Construction Records ~ Upon completion of the project; revise the construction contract drawings to conform to the construction records. Submit to Owner in Revit software format.
- Conduct Control System Configuration Meetings with UV Disinfection System programmer and the Owner's Configuration Contractor. Prepare agenda and minutes.

Deliverables

- Contractor Schedule Review, Review Estimates of Payments, Shop Drawing Review, RFI Review & Response, Change Order & Claims Review, Drawings Conformed to Construction Records
- Conduct two eight hour long Control System Configuration Meetings with UV Disinfection System programmer and the Owner's Configuration Contractor.
- Electronic copy of agenda and minutes for the Control System Configuration Meetings with UV Disinfection System programmer and the Owner's Configuration Contractor

Task 420 - Field Support Services

Activities

- Preconstruction Conference ~ Conduct the preconstruction conference at a date and time selected by Owner and at a facility provided by Owner Elements of the conference include:

    - Agenda prepared by Engineer
    - Engineer prepare and distribute minutes
    - Discussion of Contractor's tentative schedules
    - Procedures for transmittal and review of Contractor's submittals
    - Special Inspections Program
    - Processing applications for payment
    - Critical work sequencing
    - Change orders
    - Record documents
    - Contractor's responsibilities for safety and first aid
- Construction Progress Review Meetings ~ Visit the construction site to observe progress of the work, and consult with the Owner and the Contractor. A total of 50 meetings are included.
- Site Visits ~ Project design team personnel with particular areas of responsibilities for the project shall visit the site to observe construction and to confer with Owner and Contractor. Site visits will be as-needed throughout the construction contract.
- Photographic Records ~ Provide, through a subcontract, photographic records of the project.
    - Construction site prior to the start of the construction to assist in defining the original condition of existing physical features, including, but not limited to, pavement, curb and gutter, lawns, shrubs, trees, ditches, fences, sidewalks, buildings, and structures that are located within the limits of construction.
    - Periodic views showing construction progress and elements that will be covered by subsequent construction
-
- Punch List ~ Upon substantial completion, inspect the construction work and prepare a punch list of those items to be completed or corrected before final completion of the project. Submit results of the inspection to Owner and the Contractor. Site inspection, punch list preparation and review of contractor status will be conducted as necessary.
- Final Inspection ~ Upon completion or correction of the items of work on the punch list, conduct a final inspection to determine if the work is completed. Provide written recommendations to Owner concerning final payment, including a list of items, if any, to be completed prior to making such payment. Site inspection and review of contractor status will be conducted as necessary.

Deliverables

Preconstruction Conference, Construction Progress Meetings, Periodic Site Visits, Substantial Completion Inspection, Final Completion Inspection

Task 425 – Structural Tests and Special Inspections

Appendix E presents the Duties, Responsibilities and Limitations of Authority of the Special Inspections Representative.

Activities

- Serve as the Registered Design Professional in Responsible Charge of Construction as defined in IBC 107.3.4.1 for the disciplines of structural engineering, geotechnical engineering, mechanical engineering, electrical engineering, and architectural.
- Prepare the Statement of Special Inspections

Deliverables

- Statement of Special Inspections

Information and Support from the Owner

- Conduct tests and inspections as required by 01450 Structural Tests and Special Inspections.

Task 430 - Onsite Resident Project Representative Services During Construction

Appendix F presents the Duties, Responsibilities and Limitations of Authority of the Resident Project Representative.

Activities

- Provide Resident Project Representative Services

Deliverables

- Site Inspection and Observation, Owner and Contractor Liaison, Engineer Liaison, Outside Agency Liaison, Preconstruction Conference, Construction Progress Meetings, Progress Reporting , Schedule Reviews, Pay Request Processing, Photographic Records, Materials Testing Coordination, Jobsite Files, Daily Log Book, Equipment Testing & Startup, Substantial Completion Inspection, Final Completion Inspection

Task 440 - O&M Manuals

Activities

- Prepare an electronic O&M manual for the UV disinfection system, liquid ammonium sulfate storage and feed system, and the electrical switchgear and procedures that will be added as part of Phase 1. Electronic O&M manual is to be capable of being upgraded by the Owner to include the existing equipment and procedures.
- Prepare the O&M manual content in the format as described below for each unit process:
    - **Overview.** A short, concise description of each unit process identifying the purpose of the equipment within each system. Photographs of major equipment embedded in text.
    - **General Operating Strategy.** A general description of controls. This includes the functional descriptions prepared by PLC/SCADA programmer.

- **Process Flow Schematics.** Simplified figures from the contract drawings and embedded within applicable chapters. These will be located in the first section of the chapter.
- **Key Performance Indicators.** Tabular format of process parameters which the operators either control or monitor the process. Provides target ranges of each of the parameters.
- **Process Troubleshooting.** A list of process alarms and fault conditions showing possible causes and suggested responses. This will be in tabular form.

Deliverables

- Electronic copy of draft and final Part 1 - Operations Plan
- Electronic copy of draft and final Part 2 - Maintenance Plan
- Electronic copy of draft and final Part 3 - Manufacturer's O&M Manuals

Information and Support from the Owner

- Written review comments on the draft documents consolidated and listed in the Reviewer portion of the Quality Control Review Comments.

Task 450 - Start-up Assistance, Training, & Post-Construction Activity

Activities

- Pre- & Post-start-up Training
  - UV 101 and applications training (1 trip, multiple sessions over 1 week period) – goal is to provide additional background training on UV disinfection and role of UV system in disinfection strategy for Great Falls WTP.
  - Participation in Xylem provided Operations and Maintenance training (includes total of 6 sessions for 8 hrs. each: 3 maintenance and 3 operation sessions) – goal is to provide B&V presence during the training sessions provided by Xylem observe and provide assistance
- Start-up Assistance
- Performance Testing
  - Review/approval of Xylem prepared protocols
  - On-site supervision of testing by Xylem personnel (1 week on-site)
  - Analysis of test data
  - Review/approval of performance test report prepared by Xylem
- Operational Consultation

Deliverables

- UV 101 Applications Training
- Agenda and handouts for UV 101 Applications Training

Task 451 – Contingency Task for Construction and Commissioning Phases

Activities and deliverables will be provided on an as-needed basis and authorized by the Owner.

Schedule

The schedule for the Detailed Design and Bidding Phases is shown in the following graphic. The schedule is based on the following: 1) it is independent of the schedule for completing the services associated with replacing the NW Energy Substation and coordinating with NW Energy, 2) it does not regard the time NW Energy needs to complete their services, 3) it is based the revised BIM Workflow Model that the Engineer will use for executing the services for detailed design. The schedule may or may not allow for completion of the services related to the NW Energy Substation. The approach is to continue to attempt to advance the design of the replacement of the NW Energy Substation. The Owner will decide at the time of bidding the construction of the Phase 1 as to whether the Alternate Bid Item No. 1 – Replacement of the NW Energy Substation will be included in the Phase 1.

The Opinion of Probable Schedule for the construction of Phase 1 is 24 months from the notice to proceed for construction.

Fees

The fees for the Detailed Design, Bidding, Construction and Commission Phase services are shown in the following table. The fees assume: 1) one construction contract, 2) preparation of one bid package, 3) a 24 month construction duration, 3) the conceptual design of Phase 1 shown in the Task 282C Phase 1 Drawings contained in Appendix A, and 4) the information and schematics on existing SCADA System shown in Appendix D.

Appendix A – Task 282 C Phase1 Drawings

Appendix B – Preliminary List of Drawings

List of Drawings for Phase 1 of the Water Treatment Facility Upgrades

Discipline	Sub-Discipline		Sheet No.	Drawing No.	Title
General Drawings					
				GL-1	Sheet List
				GL-2	Legend and Abbreviations
Civil Site Development					
	General Civil Site Plans				
				GC-1	Overall Site, Access & Staging Plan
	Demolition				
				SR-1	West Site Demolition Plan
				SR-2	West Site Demolition Plan – Base Bid + Bid Alternate No. 1
				SR-3	Central Site Demolition Plan
				SR-4	East Site Demolition Plan
				SR-5	East Site Demolition Plan – Base Bid + Bid Alternate No. 2
	Site Grading Plans				
				TG-1	West Site Grading Plan
				TG-2	West Site Grading Plan – Base Bid + Bid Alternate No. 1
				TG-3	Central Site Grading Plan
				TG-4	East Site Grading Plan
				TG-5	East Site Grading Plan – Base Bid + Bid Alternate No. 2
	Site Piping Plans				
				SD-1	West Site Piping Plan
				SD-2	Central Site Piping Plan
				SD-3	East Site Piping Plan – Bid Alternate No. 2
	Landscaping				
				LA-1	West Landscape Plan
				LA-2	West Landscape Plan – Base Bid + Bid Alternate No. 1
				LA-3	Central Landscape Plan
				LA -4	East Landscape Plan

Discipline	Sub-Discipline		Sheet No.	Drawing No.	Title
				LA-5	East Landscape Plan – Base Bid + Bid Alternate No. 2
	Yard Structures				
				SY-1	Expanded Yard Piping Plans
				SY-2	Expanded Yard Piping Plans
				SY-3	Electrical Room Addition Foundation Drain Plan
				SY-4	Chemical Feed and UV Disinfection Building Foundation Drain Plan
				SY-5	Yard Piping Profiles
				SY-6	Yard Structures
				SY-7	Civil Details 1
				SY-8	Civil Details 2
				SY-9	Civil Details 3
				SY-10	Electrical Room Addition Foundation Drain Pump Station Plan & Details
				SY-11	Chemical Feed and UV Disinfection Building Foundation Drain Pump Station Plan & Details
Architectural					
	Administration Building Addition				
				AA-1	Code Plan / Overall Floor Plan
				AA-2	Main Level Floor Plan
				AA-3	Plan Details
				AA-4	Roof Plan / Roof Details
				AA-5	Building Sections
				AA-6	Building Sections
				AA-7	Wall Sections
				AA-8	Wall Sections
				AA-9	Section Details
				AA-10	Exterior Elevations
				AA-11	Exterior Elevations
				AA-12	Interior Elevations
				AA-13	Door and Window Schedules
				AA-14	Door and Window Details

Discipline	Sub-Discipline		Sheet No.	Drawing No.	Title
				AA-15	Millwork Details
				AA-16	Reflected Ceiling Plan
				AA-17	Finish Floor Plan / Schedule
	Chemical Feed and UV Disinfection Building				
				AC-1	Code Plan
				AC-2	Lower Level Floor Plan / Details
				AC-3	Main Level Floor Plan / Details
				AC-4	Roof Plan / Roof Details
				AC-5	Building Sections
				AC-6	Wall Sections
				AC-7	Section Details
				AC-8	Exterior Elevations
				AC-9	Door and Window Schedules / Details
				AC-10	Exterior Elevations
				AC-11	Exterior Elevations
				AC-12	Door and Window Schedules / Details
				AC-13	Finish Floor Plan / Schedule
	Pump Station Modifications				
				AP-1	Code Plan / Overall Floor Plan
				AP-2	Lower Level Floor Plan / Main Level Floor Plan
				AP-3	Roof Plan / Roof Details
				AP-4	Building Sections
				AP-5	Wall Sections
				AP-6	Section Details
				AP-7	Exterior Elevations
				AP-8	Exterior Elevations
				AP-9	Door and Window Schedules / Details
				AP-10	Finish Floor Plans

Discipline	Sub-Discipline		Sheet No.	Drawing No.	Title
	Surge Tank				
				AS-1	Floor Plan
				AS-2	Building Sections
				AS-3	Wall Sections
				AS-4	Roof Plan / Details
Civil					
	Chemical Feed and UV Disinfection Building				
				CC-1	Upper Level Floor Plan
				CC-2	Lower Level Floor Plan
				CC-3	Sections
				CC-4	Sections and Details
	Head House Modifications				
				CH-1	Chlorine Room Plan
				CH-2	Chlorine Storage Room Plan
	Surge Tank				
				CS-1	Surge Tank Civil Floor Plan
				CS-2	Surge Tank Civil Sections
				CS-3	Surge Tank Civil Sections
				CS-4	Surge Tank Civil Details
				CS-5	Surge Tank Civil Details
	General				
				GC-1	
				GC-2	
Structural Drawings					
	Administration Building Addition				
				SA-1	General Structural Specs
				SA-2	General Structural Specs

Discipline	Sub-Discipline		Sheet No.	Drawing No.	Title
				SA-3	Foundation Plan
				SA-4	Main Floor Plan
				SA-5	Roof Plan
				SA-6	Section Views
				SA-7	Section Views
				SA-8	Section Views
				SA-9	Section Views
				SA-10	Detail Views
				SA-11	Detail Views
				SA-12	Detail Views
				SA-13	Detail Views
				SA-14	Detail Views
	Chemical Feed and UV Disinfection Building				
				SC-1	General Structural Specs
				SC-2	General Structural Specs
				SC-3	Foundation Plan
				SC-4	Lower Level Plan
				SC-5	Main Floor Plan
				SC-6	Roof Plan
				SC-7	Section Views
				SC-8	Section Views
				SC-9	Section Views
				SC-10	Section Views
				SC-11	Detail Views
				SC-12	Detail Views
				SC-13	Detail Views
				SC-14	Detail Views
				SC-15	Detail Views
	Head House Modifications				

Discipline	Sub-Discipline		Sheet No.	Drawing No.	Title
				SH-1	General Structural Specs
				SH-2	Main Level Demolition/Modification Plan
				SH-3	Level 2 Demolition/Modification Plan
				SH-4	Detail Views
				SH-5	Detail Views
	Pump Station Modifications				
				SP-1	General Structural Specs
				SP-2	General Structural Specs
				SP-3	Foundation Plan
				SP-4	Basement Level Plan
				SP-5	Main Level Plan
				SP-6	Roof Plan
				SP-7	Section Views
				SP-8	Section Views
				SP-9	Section Views
				SP-20	Section Views
				SP-11	Detail Views
				SP-12	Detail Views
				SP-13	Detail Views
				SP-14	Detail Views
				SP-15	Detail Views
				SP-15	Level 1 Demolition/Modifications Plan
				SP-16	Detail Demolition/Modification Views
	Surge Tank				
				SS-1	General Structural Specs
				SS-2	Foundation Plan
				SS-3	Floor Plan
				SS-4	Section Views
				SS-5	Section Views

Discipline	Sub-Discipline		Sheet No.	Drawing No.	Title
				SS-6	Detail Views
				SS-7	Detail Views
	NW Energy Metering and Service Disconnect Building				
				SM -1	General Structural Specs
				SM-2	Foundation Plan
				SM-3	Floor Plan
	General				
				GS-1	Overall Project General Structural Specs
HVAC Drawings					
	Administration Building Addition				
				HA-1	Administration Building Addition Floor Plan
				HA-2	Filter Building Locker Room Addition Floor Plan
				HA-3	Sections
	Chemical Feed and UV Disinfection Building				
				HC-1	Administration Building Addition Floor Plan
				HC-2	Filter Building Locker Room Addition Floor Plan
				HC-3	Sections
	Pump Station Modifications				
				HP-1	Floor Plan
				HP-2	Roof Plan
	General				
				GH-1	Schedules
				GH-2	Sequence of Operation and Details
Plumbing Drawings					
	Administration Building Addition				
				PA-1	Floor Plan – Water Supply
				PA-2	Floor Plan - Drainage
				PA-3	Piping Isometric Diagrams

Discipline	Sub-Discipline		Sheet No.	Drawing No.	Title
	Chemical Feed and UV Disinfection Building				
				PC-1	Floor Plan – Water Supply
				PC-2	Floor Plan - Drainage
				PC-3	Piping Isometric Diagrams
	Head House Modifications				
				PH-1	Lower Level Floor Plan
	General				
				GP-1	Schedules
				GP-2	Details
Instrumentation & Control Drawings					
				I-1	P&ID Legend & Abbreviations
				I-2	P&ID Legend & Abbreviations
				I-3	P&ID UV Disinfection Systems
				I-4	P&ID Liquid Ammonia Storage System
				I-5	P&ID Liquid Ammonia Feed System
				I-6	Control System Block Diagram
				I-7	Instrument Installation Details
Electrical Drawings					
	Administration Building Addition				
				EA-1	Administration Building Power Plan - Alternate Bid Item No. 2
				EA-2	Administration Building Lighting Plan - Alternate Bid Item No. 2
				EA-3	Admin Bldg One-line diagrams - Alternate Bid Item No. 2 Misc starters, power panel, UPS system
				EA-4	Admin Bldg One-line diagrams - Alternate Bid Item No. 2. FACP, Comm, Telephone, Security
				EA-5	Admin Bldg one-lines & Schematics - Alternate Bid Item No. 2 HVAC, Entrance Gate
				EA-6	Admin Bldg Schedules and Details - Alternate Bid Item No. 2 Panelboard and Lighting Schedules

Discipline	Sub-Discipline		Sheet No.	Drawing No.	Title
	Chemical Feed and UV Disinfection Building				
				EC-1	Chemical Feed & UV Disinfection Building Power Plan Upper Level
				EC-2	Chemical Feed & UV Disinfection Building Power Plan Lower Level
				EC-3	Chemical Feed & UV Disinfection Building Lighting Plan Upper Level
				EC-4	Chemical Feed & UV Disinfection Building Lighting Plan Lower Level
				EC-5	Chemical Feed & UV Disinfection Building One-line diagrams LV Switchgear 1A & 1B and Elevation
				EC-6	Chemical Feed & UV Disinfection Building One-line diagrams MCC - 1 & 2 and Elevations
				EC-7	Chemical Feed & UV Disinfection Building One-line diagrams UV Disinfection and Chemical Equipment One-line diagrams
				EC-8	Chemical Feed & UV Disinfection Building One-line diagrams LAS Chemical Equipment One-line diagrams
				EC-9	Chemical Feed & UV Building One-line diagrams FACP, Comm, Telephone, Security, and Vent Failure Alarm Panels
				EC-10	Chemical Feed & UV Disinfection Building One-line diagrams PLC one-line diagram and Valve Actuators
				EC-11	Chemical Feed & UV Disinfection Building One-lines & Schematics HVAC
				EC-12	LV Genset One-line Diagrams Gen Cntl Panel and power panel
				EC-13	Chemical Feed & UV Disinfection Building Schedules Panelboard and Lighting Schedules
	Head House Modifications				
				EH-1	Head House Power Plans Levels 1 and 2
				EH-2	Head House Power Plans Basement Floor - Alternate Bid Item No. 2
				EH-3	Head House One-Line Diagrams Demo and Modification
				EH-4	Locker Room - 1916 Filter Area
				EH-5	Schedules Panelboards
	Pump Station Modifications				

Discipline	Sub-Discipline		Sheet No.	Drawing No.	Title
				EP-1	Existing Pump Station Demolition Power Plan
				EP-2	MV Switchgear Demolition One-line Diagram
				EP-3	LV Distribution Demolition One-line Diagram
				EP-4	Pump Station Power Plan Level 1
				EP-5	Pump Station Electrical Room Addition Power Plan Main Level
				EP-6	Pump Station Electrical Room Addition Power Plan Main Level Alternate Bid Item No. 2
				EP-7	Pump Station Electrical Room Addition Lighting Plan Main Level
				EP-8	Pump Station Electrical Room Addition Lighting Plan Main Level Alternate Bid Item No. 2
				EP-9	Pump Station Electrical Room Addition Power Plan Basement Level (Floor & Wall Penetrations)
				EP-10	Pump Station Electrical Room Addition Lighting Plan Basement Level
				EP-11	5 kV Main Switchgear One-line Diagram PDFD and Protective Relaying
				EP-12	5 kV Main Switchgear One-line Diagram - continued PDFD and Protective Relaying
				EP-13	5 kV Main Switchgear One-line Diagram - continued PDFD and Protective Relaying
				EP-14	5 kV Main Switchgear One-line Diagram Power and Control Connections
				EP-15	Pump Station One-line Diagrams 125Vdc Switchgear Control Power Panel
				EP-16	Pump Station MV Breaker Schematics Main, Tie, and Feeder
				EP-17	Pump Station One-line Diagram LV Switchgear 2 One-line Diagram and Elevation
				EP-18	Irrigation Pump One-line Diagram and Schematic MCC-IRR
				EP-19	Pump Station One-line Diagrams MCC-3 and 4 One-lines and Elevations
				EP-20	Pump Station One-line Diagrams Panel P1
				EP-21	Pump Station One-line Diagrams Panel P2
				EP-22	Pump Station One-line Diagrams Panel P3
				EP-23	Pump Station One-Lines HVAC and misc starters
				EP-24	Pump Stations One-lines FACP and Telephone

Discipline	Sub-Discipline		Sheet No.	Drawing No.	Title
				EP-25	Pump Stations One-lines Security and Communications
				EP-26	Pump Station PLC One-line Modifications
				EP-27	Pump Station PLC One-line Modifications
				EP-28	Pump Station PLC One-line Modifications
				EP-29	Pump Station Schematics HVAC and misc starters
				EP-30	Pump Station Schedules Panelboards
				EP-31	Pump Station Schedules Panelboard and Lighting Schedules
	Surge Tank				
				ES-1	Surge Tank Plan
				ES-2	Miscellaneous Details
	NW Energy Substation				
				EN-1	NWE Substation One-line Diagram Modifications
				EN-2	NWE Substation One-line Diagram Modifications – Alternate Bid Item No. 1
				EN-3	NW Energy Metering & Service Disconnect Building Plan - Alternate Bid Item No. 1 Equipment arrangement and 5kV Utility Switchgear Elevation
				EN-4	NWE Switchgear One-line Diagram - Alternate Bid Item No. 1 PDFD & Protective Relaying
				EN-5	NWE Switchgear One-line Diagram & Schematics- Alternate Bid Item No. 1 Power and Control Connections/Typ CB Schematic
				EN-6	One-line Diagrams - Alternate Bid Item No. 1 FACP, 480V PP, HVAC, DC Panel,
				EN-7	Schematics and Details - Alternate Bid Item No. 1
	General				
				GE-1	Legend and Abbreviations
				GE-2	Site Plan - East
				GE-3	Site Plan - East – Alternate Bid Item No. 2

Discipline	Sub-Discipline		Sheet No.	Drawing No.	Title
				GE-4	Site Plan - Central
				GE-5	Site Plan - West
				GE-6	Site Plan - West – Alternate Bid Item No. 1
				GE-7	Duct Bank Sections and Duct Bank Schedule
				GE-8	Expanded Site Plan Existing NWE Substation Plan
				GE-9	Expanded Site Plan New NWE Substation Plan
				GE-10	Expanded Site Plans Carbon Storage Building
				GE-11	Expanded Site Plans – Alternate Bid Item No. 2 Administration Building Site Power and Lighting Plan
				GE-12	Site Details LV Generator Plan and Load Center Building Plan
				GE-13	Site Details Manholes, handholes, grounding transformer pads, misc structures
				GE-14	Site Details Miscellaneous Area (Backwash Water Trt XFMR mods)
				GE-15	WTP Power Distribution Functional Diagram 5kV Main Switchgear & MV Starter Line-ups
				GE-16	WTP Power Distribution Functional Diagram – Alternate Bid Item No. 1 5kV Main Switchgear & MV Starter Line-ups

Appendix C – Preliminary Table of Contents for Project Manual

Table of Contents for Project Manual for Phase 1 of the Water Treatment Facility Upgrades

00575	Surety's Agreement to Assignment	1
00610	Performance Bond	1 : 2
00615	Payment Bond	1 : 2
00620	Application for Payment	1 : 3
00625	Certificate of Substantial Completion	1

CONDITIONS OF THE CONTRACT

00700	Standard General Conditions of the Construction Contract	1 : 42
00800	Supplementary Conditions	1 :

Attachments

00800A	Duties, Responsibilities, and Limitations of Authority of the Resident Project Representative as Set Forth in the Owner/Engineer Agreement	1 :
00800B	Duties, Responsibilities, and Limitations of Authority of the Special Inspections Representative as Set Forth in the Owner/Engineer Agreement	
00800C	American Iron and Steel (AIS) Requirements	
00800D	Employment Requirements	
	Wage Rate Determination (Suggest include all MT Categories and require higher scale for duplicate disciplines)	
	Labor Standards Provisions	

02015	Geotechnical Report	1 :
02110	Geotextiles	1 :
02112	Removal of Existing Pavement, Concrete Curb, Sidewalk, Driveway and/or Structures	1 :
02113	Adjusting Existing Manholes, Lampoles, Inlets, Water Valve Boxes, Water Services and Fire Hydrants to Grade	1 :
02114	Relocating or Removing Utility Poles, Street Signs and Mailboxes	1 :
02150	Clearing and Grubbing	1 :
02221	Trench Excavation and Backfill for Pipelines and Appurtenant Structures	1 :
02203	Site Grading, Excavation and Embankment	1 :
02225	Flowable Fill	1 :
02234	Sub Base Course	1 :
02235	Crushed Base Course	1 :
02372	Drilled Concrete Piers and Shafts (Rodney?)	1 :
02502	Asphalt Prime and/or Tack Coat	1 :
02510	Asphalt Concrete Pavement	1 :
02515	Portland Cement Concrete Pavement	1 :
02528	Concrete Curb and Gutter	1 :
02529	Concrete Sidewalks, Driveways, Approaches, Curb Turn Fillets, Valley Gutters and Miscellaneous New Concrete Construction	1 :
02581	Pavement Markings and Markers (Pre-Formed Plastic, Paints and Enamels)	1 :
02661	Foundation Drains	
02662	Underground Piping	1 :
02671	Underground Gate Valves	1 :
02673	Underground Butterfly Valves	1 :
02720	Storm Drain Systems	1 :
02725	Drainage Culverts	1 :
02801	Chain Link Fencing	1 :
02910	Seedings	
02920	Hydraulic Seeding	1 :
02930	Irrigation Systems	1 :
02940	Landscape Plantings	1 :

DIVISION 3 – CONCRETE

03100	Concrete Forming	1 :
03200	Concrete Reinforcing	1 :
03250	Concrete Joints and Accessories	1 :
03300	Cast-in-Place Concrete	1 :
03301	Miscellaneous Cast-in-Place Concrete	1 :
03315	Lightweight Structural Concrete	1 :
03350	Concrete Placing, Finishing, and Curing	1 :
03430	Precast Structural Concrete	1 :
03600	Grouting	1 :
03930	Concrete Crack Repair	1 :

DIVISION 4 – MASONRY

04200	Masonry	1 :
04220	Masonry Reinforcing	

DIVISION 5 – METALS

05300	Steel Decking	1 :
05440	Cold Formed Steel Trusses	1:
05500	Metal Fabrications	1:
05520	Handrailing, Guardrailing, and Ladders	1 :
05530	Grating	1 :
05550	Anchorage In Concrete and Masonry	1 :
05990	Structural and Miscellaneous Metals	1 :

DIVISION 6 – WOOD AND PLASTICS

06090	Carpentry	1 :
06200	Shop Fabricated Wood Trusses	1 :

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

07160	Dampproofing	1 :
		1 :
		1 :

		1 :
07532	EPDM Roofing, Fully Adhered	1 :
07600	Flashing and Sheet Metal	1 :
07900	Joint Sealants	1 :

DIVISION 8 – DOORS AND WINDOWS

08110	Steel Doors and Frames	1 :
08305	Floor Access Doors and Hatches	1 :
08330	Overhead Coiling Steel and Fire Doors	1 :
08410	Aluminum Entrances and Assemblies	1 :
08520	Aluminum Windows	1 :
08700	Hardware	1 :
08800	Glass Glazing	1 :

DIVISION 9 – FINISHES

09250	Gypsum Board	1 :
09310	Ceramic Tiling	1 :
09510	Acoustical Panel Ceilings	1 :
09660	Resilient Flooring	1 :
09920	Painting	1 :
09940	Protective Coatings	1 :

DIVISION 10 – SPECIALTIES

10200	Louvers and Vents	1 :
10500	Metal Lockers	1 :
10800	Toilet Accessories	1 :

DIVISION 11 – EQUIPMENT

11060	Equipment Installation	1 :
11115	Portable Chemical Pumps	1 :
11185	Submersible Sump and Sewage Pumps	1 :
11720	UV Cleaning Storage and Feed System	
11725	Gas Chemical Feed Systems	1 :
11727	Liquid Chemical Feed Systems	1 :

11910	Engine Generators	1 :

DIVISION 12 – FURNISHINGS – Not Used

DIVISION 13 – SPECIAL CONSTRUCTION

13140	Pre-fabricated Electrical Building	1 :
13190	Fiberglass Reinforced Plastic Chemical Storage Tanks	1 :
13199	Chemical Storage Tank Installation	1 :
13500	Instrumentation and Control System	1 :
13530	Programmable Logic Controllers	1 :
13540	Multiple Address Radio Equipment	1 :
13550	Software Control Block Descriptions	1 :
13561	Panel Mounted Instruments	1 :
13562	Flow Instruments	1 :
13563	Pressure and Level Instruments	1 :
13564	Process Analytical Instruments	1 :
13565	Miscellaneous Instruments	1 :
13570	Panels, Consoles, and Appurtenances	1 :
13590	Ethernet Networks	1 :
13591	Network Cabling	1 :
13930	Fire-Suppression Sprinkler Systems	1 :

DIVISION 14 – CONVEYING SYSTEMS

14621	Monorail Chain Hoists	1 :
14630	Bridge Cranes	1 :
14641	Portable Gantry Cranes	1 :
14650	Jib Cranes	1 :

DIVISION 15 – MECHANICAL

15010	Valve Installation	1 :
15020	Miscellaneous Piping and Accessories Installation	1 :
15050	Basic Mechanical Building Systems Materials and Methods	1 :
15060	Miscellaneous Piping and Pipe Accessories	1 :
15061	Ductile Iron Pipe	1 :

15062	Steel Pipe	1 :
15064	Stainless Steel Pipe, Tubing, and Accessories	1 :
15065	Miscellaneous Steel Pipe, Tubing, and Accessories	1 :
15067	Miscellaneous Plastic Pipe, Tubing, and Accessories	1 :
15069	Cast Iron Soil Pipe and Accessories	1 :
15070	Copper Tubing and Accessories	1 :
15091	Miscellaneous Ball Valves	1 :
15093	Check Valves	1 :
15094	Backflow Preventers	1 :
15096	Globe Valves	
15098	Plug Valves	1 :
15099	Pressure Reducing Valves	1 :
15100	Miscellaneous Valves	1 :
15101	AWWA Butterfly Valves	1 :
15104	Resilient-Seated Gate Valves	1 :
15108	Air Valves	1 :
15140	Pipe Supports	1 :
15150	Water Meters	1 :
15160	Flow Tubes and Venturi Tubes	1 :
15180	Valve and Gate Actuators	1 :
15250	Mechanical Insulation	1 :
15400	Plumbing	1 :
15550	Heating Systems Equipment	1 :
15650	Refrigeration Systems	1 :
15755	Industrial Heat Exchangers	1 :
15880	Air Distribution Systems	1 :
15955	Building System Controls	1 :
15990	Testing, Adjusting, and Balancing	1 :

DIVISION 16 – ELECTRICAL

16050	Electrical	1 :
16100	Electrical Equipment Installation	1 :
16220	General Purpose Induction Motors	1 :
16310	Secondary Integral Unit Substations	1 :

FIGURES

1-16050	600 Volt, Single Conductor Lighting Cable (THHN-THWN)	16050-
2-16050	600 Volt, Single Conductor Lighting/Power Cable (XHHW)	16050-
3-16050	600 Volt, Single Conductor Power Cable (THHN-THWN)	16050-
4-16050	600 Volt, Single Pair Shielded Instrument Cable	16050-
5-16050	600 Volt, Single Triad Shielded Instrument Cable	16050-
6-16050	600 Volt, Multiple Pair and/or Triad Shielded Instrument Cable	16050-
7-16050	600 Volt, Multiconductor 14 AWG Control Cable (THHN-THWN)	16050-
8-16050	600 Volt, Multiconductor 12 AWG Control Cable (THHN-THWN)	16050-
9-16050	8000 Volt, Single Conductor Power Cable (EPR)	16050-
10-16050	15,000 Volt, Single Conductor Power Cable (EPR)	16050-
11-16050	600 Volt, 3 Conductor with Ground Power Tray Cable	16050-
12-16050	600 Volt, Single Conductor Power Tray Cable	16050-
13-16050	600 Volt, Single Conductor Power Cable (RHH-RHW-USE)	16050-
14-16050	600 Volt, Type MC Metal Clad Lighting Cable	16050-
15-16050	2000 Volt, 3 Conductor Adjustable Frequency Drive Cable	16050-
16-16050	Cable Test Data Form	16050-

Appendix D – Information and Schematics on Existing SCADA System

IAC has as-built drawings for the following:

1. Backwash Clarifier: 90-30 control system, IC693CPU374 w/ 10/100 ENet.
2. Head House: 90-30 control system, IC693CPU366 w/ Profibus Master, add-on ENet card.
3. Filter Building: 90-30 control system, IC693CPU366 w/10/100 ENet. A full set of drawings was not produced for this project as per Owner's direction. Drawings are mainly for panel layouts, I/O module layouts, and typical connection details to field devices.

It is not known what drafted documentation is available for all of the remote terminal units (RTUs). The only RTUs IAC was involved with are at the Gore Hill Tank and The Gore Hill Pump Station. RTU as-builts will probably be only what the Owner has on file.

The documentation for the wireless communications networks shows that a mix of frequencies and protocols are being used.

1. 14.375 GHz full duplex between a MDS Master Station at the Filter Building and a repeater at Hill 57. Modbus protocol.
2. 14.375 GHz full duplex between the repeater and five RTUs that use MDS 9710b radios. Modbus protocol.
3. 902-928 MHz FHSS between remote Modbus masters and groups of Modbus slaves using MDS9810b radios. Communications between the remote Modbus masters and the Hill 57 repeaters is always at 14.375 GHz.
4. All GE VersaMax PLCs communicate with the Hill 57 repeater at 14.375 GHz, Modbus protocol.
5. Modbus TCP is not used anywhere.
6. The filter building control room 90-30 PLC and the Chlorine building VersaMax PLC communicate with the HMI using 10BaseT over copper.
7. The SCADA servers and client PCs communicate using 100BaseT over copper.
8. The backbone between the Filter Building and the Pump Station is over 1 GHz fiber.

There are a few other variations, but the takeaway from this information is that the WTP communications architecture is already built for performance where possible. Slower communications is used where the control or the communications equipment does not support higher bandwidth.

City of Great Falls Water System SCADA Infrasctructure

Wired Network Topology

Dwg 1 **WTP Network Overview**

	Location	Comm	Location
	Filter Building	T1	City of Great Falls WAN
	Filter Building	Dual 1000BaseSX	Pump Station
	Pump Station	10BaseT	Backwash Clarifier

Dwg 2 **Filter Building (FB)**

	Equipment	Comm	Location or Equipment	Comm	Location or Equipment
	FB SCADA Router	1000BaseSX	Pump Station Building		
		10BaseT	FB Control Room 90-30 PLC	RS232 Modbus	MDS Master Transceiver
		10BaseT	FB Chlorine Room VersaMax Micro PLC		
		100BaseTX	Multilin ML2400 Managed Switch	100BaseFX	Head House Multilin ML600 Switch
		100BaseTX	Historian Server 1	100BaseTX	Historian Server 2
			Historian Server 1	100BaseTX	FB COGF Router
		1000BaseTX	FB COGF Router		

	Equipment	Comm	Location or Equipment	Comm	Location or Equipment
	FB COGF Router	1000BaseTX	FB SCADA Router		
		1000BaseSX	Pump Station Building		
		100BaseTX	Historian Server 2		
		100BaseTX	Control Server 2		
		100BaseTX	CCTV DVR		
		100BaseTX	Control Room Workstation 1		
		100BaseTX	Lab Workstation		
		100BaseTX	Control Room Information Workstation		
		100BaseTX	Cisco 1700 Series Router	T1	City of Great Falls WAN

Dwg 3 **Pump Station Building**

	Equipment	Comm	Location or Equipment
	PS COGF SCADA Router	10BaseT	Backwash Clarifier
		1000BaseSX	Filter Building
		1000BaseTX	PS COGF Router
		10BaseT	PS Control Room 90-30 PLC

	Equipment	Comm	Location or Equipment
	PS COGF Router	1000Base TX	PS COGF SCADA Router
		1000BaseSX	Filter Building
		100BaseTX	Office Workstation
		100BaseTX	Office Maintenance Workstation
		100BaseTX	Maintenance Management Server
		100BaseTX	Engineering Workstation
		100BaseTX	IBM Printer
		100BaseTX	Kyocera Printer

Dwg 4 **Backwash Clarifier Building**

	Equipment	Comm	Location or Equipment
	Backwash Clarifier Versamax PLC	10BaseT	Pump Station Building

Dwg 5 **Head House**

	Equipment	Comm	Location or Equipment
	Multilin ML600 Switch	10BaseT	Headhouse 90-30 PLC
		100BaseTX	QuickPanel OIT
		100BaseFX	Filter Building Control Room

City of Great Falls Water System SCADA Infrasctructure

Wireless Network Topology

Dwg 6 **Wireless SCADA**

Radio/PLC	Comm	Radio/PLC	Comm	Radio/PLC	Comm	Radio/PLC
Filter Building SCADA Master 90-30 PLC	RS232 Modbus	Master Station MDS 9790B Radio	14.375 GHz	Hill 57 Booster Station MDS 3131 Repeater Radio	14.375 GHz	Boston Heights Standpipe MDS 9710B Radio
					14.375 GHz	Malmstrom AFB MDS 9710B Radio
					14.375 GHz	Gore Hill Booster Station MDS 9710B Radio
					14.375 GHz	Fire Station 1 MDS 9710B Radio
					14.375 GHz	33rd St. Booster Station MDS 9710B Radio

Dwg 7 **Hill 57 Booster**

Radio/PLC	**Comm**	**Radio/PLC**	**Comm**	**Radio/PLC**	**Comm**	**Radio/PLC**	**Comm**	**Radio/PLC**
Hill 57 Booster Station MDS 3131 Repeater Radio	RS232 Modbus	33rd St. Booster Station 90-30 PLC	RS232 Modbus	Hill 57 Modbus Master MDS 9810b FHSS Radio	900 Mhz	Skyline Tank MDS 9810b FHSS Radio	RS232 Modbus	Skyline Tank 90-30 PLC
					900 Mhz	Riverview Booster MDS 9810b FHSS Radio	RS232 Modbus	Ella Tank Versamax Micro PLC

Dwg 8 **Gore Hill Booster**

Radio/PLC	**Comm**	**Radio/PLC**	**Comm**	**Radio/PLC**	**Comm**	**Radio/PLC**	**Comm**	**Radio/PLC**	**Comm**	**Radio/PLC**
Hill 57 Booster Station MDS Repeater Radio	952TX/928RX MHz	Gore Hill Booster MDS 9710b Radio	RS232	Gore Hill Booster Station 90-30 PLC	RS232/CCM Protocol	Gore Hill Booster MDS 9810b FHSS Radio	900 Mhz FHSS	Gore Hill Tank MDS 9810b FHSS Radio	RS232/CCM Protocol	Gore Hill Tank 90-30 PLC

Dwg 9 **33rd Street Booster**

Radio/PLC	**Comm**	**Radio/PLC**	**Comm**	**Radio/PLC**	**Comm**	**Radio/PLC**	**Comm**	**Radio/PLC**	**Comm**	**Radio/PLC**
Hill 57 Booster Station MDS Repeater Radio	952TX/928RX MHz	33rd Street Booster MDS 9710b Radio	RS232	33rd St. Booster 90-30 PLC	RS232/CCM Protocol	33rd Street Booster MDS 9810b FHSS Radio	900 Mhz	Ella Tank MDS 9810b FHSS Radio	RS232/CCM Protocol	Ella Tank 90-30 PLC

Dwg 10 **Boston Heights**

Radio/PLC	**Comm**	**Radio/PLC**	**Comm**	**Radio/PLC**
Hill 57 Booster Station MDS Repeater Radio	952TX/928RX MHz	Boston Heights MDS 9710b Radio	RS232	Boston Heights Versamax Micro PLC

Dwg 11 **Malmstrom AFB**

Radio/PLC	**Comm**	**Radio/PLC**	**Comm**	**Radio/PLC**
Hill 57 Booster Station MDS Repeater Radio	952TX/928RX MHz	Malmstrom AFB MDS 9710b Radio	RS232	Malmstrom AFB Versamax Micro PLC

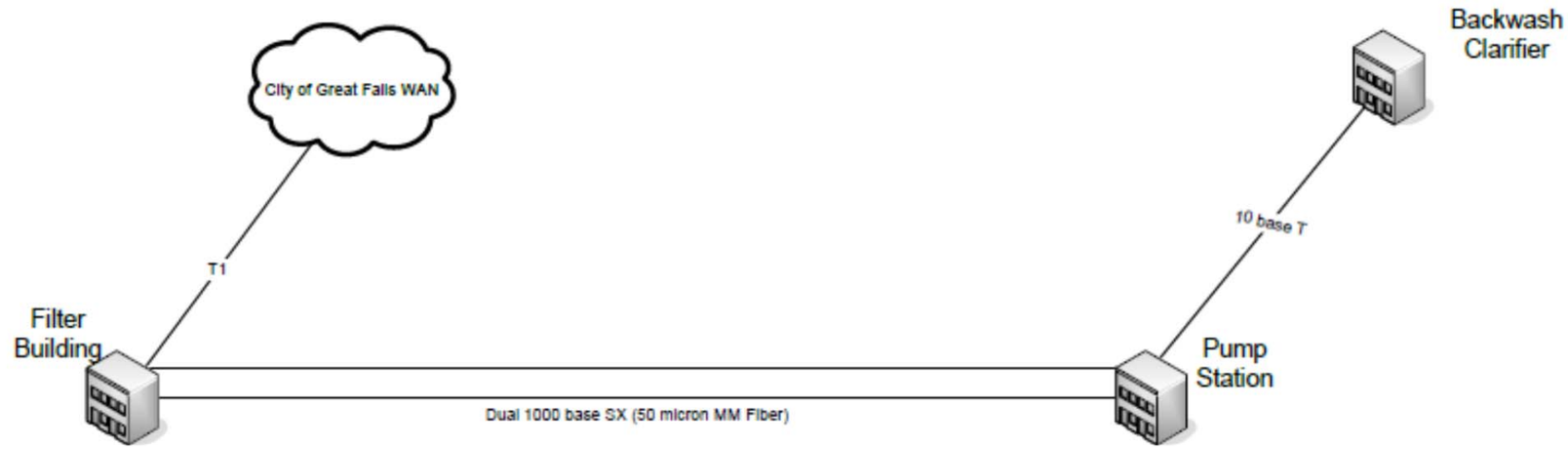
Dwg 12 **Fire Station 1**

Radio/PLC	**Comm**	**Radio/PLC**	**Comm**	**Radio/PLC**
Hill 57 Booster Station MDS Repeater Radio	952TX/928RX MHz	Fire Station 1 MDS 9710b Radio	RS232	Fire Station 1 Versamax Micro PLC

8	90-30 PLCs
4	Versamax Micro PLCs
5	MDS 9710b radios
7	MDS 9810b radios

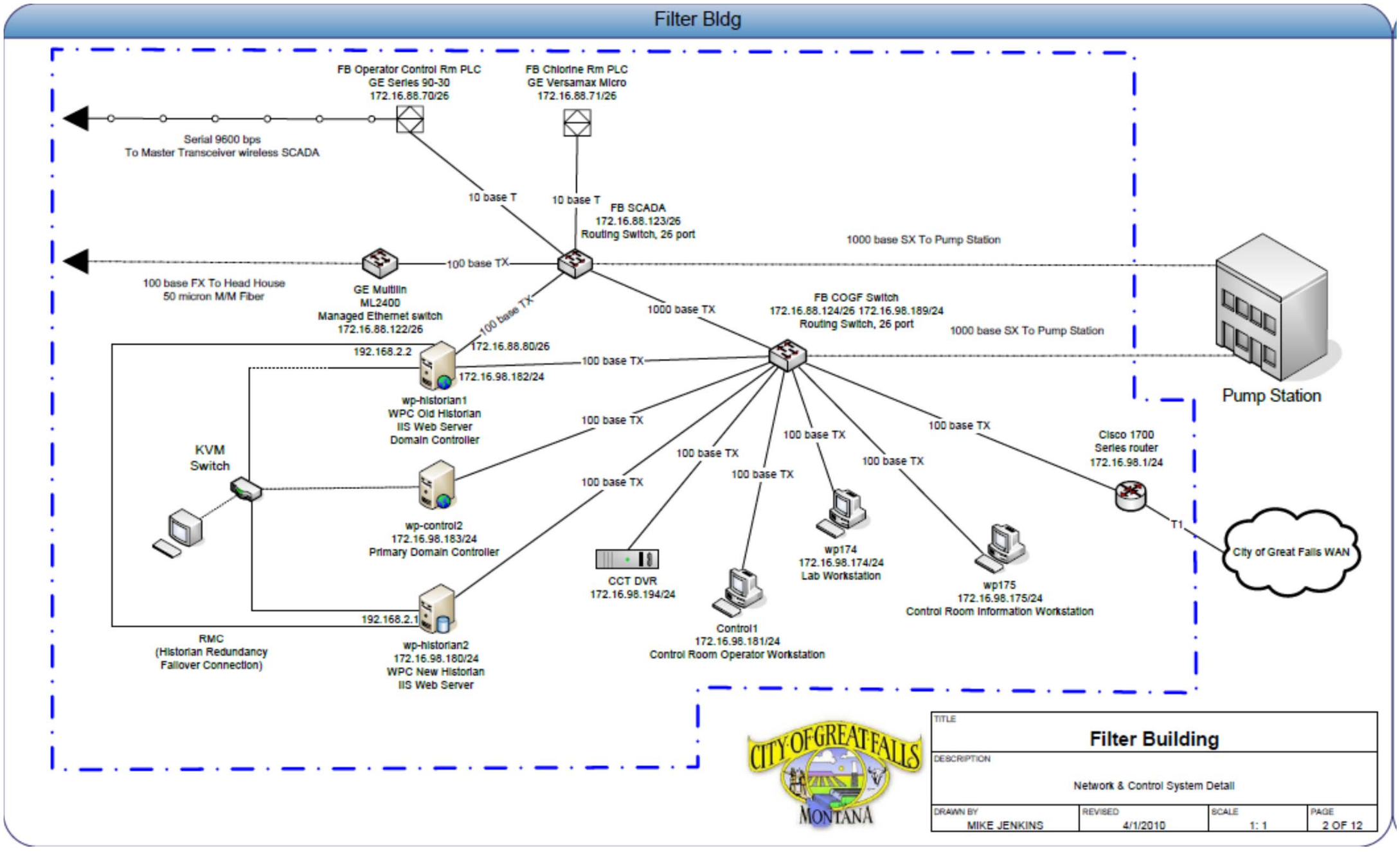
Note - Some equipment repeated on this and the Wired worksheets

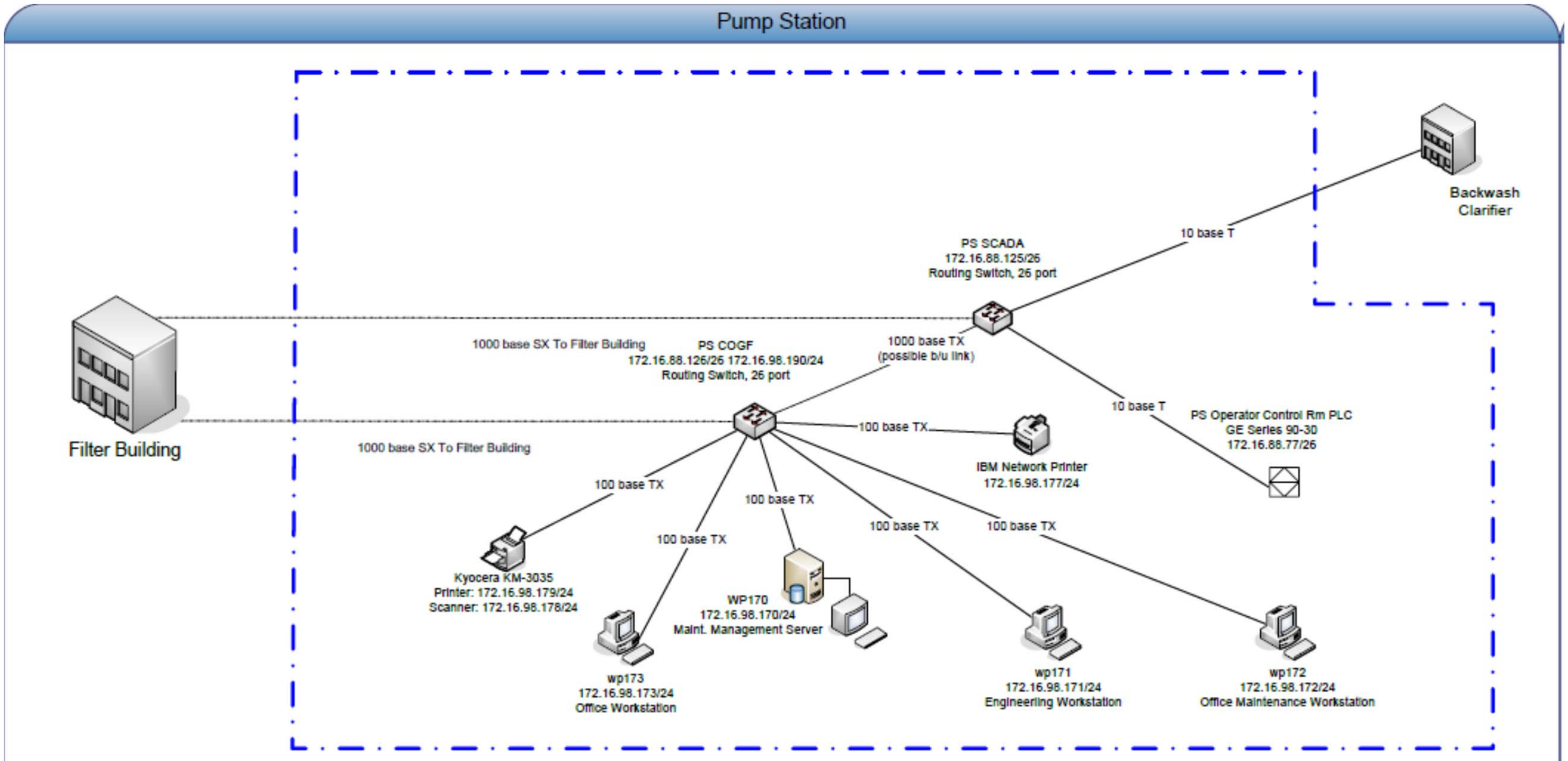
Overview



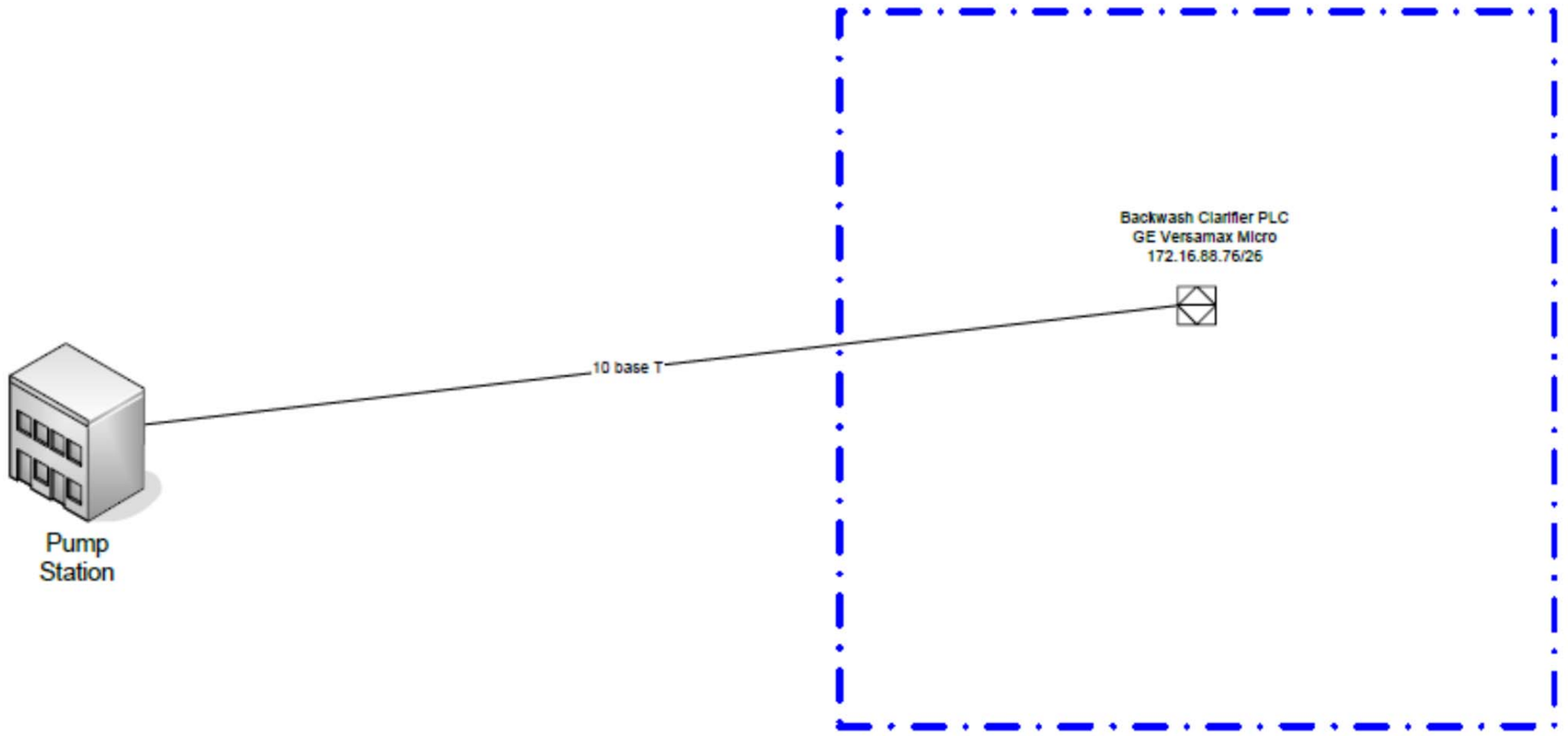
CITY OF GREAT FALLS MONTANA

TITLE			
Water Treatment Plant Network Overview			
DESCRIPTION			
Graphical overview of Control/Business Network configuration			
DRAWN BY	REVISED	SCALE	PAGE
MIKE JENKINS	4/1/2010	1: 1	1 OF 12


Filter Bldg
FB Operator Control Rm PLC
GE Series 90-30
172.16.88.70/26
FB Chlorine Rm PLC
GE Versamax Micro
172.16.88.71/26
Serial 9600 bps
To Master Transceiver wireless SCADA
10 base T
10 base T
FB SCADA
172.16.88.123/26
Routing Switch, 26 port
1000 base SX To Pump Station
100 base TX
100 base FX To Head House
50 micron M/M Fiber
GE Multilin
ML2400
Managed Ethernet switch
172.16.88.122/26
100 base TX
1000 base TX
FB COGF Switch
172.16.88.124/26 172.16.98.189/24
Routing Switch, 26 port
1000 base SX To Pump Station
Pump Station
192.168.2.2
172.16.88.80/26
100 base TX
172.16.98.182/24
wp-historian1
WPC Old Historian
IIS Web Server
Domain Controller
100 base TX
100 base TX
100 base TX
100 base TX
100 base TX
100 base TX
Cisco 1700
Series router
172.16.98.1/24
KVM
Switch
wp-control2
172.16.98.183/24
Primary Domain Controller
T1
City of Great Falls WAN
CCT DVR
172.16.98.194/24
wp174
172.16.98.174/24
Lab Workstation
wp175
172.16.98.175/24
Control Room Information Workstation
192.168.2.1
Control1
172.16.98.181/24
Control Room Operator Workstation
RMC
(Historian Redundancy
Failover Connection)
wp-historian2
172.16.98.180/24
WPC New Historian
IIS Web Server
CITY OF GREAT FALLS
MONTANA
TITLE
Filter Building
DESCRIPTION
Network & Control System Detail
DRAWN BY
MIKE JENKINS
REVISED
4/1/2010
SCALE
1: 1
PAGE
2 OF 12


Pump Station
Backwash
Clarifier
10 base T
PS SCADA
172.16.88.125/26
Routing Switch, 26 port
1000 base SX To Filter Building
PS COGF
172.16.88.126/26 172.16.98.190/24
Routing Switch, 26 port
1000 base TX
(possible b/u link)
Filter Building
1000 base SX To Filter Building
100 base TX
IBM Network Printer
172.16.98.177/24
10 base T
PS Operator Control Rm PLC
GE Series 90-30
172.16.88.77/26
100 base TX
100 base TX
100 base TX
100 base TX
100 base TX
Kyocera KM-3035
Printer: 172.16.98.179/24
Scanner: 172.16.98.178/24
WP170
172.16.98.170/24
Maint. Management Server
wp173
172.16.98.173/24
Office Workstation
wp171
172.16.98.171/24
Engineering Workstation
wp172
172.16.98.172/24
Office Maintenance Workstation
CITY OF GREAT FALLS
MONTANA
TITLE
Pump Station Building
DESCRIPTION
Network & Control System Detail
DRAWN BY
MIKE JENKINS
REVISED
4/1/2010
SCALE
1: 1
PAGE
3 OF 12

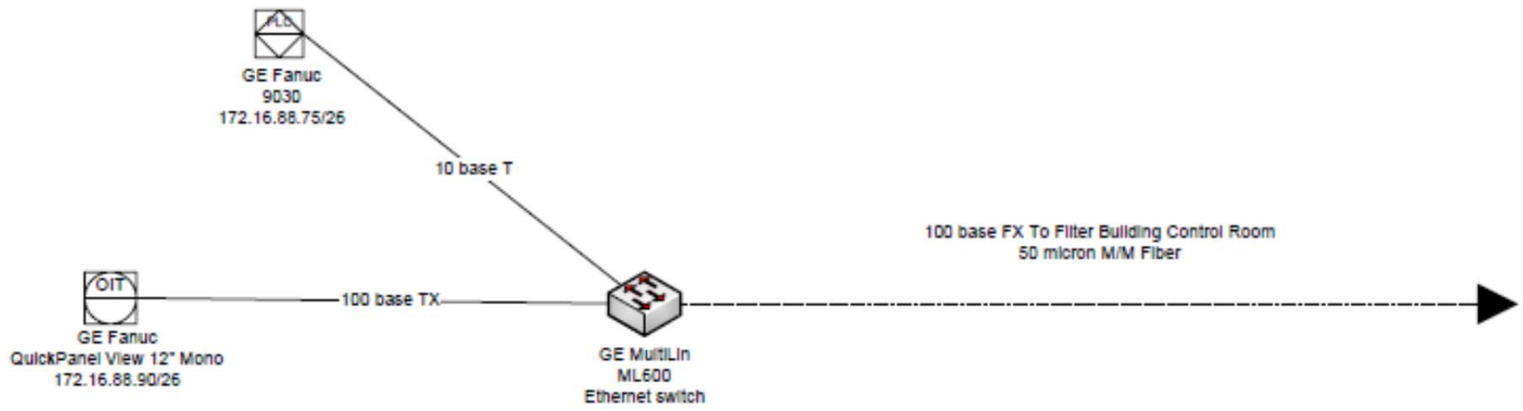
BW Clarifier



CITY OF GREAT FALLS MONTANA

TITLE			
Backwash Clarifier Building			
DESCRIPTION			
Network & control system detail			
DRAWN BY	REVISED	SCALE	PAGE
MIKE JENKINS	4/1/2010	1: 1	4 OF 12

Head House

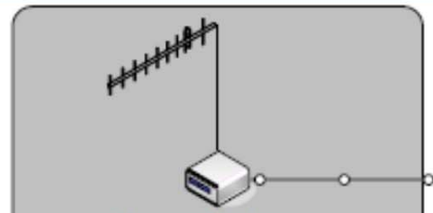


CITY OF GREAT FALLS MONTANA

TITLE: **Head House**			
DESCRIPTION: Network & control system detail			
DRAWN BY: MIKE JENKINS	REVISED: 4/1/2010	SCALE: 1: 1	PAGE: 5 OF 12

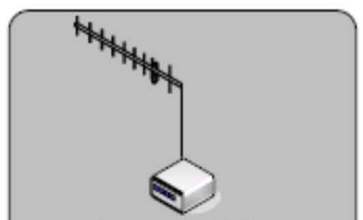
Wireless SCADA

Microwave Data Systems
MDS 3131 MAS Master Station - Repeater
Hill 57 Booster Station Node 5
Tx:952.14375 MHz Rx:928.14375 MHz

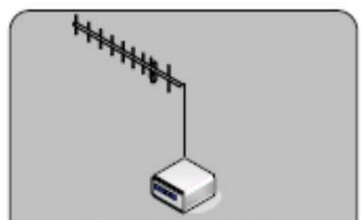


Microwave Data Systems
MDS 9790B MAS Full Duplex Master Station
- Polling Master
Water Treatment Plant
Tx:928.14375 MHz Rx:952.14375 MHz

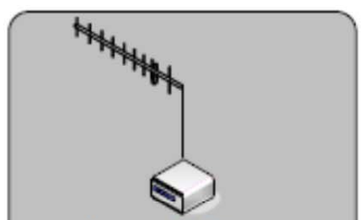
Serial 9600 bps
To Filter Building
Control Room PLC



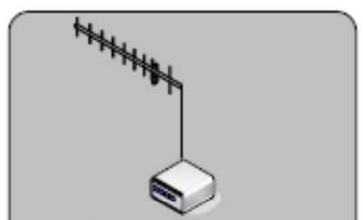
Microwave Data Systems
MDS 9710b
Boston Heights Standpipes Node 7
Tx:928.14375 MHz Rx:952.14375 MHz



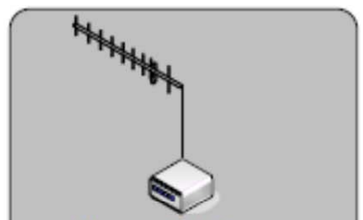
Microwave Data Systems
MDS 9710b
MAFB Node 8
Tx:928.14375 MHz Rx:952.14375 MHz



Microwave Data Systems
MDS9710b
Gore Hill Booster Station Node 3
Tx:928.14375 MHz Rx:952.14375 MHz



Microwave Data Systems
MDS9710b
Fire Station 1 Node 6
Tx:928.14375 MHz Rx:952.14375 MHz



Microwave Data Systems
MDS 9710b
33rd Street Booster Station Node 4
Tx:928.14375 MHz Rx:952.14375 MHz

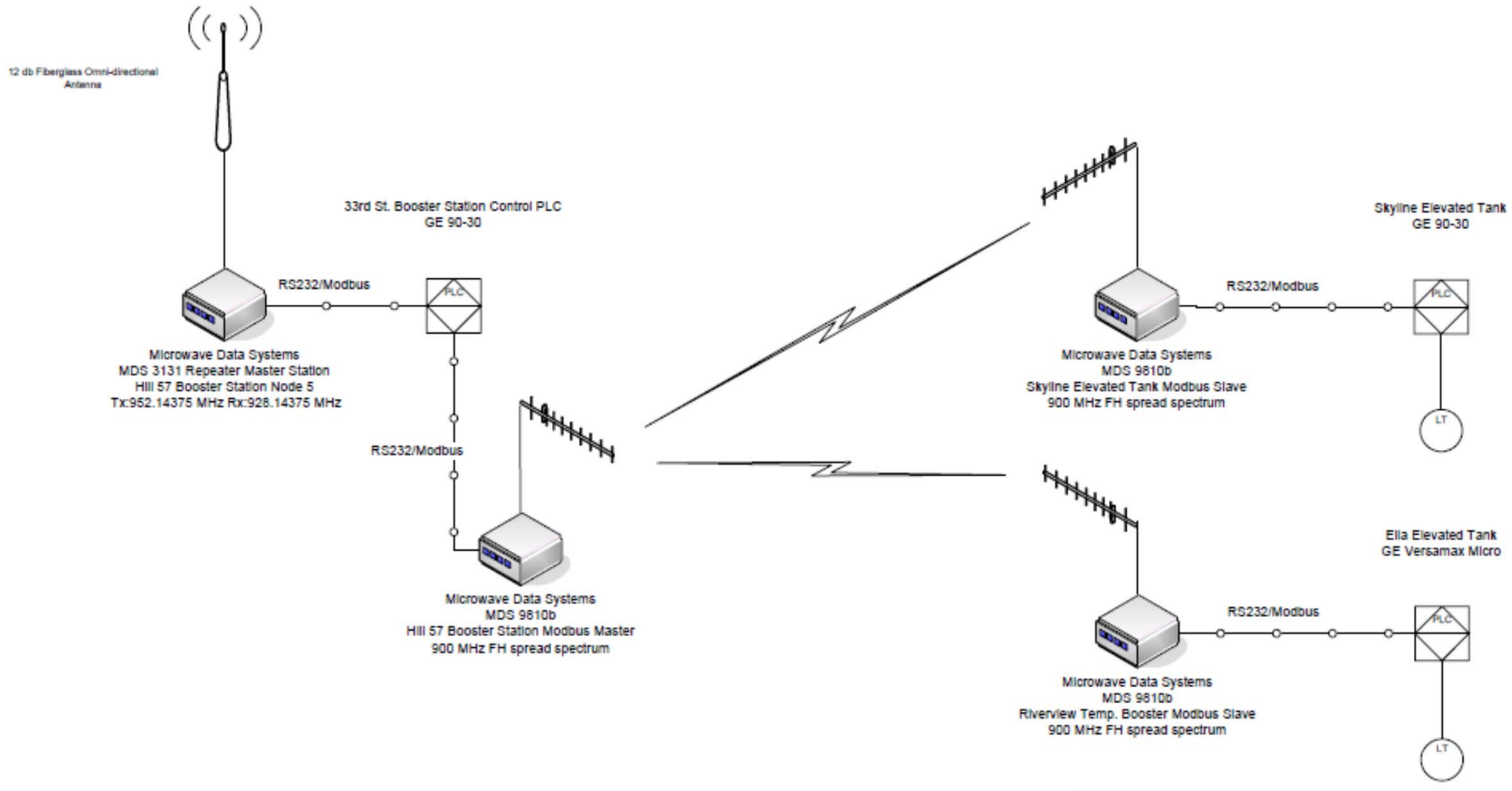
Notes

1. Modbus RTU communications speed is 9600 baud to all nodes
2. All remote nodes are configured as 'Slaves'
3. Double-click on RTU to go to details for remote site/ system.

CITY OF GREAT FALLS MONTANA

TITLE: **Wireless SCADA**			
DESCRIPTION: Modbus Wireless Communications Overview			
DRAWN BY: MIKE JENKINS	REVISED: 4/1/2010	SCALE: 1: 1	PAGE: 6 OF 12

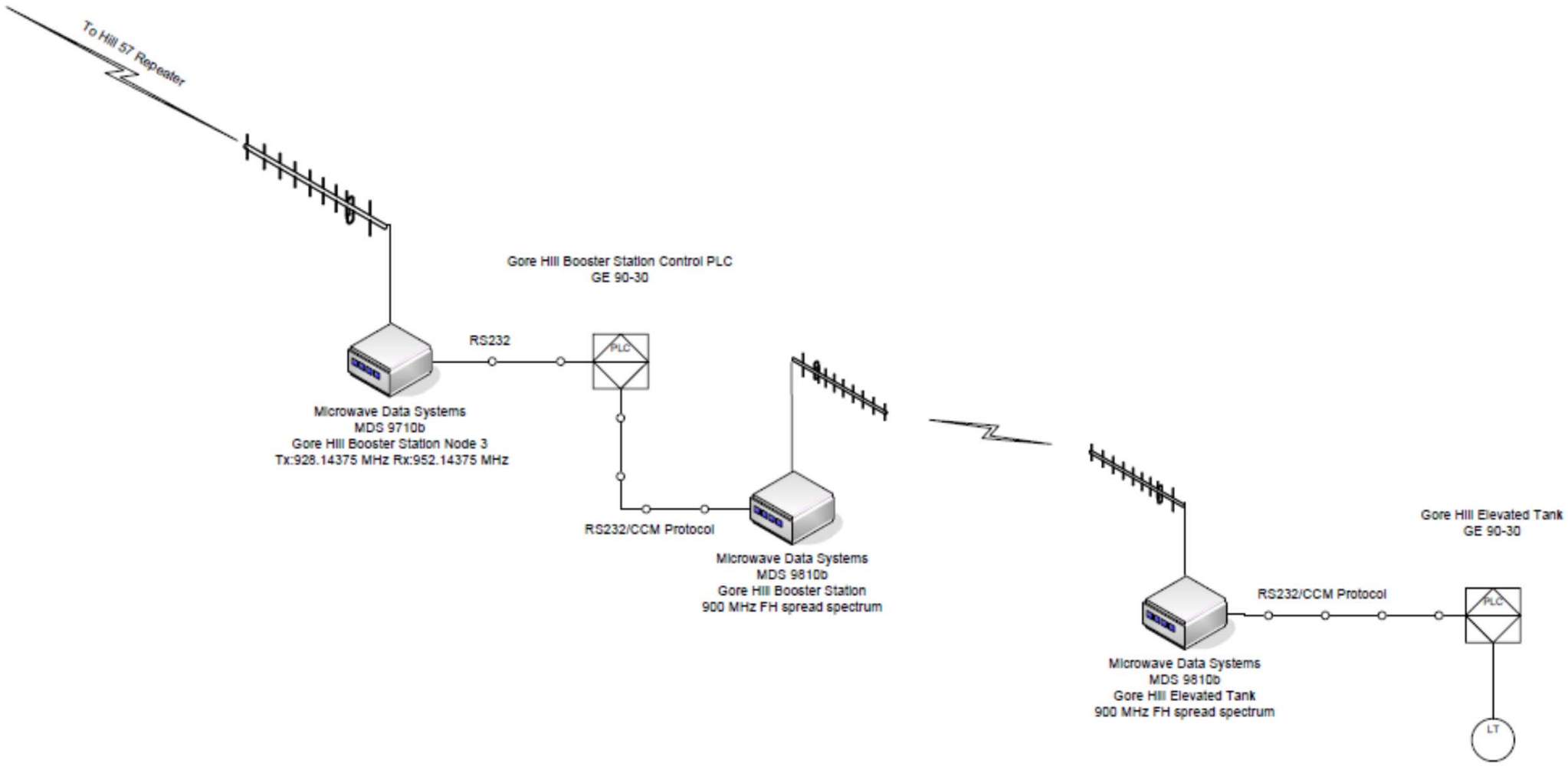
Hill 57 Booster



CITY OF GREAT FALLS MONTANA

TITLE			
Hill 57 Booster			
DESCRIPTION			
SCADA Communications Detail			
DRAWN BY	REVISED	SCALE	PAGE
MIKE JENKINS	4/1/2010	1: 1	7 OF 12

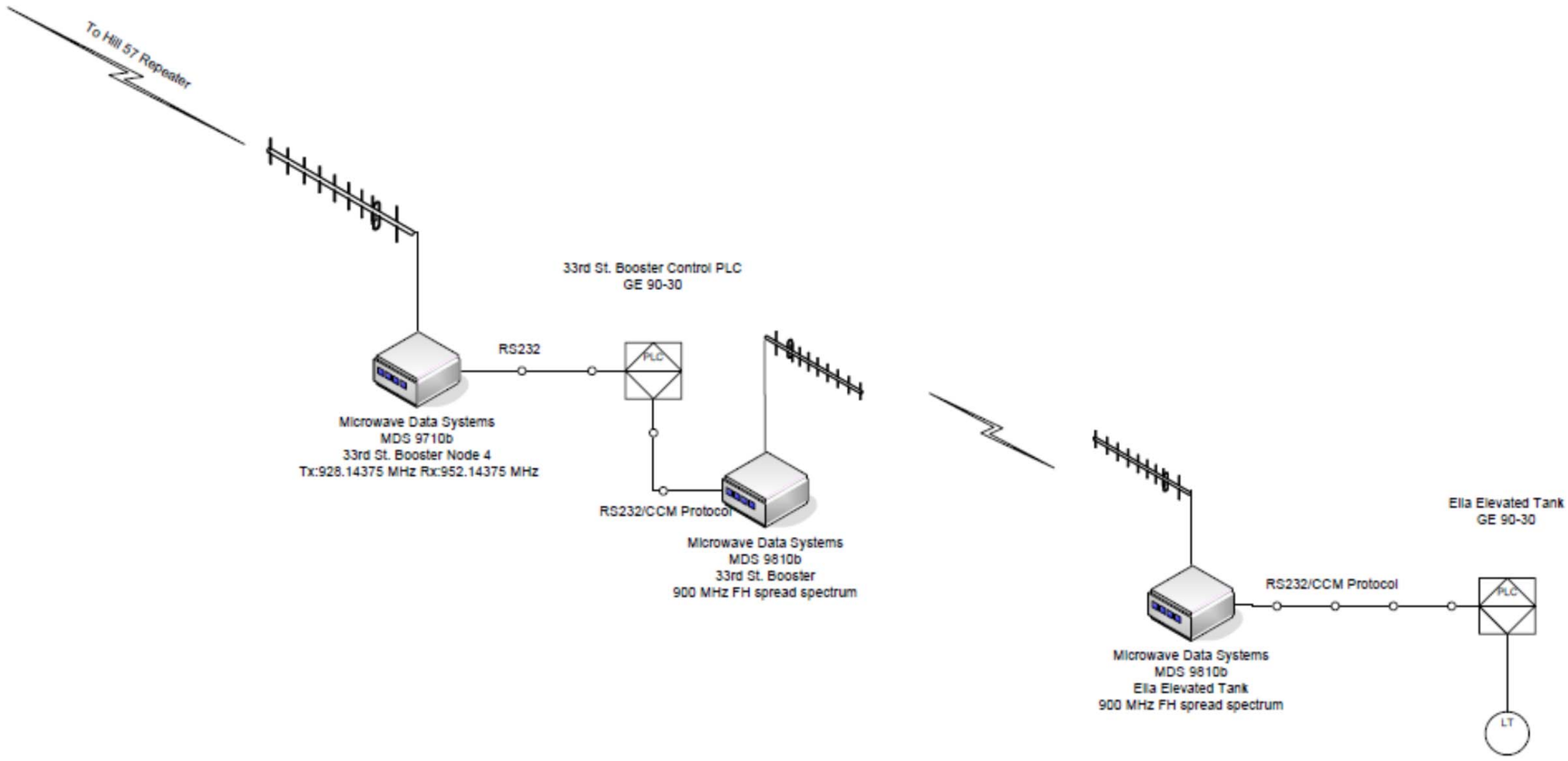
Gore Hill Booster



CITY OF GREAT FALLS MONTANA

TITLE			
Gore Hill Booster			
DESCRIPTION			
SCADA Communications Detail			
DRAWN BY	REVISED	SCALE	PAGE
MIKE JENKINS	4/1/2010	1: 1	8 OF 12

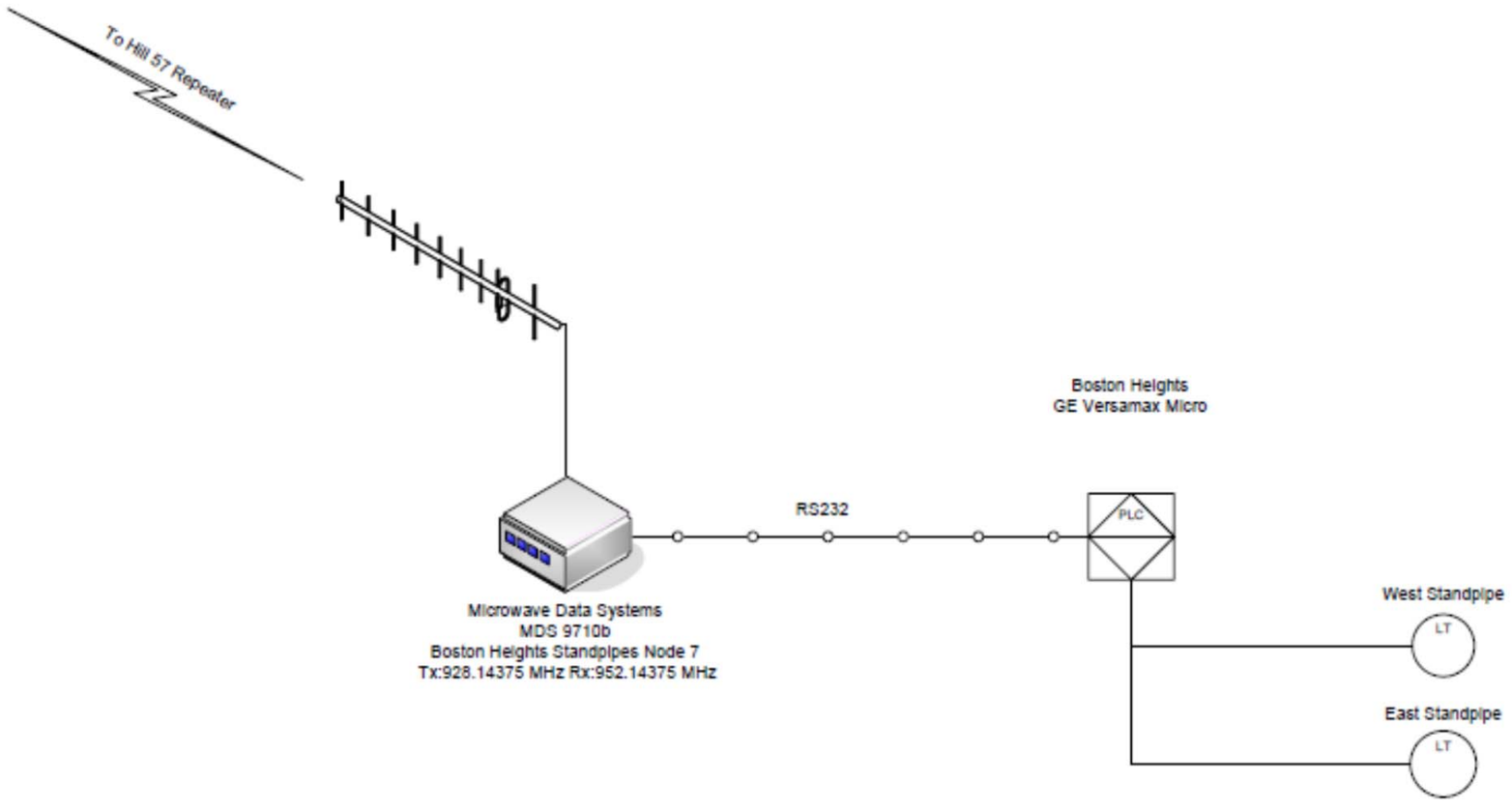
33rd St. Booster



CITY OF GREAT FALLS MONTANA

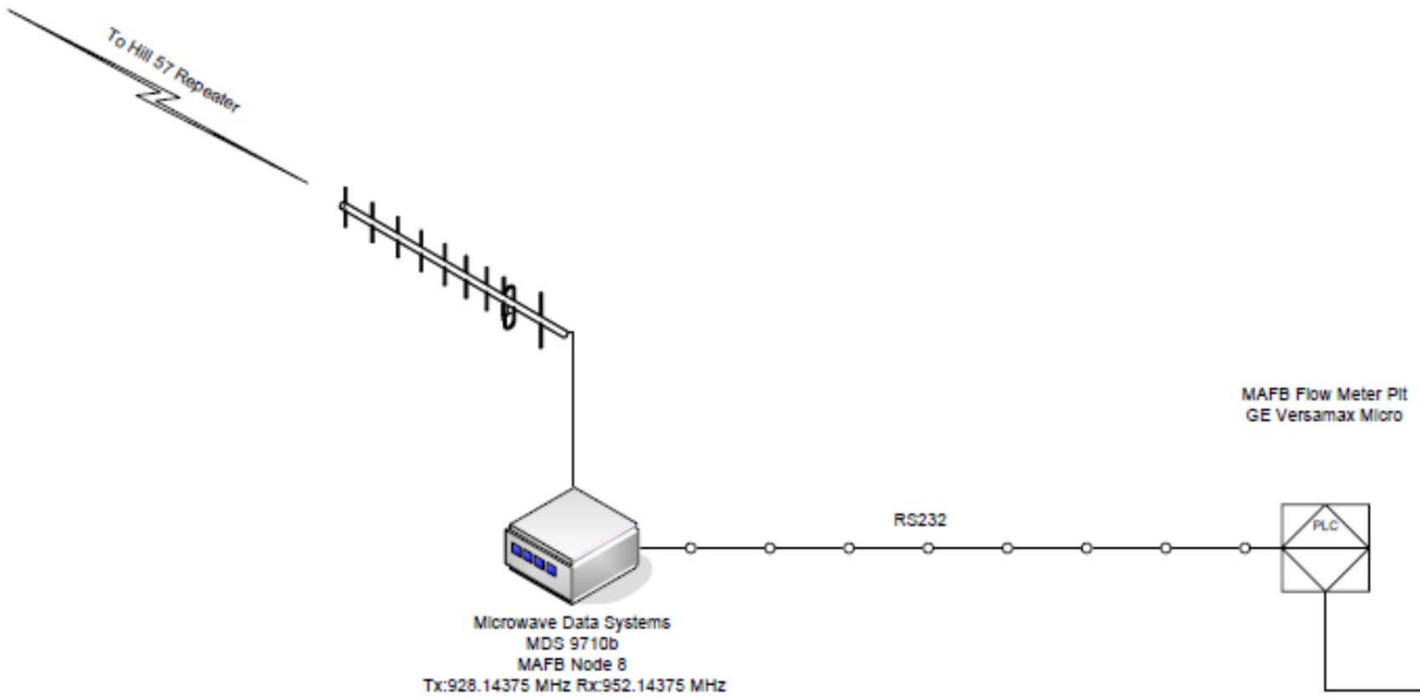
TITLE			
33rd St. Booster			
DESCRIPTION			
SCADA Communications Detail			
DRAWN BY	REVISED	SCALE	PAGE
MIKE JENKINS	4/1/2010	1: 1	9 OF 12

Boston Heights



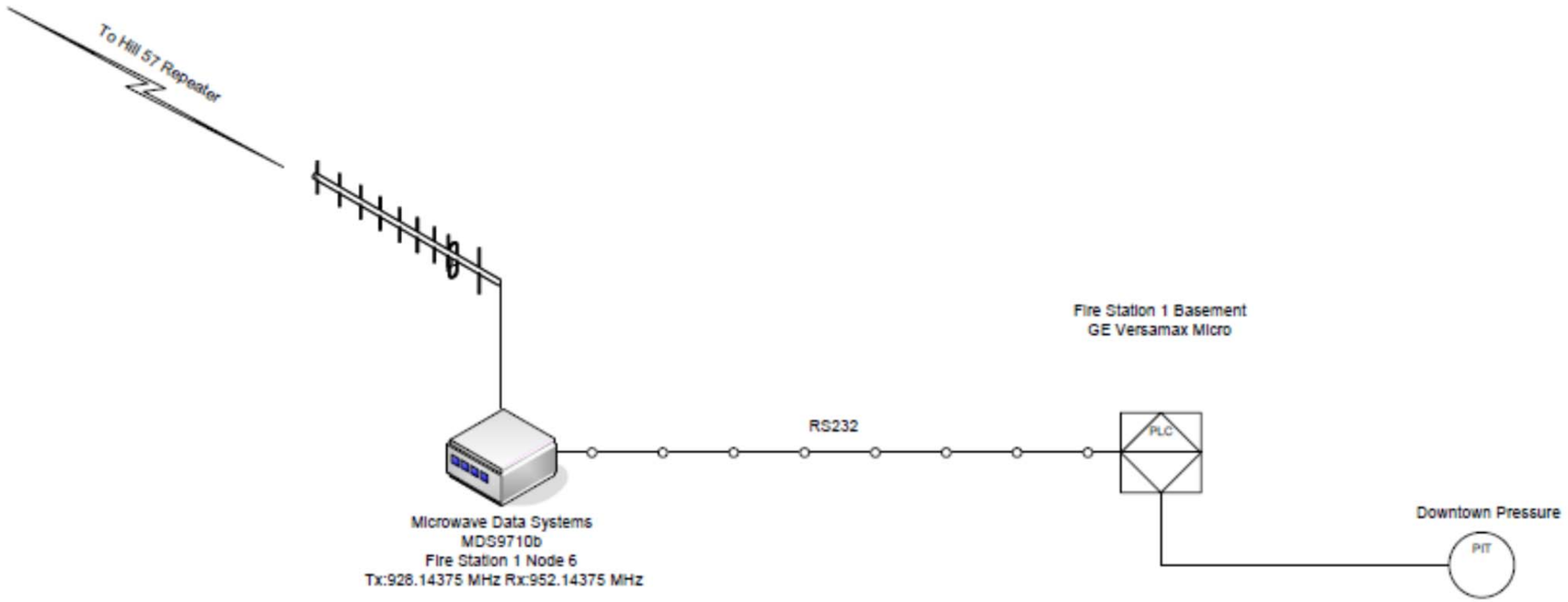
TITLE: **Boston Heights**			
DESCRIPTION: SCADA Communications Detail			
DRAWN BY: MIKE JENKINS	REVISED: 4/1/2010	SCALE: 1: 1	PAGE: 10 OF 12

MAFB



TITLE: **MAFB**			
DESCRIPTION: SCADA Communications Detail			
DRAWN BY: MIKE JENKINS	REVISED: 4/1/2010	SCALE: 1: 1	PAGE: 11 OF 12

Fire Sta. 1



CITY OF GREAT FALLS MONTANA

TITLE	Fire Sta. 1
DESCRIPTION	SCADA Communications Detail

DRAWN BY	REVISED	SCALE	PAGE
MIKE JENKINS	4/1/2010	1: 1	12 OF 12

Appendix E - Duties, Responsibilities and Limitations of Authority of the Special Inspections Representative

DUTIES, RESPONSIBILITIES AND
LIMITATIONS OF AUTHORITY OF THE
SPECIAL INSPECTIONS REPRESENTATIVE

1. Engineer will furnish a Special Inspections Representative and Special Inspectors. The Special Inspection Representative and Special Inspectors will observe the Contractor's work and perform the services listed in 01450 Structural Tests and Special Inspections. The Special Inspections Representative shall not have responsibility for the superintendence of construction site conditions, safety, safe practices or unsafe practices or conditions, operation, equipment, or personnel other than employees of the Engineer. This service will in no way relieve the Contractor of complete supervision and inspection of the work or the Contractor's obligation for complete compliance with the drawings and specifications. The Contractor shall have sole responsibility for safety and for maintaining safe practices and avoiding unsafe practices or conditions. Specific services performed by the Special Inspections Representative and Special Inspectors and durations of their services are as follows:

   a. Special Inspections Representative 24 Months

   b. Concrete Inspector 24 Months

   c. Masonry Inspector 24 Months

   d. Geotechnical Inspector 24 Months

2. Site Observations and Liaison with Owner, Engineer, Authority Having Jurisdiction (AHJ), Inspection and Testing Agencies and Contractor(s)

   a. Conduct onsite observations of the general progress of the testing and inspections to assist Engineer in determining if Structural Tests and Special Inspections are proceeding in accordance with the Special Inspections Program.

   b. Serve as Engineer's liaison with the Authority Having Jurisdiction, and assist Engineer in providing thorough execution of the Special Inspections Program. Assemble and transmit interim inspection reports to the AHJ and Engineer in accordance with the schedule set forth in the Special Inspections Program.

   c. Serving as Engineer’s liaison with the Contractor when the testing and/or inspections activities must be coordinated with the Contractor’s onsite operation.

   d. Report to Engineer, giving opinions and suggestions based on the interim reporting received from the tests and inspections regarding defects or deficiencies in the

Contractor's work and relating to compliance with drawings, specifications, and design concepts.

e. Advise Engineer, AHJ and the Contractor or its superintendent immediately of the presence of an unresolved deficiency in the work requiring resolution. Notify the Contractor of the need to correct the deficiency before proceeding with any activity that would encumber correcting the deficiency.

f. Review the Contractors' construction sequence and coordinate the appropriate inspection and/or testing activities.

g. Verify that the Contractor has contacted the Special Inspectors or Testing Agencies and advised them of Contractor's schedule. Assist in coordinating scheduling of inspections or tests to minimize impacts to the progress of the Work.

h. Coordinate onsite structural testing services during construction. Copies of testing results will be forwarded to Special Inspectors for review and information.

i. Observe the execution of the Special Inspections Program and review the resulting reports, commenting to Engineer, as appropriate.

3. Outside Liaison and Public Information Services

a. Accompany visiting inspectors representing public or other agencies having jurisdiction over the project. Record the names of the inspectors, and the results of the inspections, and report to Engineer.

4. Meetings, Reports, and Document Review and Maintenance

a. Attend the preconstruction conference, and assist Engineer in explaining administrative procedures of the Special Inspections Program that will be followed during construction.

b. Attend monthly progress meetings, and other meetings with Owner, AHJ and the Contractor when necessary, to review and discuss progress of inspections and/or testing.

c. Submit to Engineer, with a copy to AHJ, interim Special Inspections progress reports containing a summary of the Contractor's progress, general condition of the work, problems, and resolutions or proposed resolutions to problems.

d. Notify Engineer regarding work which is reported to be defective, or which fails any required inspections, tests, or approvals; and advise Engineer of status of corrective action.

e. Record date of receipt of inspection reports and test reports. Maintain records at the site for examination by Owner, AHJ, Inspectors, Contractor or Engineer.

f. Maintain a marked set of drawings and specifications at the jobsite based on data provided by the Contractor and/or inspectors regarding noted deficiencies and the subsequent corrections to the Work. This information will be combined with information from the record documents maintained by the Contractor, and a master set of documents conforming to construction records will be produced.

5. Maintain the following documents at the jobsite.

   a. Correspondence files.

   b. Test Reports.

   c. Manufacturer's Certificates of Compliance for items contained in the Statement of Special Inspections.

   d. Reproductions of original construction contract documents.

   e. Addenda.

   f. Change orders.

   g. Field orders.

   h. Additional drawings issued subsequent to execution of the construction contract documents.

   i. Inspection Reports.

   j. Names, addresses, and telephone numbers of all Special Inspectors and Agencies conducting testing in accordance with the Special Inspections Program.

6. Maintain a daily diary or log book of events at the jobsite. The diary or log book shall remain the property of Engineer. It will include the following information:

   a. Days the Agencies or Inspectors worked on the jobsite.

   b. Inspector and/or testing personnel on jobsite.

   c. Testing or inspection equipment on the jobsite.

   d. Weather conditions.

   e. Observations pertaining to the progress of the inspections.

f. Materials received on jobsite subject to 01450 Structural Tests and Special Inspections.

Appendix F - Duties, Responsibilities and Limitations of Authority of the Resident Project Representative

DUTIES, RESPONSIBILITIES AND
LIMITATIONS OF AUTHORITY OF THE
RESIDENT PROJECT REPRESENTATIVE

5. Engineer will furnish a Resident Project Representative. The Resident Project Representative will observe the Contractor's work and perform the services listed below. The Resident Project Representative shall not have responsibility for the superintendence of construction site conditions, safety, safe practices or unsafe practices or conditions, operation, equipment, or personnel other than employees of the Engineer. This service will in no way relieve the Contractor of complete supervision and inspection of the work or the Contractor's obligation for complete compliance with the drawings and specifications. The Contractor shall have sole responsibility for safety and for maintaining safe practices and avoiding unsafe practices or conditions. Specific services performed by the Resident Project Representative and assistants and durations of their services are as follows:

   a. Resident Project Representative 24 Months

6. Site Observations and Liaison with Owner and Contractor(s)

   a. Conduct onsite observations of the general progress of the work to assist Engineer in determining if the work is proceeding in accordance with the construction contract documents.

   b. Serve as Engineer's liaison with the Contractor, working principally through the Contractor's superintendent, and assist Engineer in providing interpretation of the construction contract documents. Transmit Engineer's clarifications and interpretations of the construction contract documents to the Contractor.

   c. Assist Engineer in serving as Owner's liaison with the Contractor when the Contractor's operations affect Owner's onsite operation.

   d. As requested by Engineer, assist in obtaining from Owner additional details or information when required at the jobsite for proper execution of the work.

   e. Report to Engineer, giving opinions and suggestions based on the Resident Project Representative's observations regarding defects or deficiencies in the Contractor's work and relating to compliance with drawings, specifications, and design concepts. These opinions and observations are exclusive of special inspections and structural observation to be conducted by others.

   f. Advise Engineer and the Contractor or its superintendent immediately of the commencement of any work requiring a shop drawing or sample submission if the submission has not been accepted by Engineer.

g. Monitor changes of apparent integrity of the site, such as differing subsurface and physical conditions, existing structures, and site-related utilities when such utilities are exposed.

h. Observe pertinent site conditions when the Contractor maintains that differing subsurface and physical conditions have been encountered, and document actual site conditions. Review and analysis of the Contractor's claims for differing subsurface and physical conditions are supplemental services.

i. Review the Contractors' construction sequence and traffic control plans for all construction work undertaken simultaneously.

j. Verify that the Contractor has contacted utilities in the general construction area and advised them of Contractor's schedule. Assist in coordinating scheduling of utility activities to minimize conflicts with Owner's activities.

k. Establish and furnish the Contractor with necessary baselines and control points that will be used as datum for the work. Actual construction staking will be done by the Contractor.

l. Visually inspect materials, equipment, and supplies delivered to the worksite. Reject materials, equipment, and supplies that do not conform to the construction contract documents. These inspections are exclusive of special inspection activities performed by others.

m. Coordinate onsite materials testing services during construction. Copies of testing results will be forwarded to Owner for review and information. Materials testing contained as part of special inspections are the responsibility of the approved agency conducting such work and reporting is made in accordance with the program for special inspections.

n. Observe field tests of equipment, structures, and piping, and review the resulting reports, commenting to Engineer, as appropriate.

7. Outside Liaison and Public Information Services

a. Accompany visiting inspectors representing public or other agencies having jurisdiction over the project. Record the names of the inspectors, and the results of the inspections, and report to Engineer.

b. Provide personnel and facilities for dealing with telephoned or written complaints and other communications related to the construction of the project.

c. Provide the necessary services in connection with public information and notification of individual property owners during construction.

8. Meetings, Reports, and Document Review and Maintenance

   a. Attend the preconstruction conference, and assist Engineer in explaining administrative procedures that will be followed during construction.

   b. Schedule and attend monthly progress meetings, and other meetings with Owner and the Contractor when necessary, to review and discuss construction procedures and progress scheduling, engineering management procedures, and other matters concerning the project.

   c. Submit to Engineer, with a copy to Owner, weekly construction progress reports containing a summary of the Contractor's progress, general condition of the work, problems, and resolutions or proposed resolutions to problems. Special inspections reports are submitted by others per schedule and procedures established in the program for special inspections.

   d. Review the progress schedule, schedule of shop drawings submissions, and schedule of values prepared by the Contractor, and consult with Engineer concerning their acceptability.

   e. Report to Engineer regarding work which is known to be defective, or which fails any required inspections, tests, or approvals, or has been damaged prior to final payment; and advise Engineer whether the work should be corrected or rejected, or should be uncovered for observation, or requires additional testing, inspection, or approval. The responsibilities of any special inspector or agent to report deficiencies in accordance with the program of special inspections is not to be amended or altered and may be the basis for the knowledge.

   f. Review applications for payment with the Contractor for compliance with the established procedure for their submission, and forward them with recommendations to Engineer, noting particularly their relation to the schedule of values, work completed, and materials and equipment delivered at the site, but not incorporated into the work.

   g. Record date of receipt of shop drawings and samples. Receive samples that are furnished at the site by the Contractor, and notify Engineer of their availability for examination.

   h. During the course of the work, verify that specified certificates, operation and maintenance manuals, and other data required to be assembled and furnished by the Contractor are applicable to the items actually installed; and deliver this material to Engineer for his review and forwarding to Owner prior to final acceptance of the work. This is exclusive of any verifications contained as part of the program of special inspections.

   i. Maintain a marked set of drawings and specifications at the jobsite based on data provided by the Contractor. This information will be combined with information from

the record documents maintained by the Contractor, and a master set of documents conforming to construction records will be produced.

j. Review certificates of inspections, tests, and related approvals submitted by the Contractor as required by laws, rules, regulations, ordinances, codes, orders, or the Contract Documents (but only to verify that their content complies with the requirements of, and the results certified indicate compliance with, the construction contract documents). This service is limited to a review of items submitted by the Contractor and does not extend to a determination of whether the Contractor has complied with all legal requirements. This is exclusive of items contained in the program of special inspections reviewed or verified by others.

5. Maintain the following documents at the jobsite.

k. Correspondence files.

l. Reports of jobsite conferences, meetings, and discussions among the Engineer, Owner, and Contractor.

m. Submittals of shop drawings and samples.

n. Reproductions of original construction contract documents.

o. Addenda.

p. Change orders.

q. Field orders.

r. Additional drawings issued subsequent to execution of the construction contract documents.

s. Progress reports.

t. Names, addresses, and telephone numbers of all contractors, subcontractors, and major suppliers of materials and equipment.

6. Maintain a daily diary or log book of events at the jobsite. The diary or log book shall remain the property of Engineer. It will include the following information:

g. Days the Contractor worked on the jobsite.

h. Contractor and subcontractor personnel on jobsite.

i. Construction equipment on the jobsite.

j. Observed delays and causes.

k. Weather conditions.

l. Data relative to claims for extras or deductions.

m. Daily activities.

n. Observations pertaining to the progress of the work.

o. Materials received on jobsite.

7. Assistance in Certification of Substantial Completion

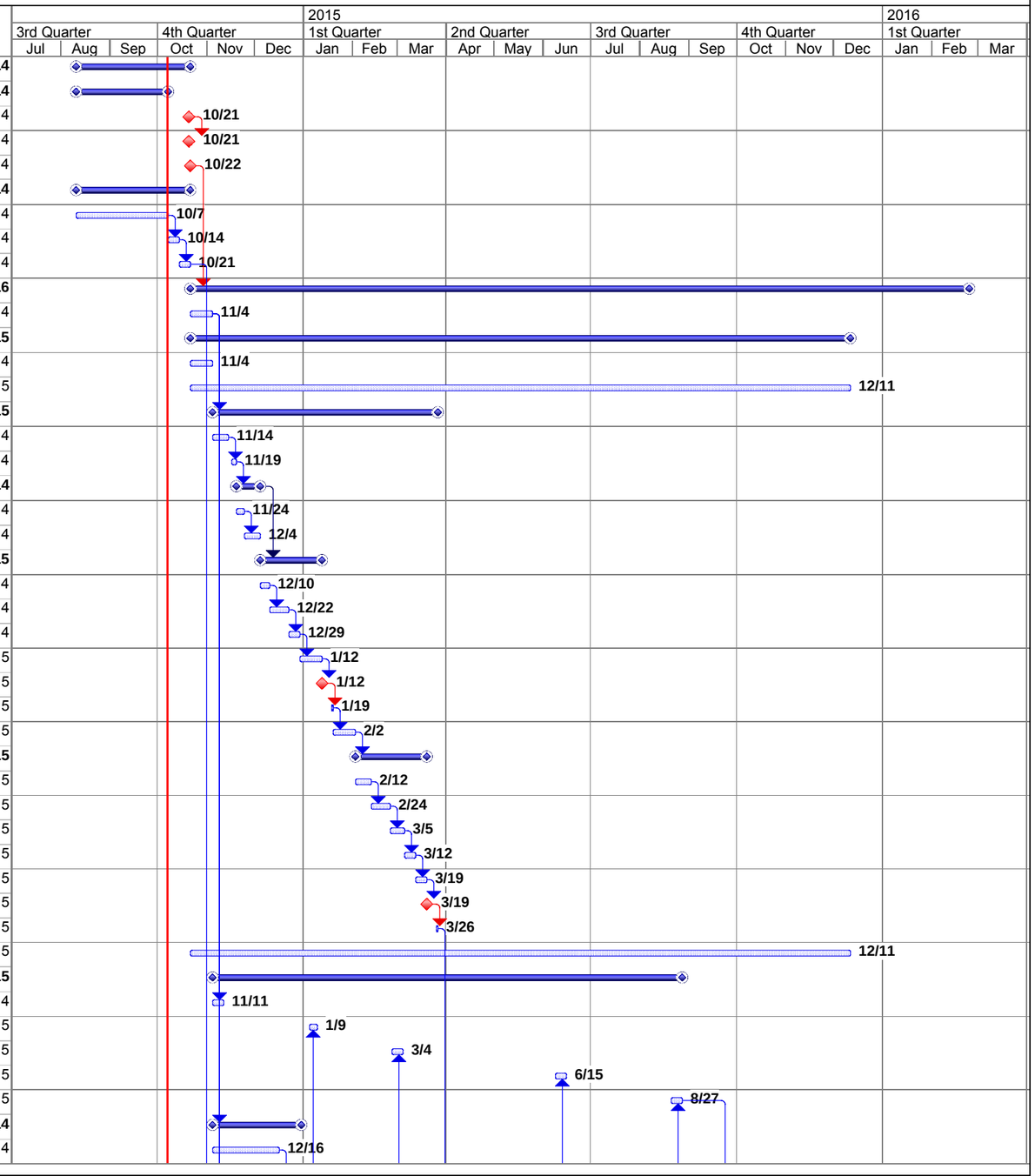
a. Before Engineer issues a Certificate of Substantial Completion, submit to the Contractor a list of items observed to require completion or correction.

b. Assist Engineer in conducting final inspection in the company of Owner and the Contractor, and prepare a final list of items to be completed or corrected.

c. Verify that all items on the final list have been completed or corrected, and make recommendations to Engineer concerning acceptance.

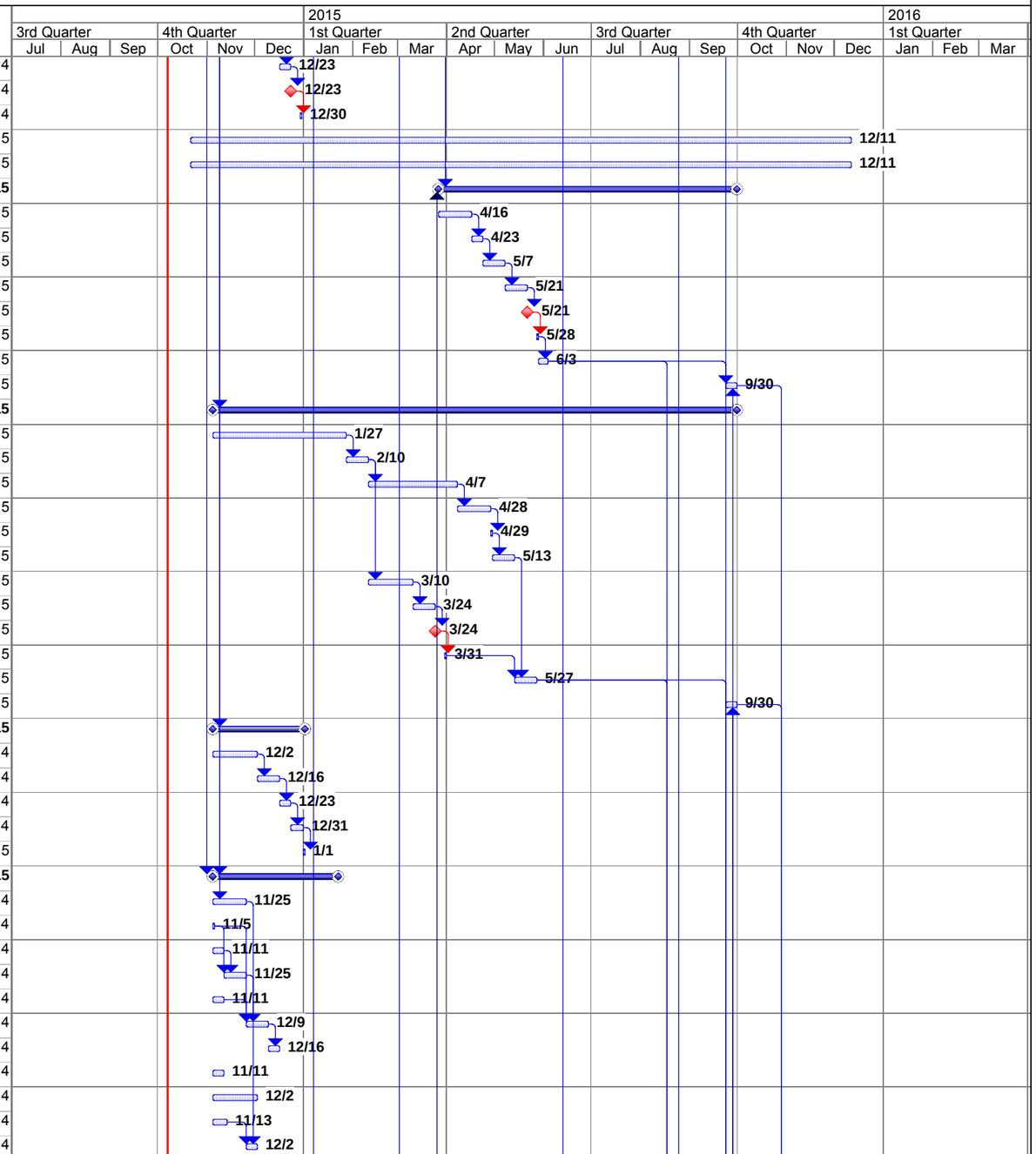
Great Falls Montana WTP Facility Upgrade Project - Phase 1
Schedule v4 - Based on Revised BIM Workflow Model
Detailed Design and Bidding Phases

ID	Task Name	Start	Finish
1	**305 A - Amend Prepare/Update Final Scope of Facility Upgrades**	**Mon 8/11/14**	**Wed 10/22/14**
2	**Prepare Proposal for Detailed Design and Bidding Services**	**Mon 8/11/14**	**Tue 10/7/14**
23	Contract approval at City Commission Meeting	Tue 10/21/14	Tue 10/21/14
24	Project Gate - Buy-in by all Stateholders so detailed design can proceed	Tue 10/21/14	Tue 10/21/14
25	Notice to Proceed	Wed 10/22/14	Wed 10/22/14
26	**290A - Amend Develop As-built Drawing of Existing Buried Utilities**	**Mon 8/11/14**	**Tue 10/21/14**
27	Delay in completing Potholing	Mon 8/11/14	Tue 10/7/14
28	Surveying	Wed 10/8/14	Tue 10/14/14
29	Drawing Preparation	Wed 10/15/14	Tue 10/21/14
30	**Detailed Design and Bidding Phase**	**Wed 10/22/14**	**Wed 2/24/16**
31	110A - Amend Project Workplan	Wed 10/22/14	Tue 11/4/14
32	**190D - Continued Project Management & Controls**	**Wed 10/22/14**	**Fri 12/11/15**
33	Amend agreements with TD&H & LPW	Wed 10/22/14	Tue 11/4/14
34	Project Management and Controls	Wed 10/22/14	Fri 12/11/15
35	**PLC Migration Plan & Performance Test of Partial Conversion**	**Wed 11/5/14**	**Thu 3/26/15**
36	Prepare and execute amendment to agreement	Wed 11/5/14	Fri 11/14/14
37	Task 260 - Review Existing Data and Documents	Mon 11/17/14	Wed 11/19/14
38	**Task 261 - Prepare As-built Drawings**	**Thu 11/20/14**	**Thu 12/4/14**
39	Conduct site visit to review changes	Thu 11/20/14	Mon 11/24/14
40	Develop as-built drawings	Tue 11/25/14	Thu 12/4/14
41	**Task 262 - Develop Migration Plan for PLC Conversion**	**Fri 12/5/14**	**Mon 1/12/15**
42	Develop Alternatives	Fri 12/5/14	Wed 12/10/14
43	Evaluate Alternatives	Thu 12/11/14	Mon 12/22/14
44	Prepare Summary Memorandum	Tue 12/23/14	Mon 12/29/14
45	City Review of Draft Summary Memorandum	Tue 12/30/14	Mon 1/12/15
46	City Review Comments on Draft Summary Memorandum	Mon 1/12/15	Mon 1/12/15
47	Task 263 - Migration Plan for PLC Conversion Review	Mon 1/19/15	Mon 1/19/15
48	City Purchases PLCs	Tue 1/20/15	Mon 2/2/15
49	**Task 264 - Perform a Partial Conversion and Test Performance**	**Tue 2/3/15**	**Thu 3/19/15**
50	Perform partial conversion	Tue 2/3/15	Thu 2/12/15
51	Test Partial Conversion	Fri 2/13/15	Tue 2/24/15
52	Prepare Construction Cost Estimate	Wed 2/25/15	Thu 3/5/15
53	Amend Migration Plan to include Performance Test Results	Fri 3/6/15	Thu 3/12/15
54	City Review of Revised Migration Plan	Fri 3/13/15	Thu 3/19/15
55	City Review Comments on Revised Migration Plan	Thu 3/19/15	Thu 3/19/15
56	Task 265 - Partial Conversion and Performance Test Review	Thu 3/26/15	Thu 3/26/15
57	294B - Continued Coordination with NW Energy	Wed 10/22/14	Fri 12/11/15
58	**295 - Review of Design Deliverables by IAC**	**Wed 11/5/14**	**Thu 8/27/15**
59	Phase 1 Drawings	Wed 11/5/14	Tue 11/11/14
60	15% Design Package	Mon 1/5/15	Fri 1/9/15
61	30% Design Package	Thu 2/26/15	Wed 3/4/15
62	60% Design Package	Tue 6/9/15	Mon 6/15/15
63	90% Design Package	Fri 8/21/15	Thu 8/27/15
64	**301 - Conduct Hazardous Materials Assessment**	**Wed 11/5/14**	**Tue 12/30/14**
65	Prepare Assessment	Wed 11/5/14	Tue 12/16/14



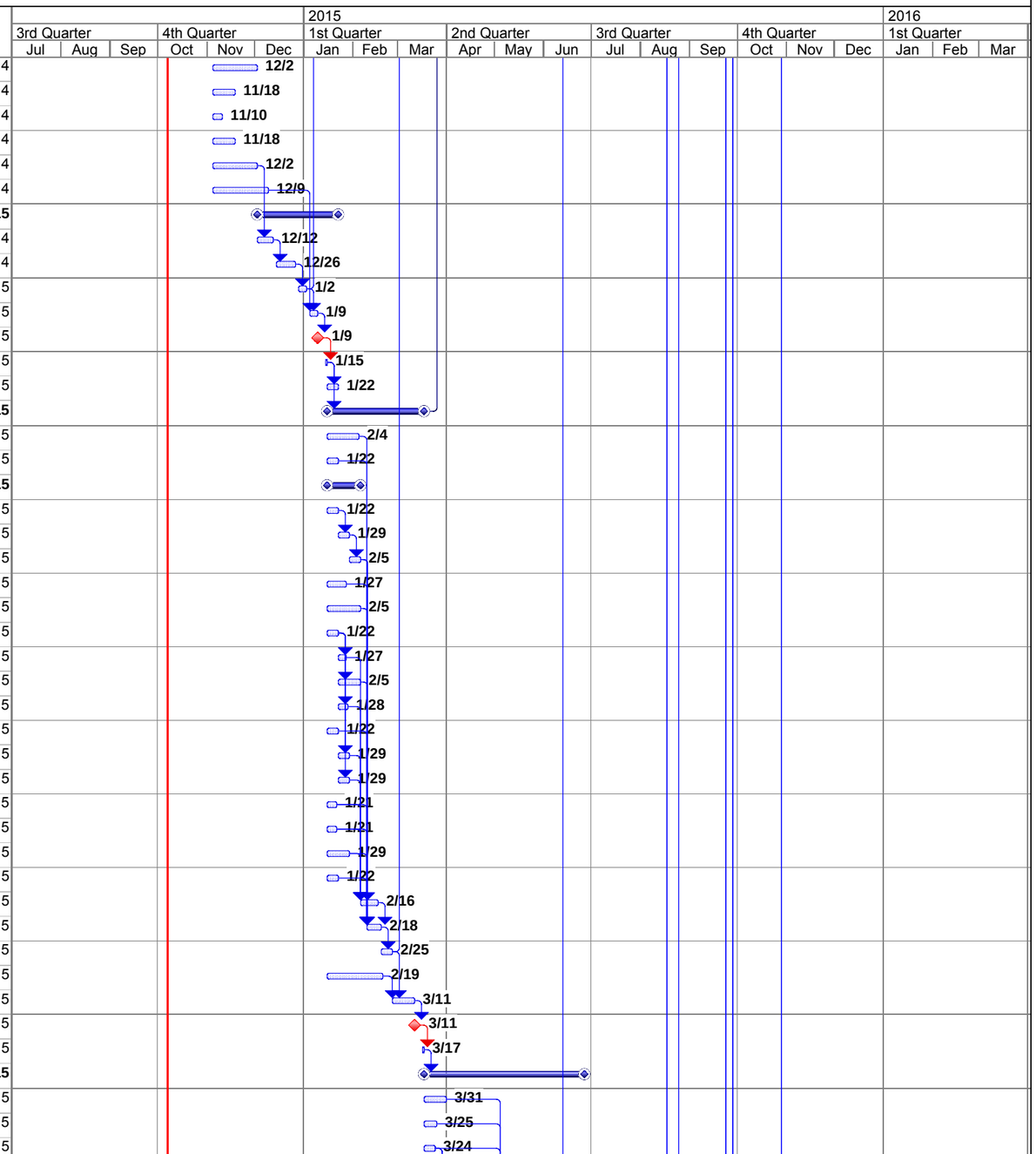
Great Falls Montana WTP Facility Upgrade Project - Phase 1
Schedule v4 - Based on Revised BIM Workflow Model
Detailed Design and Bidding Phases

ID	Task Name	Start	Finish
66	City Review of Assessment	Wed 12/17/14	Tue 12/23/14
67	City Review Comment on Assessment	Tue 12/23/14	Tue 12/23/14
68	Review Meeting to discuss City comments and decide on next steps	Tue 12/30/14	Tue 12/30/14
69	302A - Contiined Permitting Assistance and Coordination with MDEQ	Wed 10/22/14	Fri 12/11/15
70	303 - On-call Surveying	Wed 10/22/14	Fri 12/11/15
71	**304 - Prepare Contractor Information Package for IAC Construction Services**	**Fri 3/27/15**	**Wed 9/30/15**
72	Prepare Draft Package	Fri 3/27/15	Thu 4/16/15
73	Review of Draft Package by B&V	Fri 4/17/15	Thu 4/23/15
74	Revise Draft Package	Fri 4/24/15	Thu 5/7/15
75	Review of Revised Draft Package by City	Fri 5/8/15	Thu 5/21/15
76	City Review Comments on Draft Package	Thu 5/21/15	Thu 5/21/15
77	Review Meeting to disucss City review comments	Thu 5/28/15	Thu 5/28/15
78	Prepare Draft Final Package	Fri 5/29/15	Wed 6/3/15
79	Prepare Final Package based on 90% Design Package	Thu 9/24/15	Wed 9/30/15
80	**306 - Prepare Contractor Information Package for Wedeco K143 12/5(6) Reactors**	**Wed 11/5/14**	**Wed 9/30/15**
81	Delay	Wed 11/5/14	Tue 1/27/15
82	Prepare Agreement	Wed 1/28/15	Tue 2/10/15
83	Prepare draft Submittal for UV Disinfection Equipment	Wed 2/11/15	Tue 4/7/15
84	Review of Draft Submittal by City & B&V	Wed 4/8/15	Tue 4/28/15
85	Review Conference Call to discuss review comments on Draft Submittal	Wed 4/29/15	Wed 4/29/15
86	Revise Submittal	Thu 4/30/15	Wed 5/13/15
87	Prepare Draft Contractor Information Package	Wed 2/11/15	Tue 3/10/15
88	Review of Draft Contractor Information Package by City & B&V	Wed 3/11/15	Tue 3/24/15
89	City Review Comments on Draft Package	Tue 3/24/15	Tue 3/24/15
90	Review Meeting to disucss City review comments	Tue 3/31/15	Tue 3/31/15
91	Prepare Draft Final Contractor Information Package	Thu 5/14/15	Wed 5/27/15
92	Prepare Final Package base on City Comments on 90% Design Package	Thu 9/24/15	Wed 9/30/15
93	**308 - Testing of Electrical Grounding**	**Wed 11/5/14**	**Thu 1/1/15**
94	Delay to Start	Wed 11/5/14	Tue 12/2/14
95	Prepare and execute agreement	Wed 12/3/14	Tue 12/16/14
96	Conduct testing and provide results	Wed 12/17/14	Tue 12/23/14
97	Review of results by B&V	Wed 12/24/14	Wed 12/31/14
98	Review Meeting to discuss results and decide on next steps	Thu 1/1/15	Thu 1/1/15
99	**310 - 15% Detailed Design & Basis of Design Memorandum**	**Wed 11/5/14**	**Thu 1/22/15**
100	Perform survey of SE corner of site, including area around lime silo, and prepare topo map	Wed 11/5/14	Tue 11/25/14
101	Control System Standards Workshop	Wed 11/5/14	Wed 11/5/14
102	Equipment Lists	Wed 11/5/14	Tue 11/11/14
103	Process Equipment Info & Control Functions	Wed 11/12/14	Tue 11/25/14
104	Process Flow Diagrams	Wed 11/5/14	Tue 11/11/14
105	P&IDs and Control Strategy/Descriptions	Wed 11/26/14	Tue 12/9/14
106	Control System Block Diagram	Wed 12/10/14	Tue 12/16/14
107	Hydraulic Profile	Wed 11/5/14	Tue 11/11/14
108	Updated Facility Layouts / Floorplans	Wed 11/5/14	Tue 12/2/14
109	Topographic surveying of known areas	Wed 11/5/14	Thu 11/13/14
110	Updated Site Plan	Wed 11/26/14	Tue 12/2/14



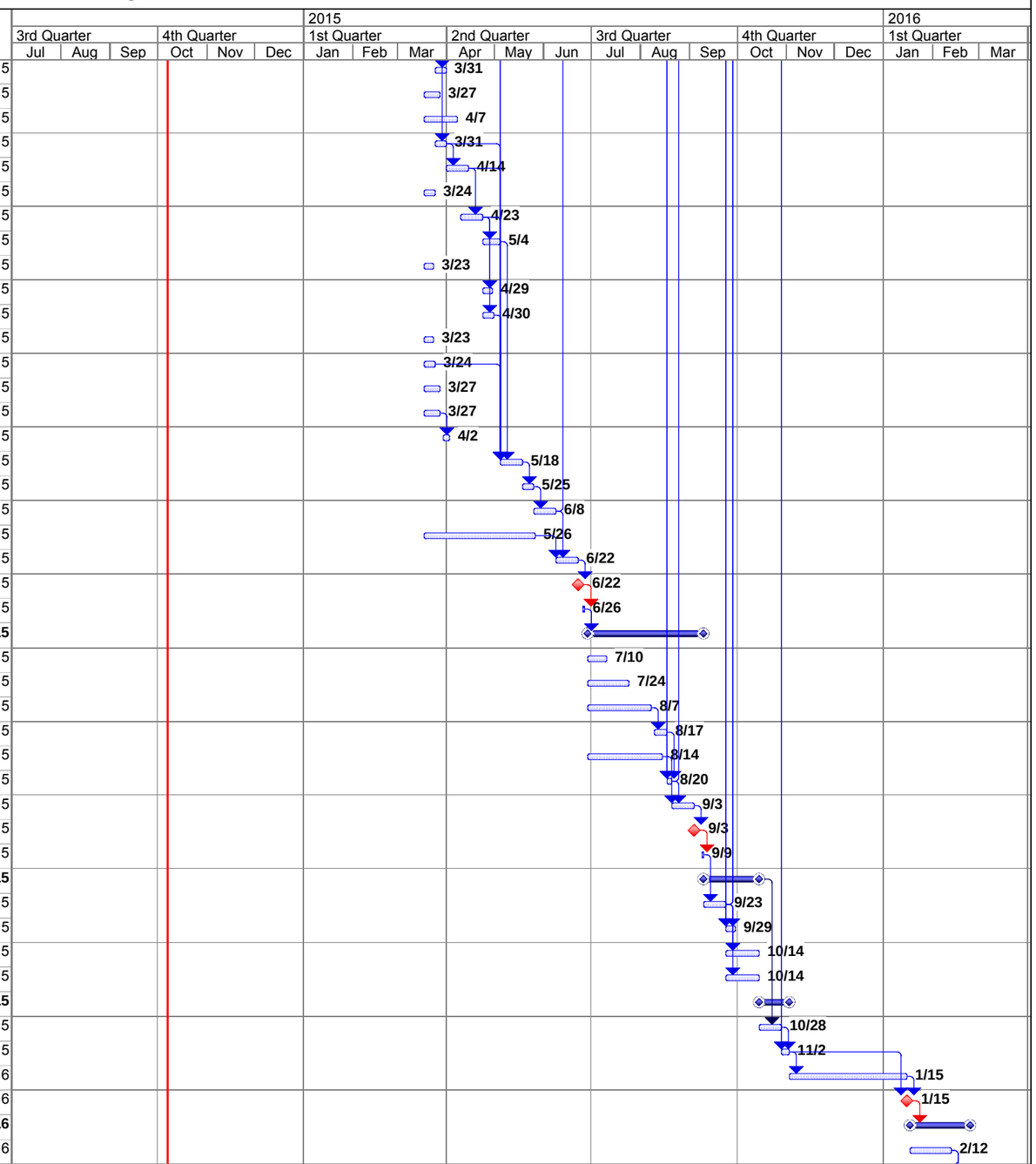
Great Falls Montana WTP Facility Upgrade Project - Phase 1
Schedule v4 - Based on Revised BIM Workflow Model
Detailed Design and Bidding Phases

ID	Task Name	Start	Finish
111	Preliminary Geotechnical Information	Wed 11/5/14	Tue 12/2/14
112	Chemical Feed Schematics	Wed 11/5/14	Tue 11/18/14
113	Chemical Feed Criteria Tables	Wed 11/5/14	Mon 11/10/14
114	Equipment Tagging Standards	Wed 11/5/14	Tue 11/18/14
115	Discipline Design Guidelines and Criteria	Wed 11/5/14	Tue 12/2/14
116	Designer Response to City Review Comments on Draft Phase 1 Drawings for Task 282C	Wed 11/5/14	Tue 12/9/14
117	**Consolidated Basis of Design Memo**	**Wed 12/3/14**	**Thu 1/22/15**
118	Prepare Draft	Wed 12/3/14	Fri 12/12/14
119	Holiday Allowance	Mon 12/15/14	Fri 12/26/14
120	Internal QA/QC & Revisions	Mon 12/29/14	Fri 1/2/15
121	City Review	Mon 1/5/15	Fri 1/9/15
122	City Review Comments on 30% Detailed Design Package	Fri 1/9/15	Fri 1/9/15
123	Review Meeting to disucss City review comments	Thu 1/15/15	Thu 1/15/15
124	Final Basis of Design Memo	Fri 1/16/15	Thu 1/22/15
125	**320 - 30% Detailed Design**	**Fri 1/16/15**	**Tue 3/17/15**
126	Front End Contract Documents	Fri 1/16/15	Wed 2/4/15
127	Civil/Site Drawings	Fri 1/16/15	Thu 1/22/15
128	**Geotechnical Report**	**Fri 1/16/15**	**Thu 2/5/15**
129	Draft Report	Fri 1/16/15	Thu 1/22/15
130	City Review	Fri 1/23/15	Thu 1/29/15
131	Final Report	Fri 1/30/15	Thu 2/5/15
132	Final Hydraulic Profile	Fri 1/16/15	Tue 1/27/15
133	Process Equipment Specifications	Fri 1/16/15	Thu 2/5/15
134	Architectural CAD Plans for Buildings	Fri 1/16/15	Thu 1/22/15
135	Architectural Elevations	Fri 1/23/15	Tue 1/27/15
136	Prelim Structural Design	Fri 1/23/15	Thu 2/5/15
137	Column Row Locations & Floor Elevations	Fri 1/23/15	Wed 1/28/15
138	Code Classification Table	Fri 1/16/15	Thu 1/22/15
139	Locate HVAC & Plumbing Equipment	Fri 1/23/15	Thu 1/29/15
140	Locate Electrical & I&C Equipment	Fri 1/23/15	Thu 1/29/15
141	Updated Power Distribution Diagram	Fri 1/16/15	Wed 1/21/15
142	Update Control System Block Diagram	Fri 1/16/15	Wed 1/21/15
143	Updated P&IDS and Control Descriptions	Fri 1/16/15	Thu 1/29/15
144	I&C I/O Lists & Device Schedules	Fri 1/16/15	Thu 1/22/15
145	Updated Construction Cost Estimate	Fri 2/6/15	Mon 2/16/15
146	Compile 30% Design Package	Tue 2/10/15	Wed 2/18/15
147	Internal QA/QC Review and Package Revision	Thu 2/19/15	Wed 2/25/15
148	Designer response to City Review Comments on 15% Design Package	Fri 1/16/15	Thu 2/19/15
149	City Review of 30% Design Package	Thu 2/26/15	Wed 3/11/15
150	City Review Comments on 30% Design Package	Wed 3/11/15	Wed 3/11/15
151	Review Meeting to disucss City review comments	Tue 3/17/15	Tue 3/17/15
152	**330 - 60% Detailed Design**	**Wed 3/18/15**	**Fri 6/26/15**
153	Updated Civil/Site Drawings & Details	Wed 3/18/15	Tue 3/31/15
154	Yard Piping & Underground Utility Drawings	Wed 3/18/15	Wed 3/25/15
155	Equipment & Piping Floor Plans	Wed 3/18/15	Tue 3/24/15



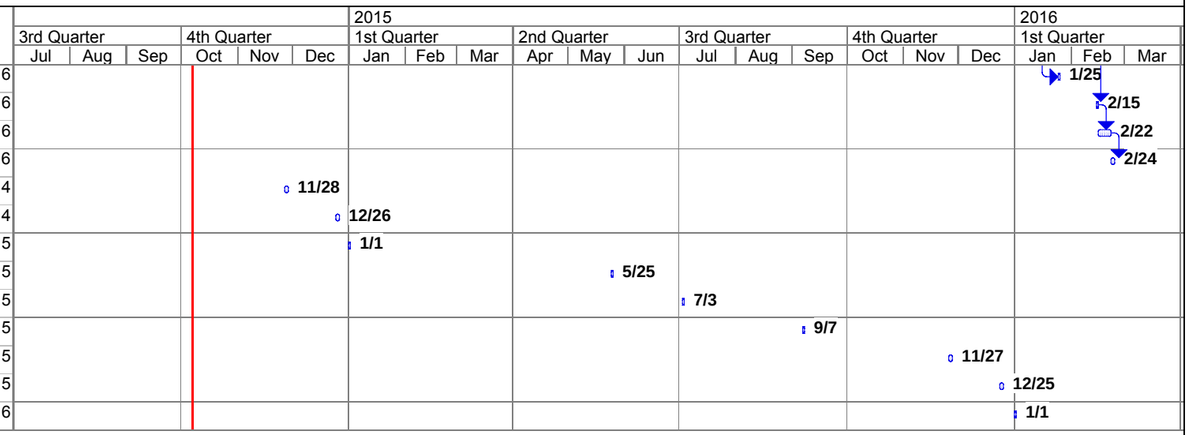
Great Falls Montana WTP Facility Upgrade Project - Phase 1
Schedule v4 - Based on Revised BIM Workflow Model
Detailed Design and Bidding Phases

ID	Task Name	Start	Finish
156	Process Equipment Sections & Details	Wed 3/25/15	Tue 3/31/15
157	Updated Process Equipment Specifications	Wed 3/18/15	Fri 3/27/15
158	Pipe, Valve, Bldg Material, Concrete Specs	Wed 3/18/15	Tue 4/7/15
159	Architectural Floor/Roof Plans	Wed 3/25/15	Tue 3/31/15
160	Architectural Wall Sections	Wed 4/1/15	Tue 4/14/15
161	Architectural Schedules	Wed 3/18/15	Tue 3/24/15
162	Structural Framing Plans & Sections	Fri 4/10/15	Thu 4/23/15
163	Plumbing & Fire Protection System Drawings	Fri 4/24/15	Mon 5/4/15
164	Plumbing Schedules	Wed 3/18/15	Mon 3/23/15
165	HVAC Plans & Equipment Schedules	Fri 4/24/15	Wed 4/29/15
166	Power Plans, Lighting Plans	Fri 4/24/15	Thu 4/30/15
167	Electrical Fixture Schedules	Wed 3/18/15	Mon 3/23/15
168	Duct Bank & Site Lighting Drawings	Wed 3/18/15	Tue 3/24/15
169	Final Equipment Control Descriptions	Wed 3/18/15	Fri 3/27/15
170	Final P&IDs	Wed 3/18/15	Fri 3/27/15
171	Final I/O Lists, Instrument Device Schedules	Mon 3/30/15	Thu 4/2/15
172	Updated Construction Cost Estimate	Tue 5/5/15	Mon 5/18/15
173	Compile Draft 60% Design Submittal	Tue 5/19/15	Mon 5/25/15
174	QA/QC of design submittal and revision	Tue 5/26/15	Mon 6/8/15
175	Designer Response to City Review Comments on 30% Design Submittal	Wed 3/18/15	Tue 5/26/15
176	City review of 60% submittal	Tue 6/9/15	Mon 6/22/15
177	City Review Comments on 60% Submittal	Mon 6/22/15	Mon 6/22/15
178	Review Meeting to disucss City review comments	Fri 6/26/15	Fri 6/26/15
179	**340 - 90% Detailed Design**	**Mon 6/29/15**	**Wed 9/9/15**
180	Complete Front End Documents	Mon 6/29/15	Fri 7/10/15
181	Complete Technical Specifications	Mon 6/29/15	Fri 7/24/15
182	Complete Drawings & Details	Mon 6/29/15	Fri 8/7/15
183	Updated Construction Cost Estimate	Mon 8/10/15	Mon 8/17/15
184	Designer Response to City Review Comments on 60% Design Package	Mon 6/29/15	Fri 8/14/15
185	Compile 90% Design Package	Tue 8/18/15	Thu 8/20/15
186	City Review of 90% Submittal	Fri 8/21/15	Thu 9/3/15
187	City Review Comments on 90% Design Package	Thu 9/3/15	Thu 9/3/15
188	Review Meeting to disucss City review comments	Wed 9/9/15	Wed 9/9/15
189	**345 - 90%QA/QC Review and Permitting Agency Reviews**	**Thu 9/10/15**	**Wed 10/14/15**
190	Incorporate comments from City Review	Thu 9/10/15	Wed 9/23/15
191	QA/QC of 90% Package	Thu 9/24/15	Tue 9/29/15
192	MDEQ Review	Thu 9/24/15	Wed 10/14/15
193	City of Great Falls Building Department Review	Thu 9/24/15	Wed 10/14/15
194	**350 - 100% Detailed Design**	**Thu 10/15/15**	**Mon 11/2/15**
195	Incorporate comments from 90% Package	Thu 10/15/15	Wed 10/28/15
196	Prepare bid-ready drawings, specifications, and contract documents	Thu 10/29/15	Mon 11/2/15
197	Schedule Contingency for Detailed Design - Authorized by City	Tue 11/3/15	Fri 1/15/16
198	Project Gate - Buy-in by all Stateholders so bidding and construction can proceed	Fri 1/15/16	Fri 1/15/16
199	**360 - Bidding Assistance and Contracting**	**Mon 1/18/16**	**Wed 2/24/16**
200	Advertise	Mon 1/18/16	Fri 2/12/16



Great Falls Montana WTP Facility Upgrade Project - Phase 1
Schedule v4 - Based on Revised BIM Workflow Model
Detailed Design and Bidding Phases

ID	Task Name	Start	Finish
201	Pre-Bid Conference	Mon 1/25/16	Mon 1/25/16
202	Bid Opening	Mon 2/15/16	Mon 2/15/16
203	Review Bids and prepare bid evaluation	Tue 2/16/16	Mon 2/22/16
204	Recommend Award	Tue 2/23/16	Wed 2/24/16
205	Thanksgiving	Thu 11/27/14	Fri 11/28/14
206	Christmas	Thu 12/25/14	Fri 12/26/14
207	New Years	Thu 1/1/15	Thu 1/1/15
208	Memorial Day	Mon 5/25/15	Mon 5/25/15
209	Forth of July	Fri 7/3/15	Fri 7/3/15
210	Labor Day	Mon 9/7/15	Mon 9/7/15
211	Thanksgiving	Thu 11/26/15	Fri 11/27/15
212	Christmas	Thu 12/24/15	Fri 12/25/15
213	New Years	Fri 1/1/16	Fri 1/1/16



City of Great Falls
WTP Facility Upgrade Project
Level of Effort and Fee Estimate Summary

	HOURS						LABOR COST						TOTAL EXPENSES	TOTAL COST
	B&V	TD&H	LPW	IAC	Bill Knoll	TOTAL	B&V	TD&H	LPW	IAC	Bill Knoll	TOTAL		
DETAILED DESIGN AND BIDDING PHASE	**10,458**	**5,312**	**2,061**	**1,013**	**398**	**19,282**	**$1,566,862**	**$517,942**	**$165,752**	**$131,625**	**$41,790**	**$2,423,971**	**$310,696**	**$2,734,667**
110A - AMEND PROJECT WORKPLAN	68	26	8	0	0	**102**	$10,024	$3,056	$912	$0	$0	$13,992	$706	$14,698
190D - CONT'D PROJECT MANAGEMENT & CONTROLS	836	267	57	0	0	**1,160**	$132,040	$30,894	$6,498	$0	$0	$169,432	$4,480	$173,912
PLC MIGRATION PLAN	222	0	0	589	0	**811**	$37,984	$0	$0	$73,625	$0	$111,609	$6,233	$117,842
289A - OWNER COMMISSION PRESENTATIONS	24	32	16	0	0	**72**	$4,656	$3,588	$1,616	$0	$0	$9,860	$4,266	$14,126
290A - CONT'D DETERMINE LOCATION OF UTILITIES	16	86	0	0	0	**102**	$2,728	$7,316	$0	$0	$0	$10,044	$1,156	$11,200
294B - CONT'D COORD. WITH NW ENERGY	700	8	0	0	0	**708**	$104,400	$936	$0	$0	$0	$105,336	$14,124	$119,460
295 - REVIEW OF DESIGN DELIVERABLES BY IAC	64	0	0	158	0	**222**	$9,524	$0	$0	$19,750	$0	$29,274	$766	$30,040
301 - CONDUCT HAZARD MTLS ASSESSMENT	8	156	0	0	0	**164**	$1,552	$16,104	$0	$0	$0	$17,656	$2,292	$19,948
302A - CONT'D PERMIT. ASST. WITH MDEQ	420	48	0	0	0	**468**	$69,800	$4,944	$0	$0	$0	$74,744	$4,504	$79,248
303 - ON-CALL SURVEYING	0	88	0	0	0	**88**	$0	$7,496	$0	$0	$0	$7,496	$2,014	$9,510
304 - PREPARE CONTRACTOR INFO FOR IAC	136	0	0	250	0	**386**	$20,500	$0	$0	$31,250	$0	$51,750	$1,558	$53,308
306 - PREPARE CONTRACTOR INFO FOR WEDECO	220	0	0	0	0	**220**	$35,200	$0	$0	$0	$0	$35,200	$57,660	$92,860
308 - TESTING OF ELECTRICAL GROUNDING	26	0	0	0	0	**26**	$4,292	$0	$0	$0	$0	$4,292	$4,278	$8,570
310 - 15% DETAILED DESIGN	683	735	193	16	20	**1,647**	$101,334	$71,150	$17,449	$2,000	$2,100	$194,033	$40,691	$234,724
320 - 30% DETAILED DESIGN	1,207	1,218	262	0	82	**2,769**	$178,724	$115,447	$20,710	$0	$8,610	$323,491	$24,207	$347,698
330 - 60% DETAILED DESIGN	1,947	1,021	590	0	136	**3,694**	$288,500	$101,039	$45,310	$0	$14,280	$449,129	$31,282	$480,411
340 - 90% DESIGN PACKAGE	1,887	705	586	0	0	**3,178**	$276,974	$68,044	$45,062	$0	$0	$390,080	$18,334	$408,414
345 - 90% QA/QC REVIEW & PERMIT. AGENCY REVIEW	360	453	89	0	160	**1,062**	$53,924	$42,500	$7,101	$0	$16,800	$120,325	$9,386	$129,711
350 - 100% DESIGN PACKAGE	814	190	58	0	0	**1,062**	$118,348	$17,022	$5,052	$0	$0	$140,422	$5,386	$145,808
360 - BIDDING ASSITANCE AND CONTRACTING	280	43	42	0	0	**365**	$34,848	$5,010	$4,242	$0	$0	$44,100	$4,445	$48,545
361 - CONTINGENCY FOR DETAILED DESIGN	540	236	160	0	0	**976**	$81,510	$23,396	$11,800	$5,000	$0	$121,706	$72,928	$194,634
CONSTRUCTION AND COMMISSIONING PHASE	**5,512**	**13,768**	**923**	**0**	**0**	**20,203**	**$862,690**	**$1,293,202**	**$79,470**	**$0**	**$0**	**$2,235,362**	**$274,109**	**$2,509,471**
190E - CONT'D PROJECT MANAGEMENT & CONTROLS	1,618	403	163	0	0	**2,184**	$249,738	$47,647	$14,100	$0	$0	$311,485	$26,552	$338,037
410 - CONSTRUCTION ADMINISTRATION SERVICES	2,416	3,665	336	0	0	**6,417**	$366,994	$362,381	$30,114	$0	$0	$759,489	$60,051	$819,540
420 - FIELD SUPPORT SERVICES	62	1,431	210	0	0	**1,703**	$10,506	$167,489	$19,026	$0	$0	$197,021	$56,109	$253,130
425 - STRUCTURAL TESTS & SPECIAL INSPECTIONS	0	2,480	14	0	0	**2,494**	$0	$214,550	$1,430	$0	$0	$215,980	$32,982	$248,962
430 - ONSITE RESIDENT PROJECT REPRESENTATIVE	0	5,000	0	0	0	**5,000**	$0	$420,000	$0	$0	$0	$420,000	$23,000	$443,000
440 - O&M MANUALS	612	0	0	0	0	**612**	$102,668	$0	$0	$0	$0	$102,668	$9,036	$111,704
450 - STARTUP ASSIST., TRAINING & POST CONSTRUCTION	368	209	0	0	0	**577**	$63,676	$21,795	$0	$0	$0	$85,471	$12,731	$98,202
451 - CONTINGENCY FOR CONSTRUCTON	436	580	200	0	0	**1,216**	$69,108	$59,340	$14,800	$0	$0	$143,248	$53,648	$196,896
TOTAL	**15,970**	**19,080**	**2,984**	**1,013**	**398**	**39,485**	**$2,429,552**	**$1,811,144**	**$245,222**	**$131,625**	**$41,790**	**$4,659,333**	**$584,805**	**$5,244,138**

City of Great Falls
WTP Facility Upgrade Project
Level of Effort and Fee Estimate

BV | TDH | LPW
Project 177716

TASK	DESCRIPTION	BLACK & VEATCH														TD&H									LPW				IAC		TOTAL HOURS	TOTAL LABOR	TRAVEL & OTHER EXPENSE	DIRECT PROJECT EXPENSE	TOTAL PROJECT EXPENSE	TOTAL PROJECT COST
	LEVEL OF EFFORT	GREG DYE - PROJECT MANAGER	TIM ENGEMOEN & PROCESS MECHANICAL TEAM	BARRY BOWLES & ELECTRICAL ENG. TEAM	MICHELE ROTH & HVAC/PLUMBING TEAM	TIM ENGEMOEN - ENGINEERING MANAGER	ERIN BRIGGEMAN & CHEM. ENG. TEAM	SHAWN LABONDE - PROJECT DIRECTOR	COST ESTIMATING TEAM	TYLER BRANNAN & I&C ENG. TEAM	QA/QC	KAT STORMS - PROJECT CONTROLS	BRYAN TOWNSEND - UV DISINFECTION	DAVE WILLARD - BIM COORD	ADMINISTRATION & PROJECT SUPPORT	WADE DEBOO - PIC; CIVIL / MECH	DUSTIN NETT - ASSISTANT PM; CIVIL / SITE; CONST MGMT	MIKE O'BRIEN - CIVIL / MECH	RODNEY BLAKE & STRUCT. TEAM	SURVEY TEAM	PETER KLEVBERG - GEOTECH. & INDUST. HYGIENE TEAM	JANA COOPER LANDSCAPE ARCHITECT	CAD TEAM	PROJECT SUPPORT ASSISTANT	TIM PETERSON - PIC; ARCHITECT	MAX GREBE - ARCHITECT	CAD	PROJECT SUPPORT ASSISTANT	COMBINED TEAM	BILL KNOLL						
110A - AMEND PROJECT WORKPLAN																															102	$13,992	$400	$306	$706	$14,698
	SUBTOTAL ==>>	32	0	0	0	16	0	0	0	0	0	0	0	0	20	4	16	0	6	0	0	0	0	0	8	0	0	0	0	0						
		32				16									20	4	16		6						8						102	$13,992	$400	$306	$706	$14,698
190D - CONT'D PROJECT MANAGEMENT & CONTROLS																															1,160	$169,432	$1,000	$3,480	$4,480	$173,912
	SUBTOTAL ==>>	396	0	0	0	0	0	40	0	0	0	136	0	0	264	51	152	0	51	0	0	0	0	13	57	0	0	0	0	0						
	PROJECT MANAGEMENT & ADMINISTRATION	396						40							264	51	152		51					13	57						1,024	$144,680	$1,000	$3,072	$4,072	$148,752
	PROJECT CONTROLS											136																			136	$24,752		$408	$408	$25,160
PLC MIGRATION PLAN																															811	111,609	$3,800	$2,433	$6,233	$117,842
	SUBTOTAL ==>>	58	0	0	0	0	0	0	0	164	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	589	0						
260 - REVIEW EXISTING DOUCUMENTS & DATA		4								8																			70		82	$10,830		$246	$246	$11,076
261 - PREPARE AS-BUILT DWGS FOR EXIST. SCADA SYSTEM		6								8																			165		179	$23,093		$537	$537	$23,630
262 - DEVELOP MIGRATION PLAN FOR PLC CONVERSION		16								104																			150		270	$38,806		$810	$810	$39,616
263 - MIGRATION PLAN FOR PLC CONVERSION REVIEW		12								20																			30		62	$9,338	$3,800	$186	$3,986	$13,324
264 - PERFORM PARTIAL CONVERSION		8								8																			149		165	$21,481		$495	$495	$21,976
265- PARTIAL CONVERSION PERFORMANCE TEST REVIEW		12								16																			25		53	$8,061		$159	$159	$8,220
289A - OWNER COMMISSION PRESENTATIONS																															72	$9,860	$4,050	$216	$4,266	$14,126
	SUBTOTAL ==>>	24	0	0	0	0	0	0	0	0	0	0	0	0	0	16	8	0	0	0	0	0	4	4	8	8	0	0	0	0						
		24														16	8						4	4	8	8					72	$9,860	$4,050	$216	$4,266	$14,126
290A - CONT'D DETERMINE LOCATION OF UTILITIES																															102	$10,044	$850	$306	$1,156	$11,200
	SUBTOTAL ==>>	8	0	8	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	38	0	0	24	8	0	0	0	0	0	0						
		8		8													16			38			24	8							102	$10,044	$850	$306	$1,156	$11,200
294B - CONT'D COORD. WITH NW ENERGY																															708	$105,336	$12,000	$2,124	$14,124	$119,460
	SUBTOTAL ==>>	100	0	400	0	200	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0						
		100		400		200											8														708	$105,336	$12,000	$2,124	$14,124	$119,460
295 - REVIEW OF DESIGN DELIVERABLES BY IAC																															222	$29,274	$100	$666	$766	$30,040
	SUBTOTAL ==>>	12	0	0	0	40	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	158	0						
		12				40				12																			158		222	$29,274	$100	$666	$766	$30,040
301 - CONDUCT HAZARD MTLS ASSESSMENT																															164	$17,656	$1,800	$492	$2,292	$19,948
	SUBTOTAL ==>>	8	0	0	0	0	0	0	0	0	0	0	0	0	0	4	6	0	0	0	136	0	8	2	0	0	0	0	0	0						
		8														4	6				136		8	2							164	$17,656	$1,800	$492	$2,292	$19,948
302A - CONT'D PERMIT. ASST. WITH MDEQ																															468	$74,744	$3,100	$1,404	$4,504	$79,248
	SUBTOTAL ==>>	40	40	0	0	0	0	0	0	0	0	0	340	0	0	16	8	8	0	0	0	0	8	8	0	0	0	0	0	0						
		40	40										340			16	8	8					8	8							468	$74,744	$3,100	$1,404	$4,504	$79,248
303 - ON-CALL SURVEYING																															88	$7,496	$1,750	$264	$2,014	$9,510
	SUBTOTAL ==>>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	80	0	0	0	0	0	0	0	0	0	0						
																	8			80											88	$7,496	$1,750	$264	$2,014	$9,510
304 - PREPARE CONTRACTOR INFO FOR IAC																															386	$51,750	$400	$1,158	$1,558	$53,308
	SUBTOTAL ==>>	24	0	0	0	80	0	0	0	28	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	250	0						
		24				80				28	4																		250		386	$51,750	$400	$1,158	$1,558	$53,308
306 - PREPARE CONTRACTOR INFO FOR WEDECO																															220	$35,200	$57,000	$660	$57,660	$92,860
	SUBTOTAL ==>>	16	0	24	0	40	0	0	0	16	4	0	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
		16		24		40				16	4		120																		220	$35,200	$57,000	$660	$57,660	$92,860
308 - TESTING OF ELECTRICAL GROUNDING																															26	$4,292	$4,200	$78	$4,278	$8,570
	SUBTOTAL ==>>	10	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
		10		16																											26	$4,292	$4,200	$78	$4,278	$8,570

310 - 15% DETAILED DESIGN																												1,647	$194,032	$35,750	$4,941	$40,691	$234,724
	SUBTOTAL ==>>	36	120	222	55	68	72	0	0	66	4	0	0	16	24	36	123	140	88	101	52	11	160	24	42	140	0	11	16	20					
	ARCHITECTURAL																								42	140		11			193	$17,449		$579	$579	$18,028
	I&C									40																					40	$6,520		$120	$120	$6,640
	CIVIL, GEOTECHNICAL & STRUCTURAL															36	123	140	88	101	52	11	160	24							735	$71,150	$24,350	$2,205	$26,555	$97,705
	CHEMICAL						72																								72	$11,736		$216	$216	$11,952
	PROCESS MECHANICAL		120																												120	$16,800		$360	$360	$17,160
	HVAC/PLUMBING				49																										49	$7,350		$147	$147	$7,497
	ELECTRICAL			216																										20	236	$33,852	$2,600	$708	$3,308	$37,160
	BIM COORDINATION													16																	16	$2,400		$48	$48	$2,448
	CONTROL SYSTEMS WORKSHOP	12								20																			16		48	$7,588	$3,800	$144	$3,944	$11,532
	DESIGN REVIEW MEETING	12		6	6	8				6																					38	$6,136	$2,000	$114	$2,114	$8,250
	15% PACKAGE &BASIS OF DESIGN MEMORANDUM	12				60					4				24																100	$13,052	$3,000	$300	$3,300	$16,352
320 - 30% DETAILED DESIGN																												2,769	$323,491	$15,900	$8,307	$24,207	$347,698
	SUBTOTAL ==>>	28	110	662	133	62	28	0	62	66	8	0	0	24	24	28	69	105	432	0	48	44	438	54	42	114	84	22	0	82					
	ARCHITECTURAL																								42	114	84	22			262	$20,710		$786	$786	$21,496
	I&C									60																					60	$9,780		$180	$180	$9,960
	CIVIL, GEOTECHNICAL & STRUCTURAL															28	69	105	432		48	44	438	54							1,218	$115,447	$9,300	$3,654	$12,954	$128,401
	CHEMICAL						28																								28	$4,564		$84	$84	$4,648
	PROCESS MECHANICAL		110																												110	$15,400		$330	$330	$15,730
	HVAC/PLUMBING				127																										127	$19,050		$381	$381	$19,431
	ELECTRICAL			656																										82	738	$105,042	$2,600	$2,214	$4,814	$109,856
	BIM COORDINATION													24																	24	$3,600		$72	$72	$3,672
	DESIGN REVIEW MEETING	12		6	6	8				6																					38	$6,136	$2,000	$114	$2,114	$8,250
	30% DESIGN PACKAGE	12				44					6				24																86	$11,356	$2,000	$258	$2,258	$13,614
	CONSTRUCTION COST OPINION	4				10			62		2																				78	$12,406		$234	$234	$12,640
330 - 60% DETAILED DESIGN																												3,694	$449,125	$20,200	$11,082	$31,282	$480,411
	SUBTOTAL ==>>	28	200	1,094	329	50	56	0	60	66	16	0	0	24	24	32	99	182	394	0	0	34	230	50	84	194	290	22	0	136					
	ARCHITECTURAL																								84	194	290	22			590	$45,310		$1,770	$1,770	$47,080
	I&C									60																					60	$9,780		$180	$180	$9,960
	CIVIL & STRUCTURAL															32	99	182	254			34	230	38							869	$84,883	$6,800	$2,607	$9,407	$94,290
	CONCRETE SPECIFICATIONS										8								140					12							160	$17,756	$6,800	$480	$7,280	$25,036
	CHEMICAL						56																								56	$9,128		$168	$168	$9,296
	PROCESS MECHANICAL		200																												200	$28,000		$600	$600	$28,600
	HVAC/PLUMBING				323																										323	$48,450		$969	$969	$49,419
	ELECTRICAL			1,088																										136	1,224	$174,216	$2,600	$3,672	$6,272	$180,488
	BIM COORDINATION													24																	24	$3,600		$72	$72	$3,672
	DESIGN REVIEW MEETING	12		6	6	8				6																					38	$6,136	$2,000	$114	$2,114	$8,250
	60% DESIGN PACKAGE	12				32					6				24																74	$9,784	$2,000	$222	$2,222	$12,006
	CONSTRUCTION COST OPINION	4				10			60		2																				76	$12,086		$228	$228	$12,314
340 - 90% DESIGN PACKAGE																												3,178	$390,086	$8,800	$9,534	$18,334	$408,414
	SUBTOTAL ==>>	20	200	1,120	275	58	52	0	60	30	8	0	0	24	40	28	90	77	206	0	0	48	230	26	84	194	286	22	0	0					
	ARCHITECTURAL																								84	194	286	22			586	$45,062		$1,758	$1,758	$46,820
	I&C									30																					30	$4,890		$90	$90	$4,980
	CIVIL & STRUCTURAL															28	90	77	206			48	230	26							705	$68,044	$4,200	$2,115	$6,315	$74,359
	CHEMICAL						52																								52	$8,476		$156	$156	$8,632
	PROCESS MECHANICAL		200																												200	$28,000		$600	$600	$28,600
	HVAC/PLUMBING				275																										275	$41,250		$825	$825	$42,075
	ELECTRICAL			1,120																											1,120	$164,640	$2,600	$3,360	$5,960	$170,600
	BIM COORDINATION													24																	24	$3,600		$72	$72	$3,672
	90% DESIGN PACKAGE	16				48					6				40																110	$14,032	$2,000	$330	$2,330	$16,362
	CONSTRUCTION COST OPINION	4				10			60		2																				76	$12,086		$228	$228	$12,314
345 - 90% QA/QC REVIEW & PERMIT. AGENCY REVIEW																												1,062	$120,325	$6,200	$3,186	$9,386	$129,711
	SUBTOTAL ==>>	28	16	166	60	24	8	0	0	14	16	0	0	8	20	13	60	28	115	0	14	7	202	14	18	38	22	11	0	160					
	ARCHITECTURAL																								18	38	22	11			89	$7,101		$267	$267	$7,368
	I&C									8																					8	$1,304		$24	$24	$1,328
	CIVIL & STRUCTURAL															13	60	28	115		14	7	202	14							453	$42,500	$2,200	$1,359	$3,559	$46,059
	CHEMICAL						8																								8	$1,304		$24	$24	$1,328
	PROCESS MECHANICAL		16																												16	$2,240		$48	$48	$2,288
	HVAC/PLUMBING				54																										54	$8,100		$162	$162	$8,262
	ELECTRICAL			160																										160	320	$40,320		$960	$960	$41,280
	BIM COORDINATION													8																	8	$1,200		$24	$24	$1,224
	DESIGN REVIEW MEETING	12		6	6	8				6																					38	$6,136	$2,000	$114	$2,114	$8,250
	90% QA/QC REVIEW & PERMITTING PACKAGE	16				16					16				20																68	$10,120	$2,000	$204	$2,204	$12,324
350 - 100% DESIGN PACKAGE																												1,062	$140,422	$2,200	$3,186	$5,386	$145,808
	SUBTOTAL ==>>	8	160	480	78	24	12	0	0	20	0	0	0	16	16	2	35	8	35	0	0	3	77	30	18	20	20	0	0	0					
	ARCHITECTURAL																								18	20	20				58	$5,052		$174	$174	$5,226
	I&C									20																					20	$3,260		$60	$60	$3,320
	CIVIL & STRUCTURAL															2	35	8	35			3	77	30							190	$17,022	$1,200	$570	$1,770	$18,792
	CHEMICAL						12																								12	$1,956		$36	$36	$1,992
	PROCESS MECHANICAL		160																												160	$22,400		$480	$480	$22,880
	HVAC/PLUMBING				78																										78	$11,700		$234	$234	$11,934
	ELECTRICAL			480																											480	$70,560		$1,440	$1,440	$72,000
	BIM COORDINATION													16																	16	$2,400		$48	$48	$2,448
	100% DESIGN PACKAGE	8				24									16																48	$6,072	$1,000	$144	$1,144	$7,216

360 - BIDDING ASSITANCE AND CONTRACTING																														**365**	**$44,100**	**$3,350**	**$1,095**	**$4,445**	**$48,545**
	SUBTOTAL ==>>	**20**	**20**	**24**	**8**	**96**	**8**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**96**	**7**	**19**	**0**	**17**	**0**	**0**	**0**	**0**	**0**	**21**	**21**	**0**	**0**	**0**	**0**					
	ARCHITECTURAL																								21	21					42	$4,242		$126	$126	$4,368
	I&C									8																					8	$1,304		$24	$24	$1,328
	CIVIL & STRUCTURAL															7	19		17												43	$5,010	$350	$129	$479	$5,489
	CHEMICAL						8																								8	$1,304		$24	$24	$1,328
	PROCESS MECHANICAL		20																												20	$2,800		$60	$60	$2,860
	HVAC/PLUMBING				8																										8	$1,200		$24	$24	$1,224
	ELECTRICAL			24											40																64	$6,968		$192	$192	$7,160
	DISTRIBUTE DRAWING SETS					24																									24	$3,144		$72	$72	$3,216
	ADDENDA					40									40																80	$8,680		$240	$240	$8,920
	PRE-BID CONFERENCE ,BID OPENING & EVALUATION	20				32									16																68	$9,448	$3,000	$204	$3,204	$12,652
361 - CONTINGENCY FOR DETAILED DESIGN																															**976**	**$121,706**	**$70,000**	**$2,928**	**$72,928**	**$194,634**
	SUBTOTAL ==>>	**50**	**50**	**90**	**50**	**40**	**40**	**0**	**40**	**40**	**0**	**0**	**60**	**40**	**40**	**24**	**40**	**24**	**64**	**0**	**0**	**4**	**56**	**24**	**40**	**40**	**40**	**40**	**40**	**0**						
		50	50	90	50	40	40		40	40			60	40	40	24	40	24	64			4	56	24	40	40	40	40	40		976	$121,706	$70,000	$2,928	$72,928	$194,634
																															0	$0		$0	$0	$0
	TOTAL HOURS	946	916	4,306	988	798	276	40	222	530	60	136	520	152	568	261	757	572	1,408	219	250	151	1,437	257	422	769	742	128	1,053	398	19,282					
	HOURLY BILLING RATES	**$194**	**$140**	**$147**	**$150**	**$131**	**$163**	**$194**	**$160**	**$163**	**$200**	**$182**	**$166**	**$150**	**$86**	**$131**	**$117**	**$100**	**$110**	**$82**	**$104**	**$91**	**$76**	**$63**	**$114**	**$88**	**$62**	**$31**	**$125**	**$105**	19,282					
	TOTAL LABOR ($)	########	**$128,240**	########	########	########	**$44,988**	**$7,760**	**$35,520**	**$86,390**	**$12,000**	**$24,752**	**$86,320**	**$22,800**	**$48,848**	**$34,191**	**$88,569**	**$57,200**	########	**$17,958**	**$26,000**	**$13,741**	**$109,212**	**$16,191**	**$48,108**	**$67,672**	**$46,004**	**$3,968**	########	######						

City of Great Falls
WTP Facility Upgrade Project
Level of Effort and Fee Estimate

BV | TDH | LPW
Project 177716

TASK	DESCRIPTION	LEVEL OF EFFORT																												TOTAL HOURS	TOTAL LABOR	TRAVEL & OTHER EXPENSE	DIRECT PROJECT EXPENSE	TOTAL PROJECT EXPENSE	TOTAL PROJECT COST
		BLACK & VEATCH														TD&H										LPW									
		GREG DYE - PROJECT MANAGER	TIM ENGEMOEN & PROCESS MECHANICAL TEAM	BARRY BOWLES & ELECTRICAL ENGINEERING TEAM	MICHELE ROTH & HVAC/PLUMBING TEAM	TIM ENGEMOEN - ENGINEERING MANAGER	ERIN BRIGGEMAN & CHEMICAL ENG. TEAM	SHAWN LABONDE - PROJECT DIRECTOR	O&M SPECIALIST	TYLER BRANNON & I&C ENGINEERING TEAM	QA/QC	KAT STORMS - PROJECT CONTROLS	BRYAN TOWNSEND - UV DISINFECTION	DAVE WILLARD - BIM COORD & MODELING	ADMINISTRATION & PROJECT SUPPORT	WADE DEBOO - PIC; CIVIL / MECH	DUSTIN NETT - ASSISTANT PM; CIVIL / SITE; CONST MGMT	MIKE O'BRIEN - CIVIL / MECH	RODNEY BLAKE & STRUCTURAL TEAM	DAN KENCZKA - SURVEYING	PETER KLEVBERG - GEOTECHNICAL	STEVE GOFF - CONST INSPECTION	CONSTRUCTION MATERIALS TESTING TECHNICIAN	CAD	PROJECT SUPPORT ASSISTANT	TIM PETERSON - PIC; ARCHITECT	MAX GREBE - ARCHITECT	CAD	PROJECT SUPPORT ASSISTANT						
190E - CONT'D PROJECT MANAGEMENT & CONTROLS																														2,184	311,485	20,000	6,552	26,552	338,037
	SUBTOTAL ==>>	678	0	0	0	0	0	40	0	0	0	240	0	0	660	50	252	0	101	0	0	0	0	0	0	109	0	0	54						
	PROJECT MANAGEMENT & ADMINISTRATION	678						40							660	50	252		101							109			54	1,944	$266,125	$20,000	$5,832	$25,832	$291,957
	PROJECT CONTROLS											240																		240	$45,360		$720	$720	$46,080
410 - CONSTRUCTION ADMINISTRATION SERVICES																														6,417	759,489	40,800	19,251	60,051	819,540
	SUBTOTAL ==>>	138	144	1,200	248	312	32	0	0	82	28	0	0	32	200	208	1,680	126	189	13	0	315	0	94	1,040	21	315	0	0						
	ARCHITECTURAL	6																								21	315			342	$31,320		$1,026	$1,026	$32,346
	I&C	12								30																				42	$7,572		$126	$126	$7,698
	CIVIL & STRUCTURAL	24														208	1,680	126	189	13		315		94	1,040					3,689	$367,205	$20,000	$11,067	$31,067	$398,272
	CHEMICAL						32																							32	$5,504		$96	$96	$5,600
	PROCESS MECHANICAL	16	84																											100	$15,732		$300	$300	$16,032
	HVAC/PLUMBING	16			216																									232	$37,560		$696	$696	$38,256
	ELECTRICAL	40		1,160																										1,200	$187,840	$5,200	$3,600	$8,800	$196,640
	SCHEDULE, MONTHLY PAYMENTS, BONDS					32																								32	$4,448		$96	$96	$4,544
	SHOP DRAWING COORDINATION					80					12				100															192	$22,836		$576	$576	$23,412
	RFIS, COS, & CLAIMS	24	40	40	32	40				32	16																			224	$36,624		$672	$672	$37,296
	PERFORMANCE TESTING OF EQUIPMENT																													0	$0		$0	$0	$0
	CONTRACTOR PAY REQUESTS					96									100															196	$22,444		$588	$588	$23,032
	CONFORMED DRAWINGS					44								32																76	$11,204	$2,000	$228	$2,228	$13,432
	CONTROL SYSTEM CONFIGURATION MEETINGS		20			20				20																				60	$9,200	$13,600	$180	$13,780	$22,980
420 - FIELD SUPPORT SERVICES																														1,703	197,021	51,000	5,109	56,109	253,130
	SUBTOTAL ==>>	12	0	16	18	0	0	0	0	16	0	0	0	0	0	163	840	126	189	50	63	0	0	0	0	21	189	0	0						
	PRECONSTRUCTION CONFERENCE	12																												12	$2,412	$2,000	$36	$2,036	$4,448
	CONSTRUCTION MEETINGS									8																				8	$1,376	$10,000	$24	$10,024	$11,400
	SITE VISITS																													0	$0	$10,000	$0	$10,000	$10,000
	TESTING SERVICES																													0	$0		$0	$0	$0
	PUNCH LIST			8																										8	$1,240	$2,000	$24	$2,024	$3,264
	FINAL INSPECTION			8						8																				16	$2,616	$2,000	$48	$2,048	$4,664
	PHOTOGRAPHIC RECORDS																													0	$0	$10,000	$0	$10,000	$10,000
	ARCHITECTURAL																									21	189			210	$19,026		$630	$630	$19,656
	CIVIL & STRUCTURAL															163	840	126	189	50	63									1,431	$167,489	$15,000	$4,293	$19,293	$186,782
	HVAC/PLUMBING				18																									18	$2,862		$54	$54	$2,916
425 - STRUCTURAL TESTS & SPECIAL INSPECTIONS																														2,494	215,980	25,500	7,482	32,982	248,962
	SUBTOTAL ==>>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,050	0	0	0	1,430	0	0	12	0	0	2						
	ARCHITECTURAL																									12			2	14	$1,430		$42	$42	$1,472
	STRUCTURAL																		1,050				1,430							2,480	$214,550	$25,500	$7,440	$32,940	$247,490
430 - ONSITE RESIDENT PROJECT REPRESENTATIVE																														5,000	420,000	8,000	15,000	23,000	443,000
	SUBTOTAL ==>>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,000	0	0	0	0	0	0	0						
	RESIDENT PROJECT REPRESENTATIVE SERVICES																					5,000								5,000	$420,000	$8,000	$15,000	$23,000	$443,000
440 - O&M MANUALS																														612	102,668	7,200	1,836	9,036	111,704
	SUBTOTAL ==>>	16	24	60	8	24	8	0	400	4	8	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	O&M PLAN, MANUFACTURER MANUALS	16	24	60	8	24	8		400	4	8		60																	612	$102,668	$7,200	$1,836	$9,036	$111,704
450 - STARTUP ASSIST., TRAINING & POST CONSTRUCTION																														577	85,471	11,000	1,731	12,731	98,202
	SUBTOTAL ==>>	36	24	40	24	0	8	0	0	16	0	0	220	0	0	18	63	84	0	0	0	26	0	0	18	0	0	0	0						
	PRE- & POST STARTUP TRAINING	12											80																	92	$16,492	$2,800	$276	$3,076	$19,568
	STARTUP ASSISTANCE	16	24	40	24		8			16			20			18	63	84				26			18					357	$46,251	$4,900	$1,071	$5,971	$52,222
	PERFORMANCE TESTING	8											120																	128	$22,728	$3,300	$384	$3,684	$26,412
451 - CONTINGENCY FOR CONSTRUCTON																														1,216	143,248	50,000	3,648	53,648	196,896
	SUBTOTAL ==>>	30	30	80	40	40	40	0	40	40	0	0	40	24	32	0	100	40	200	0	40	200	0	0	0	40	60	60	40						
		30	30	80	40	40	40		40	40			40	24	32		100	40	200		40	200				40	60	60	40	1,216	$143,248	$50,000	$3,648	$53,648	$196,896
	TOTAL HOURS	910	222	1,396	338	376	88	40	440	158	36	240	320	56	892	439	2,935	376	1,729	63	103	5,541	1,430	94	1,058	203	564	60	96	20,203					
	HOURLY BILLING RATES	**$201**	**$149**	**$155**	**$159**	**$139**	**$172**	**$201**	**$169**	**$172**	**$218**	**$189**	**$176**	**$159**	**$91**	**$133**	**$119**	**$102**	**$109**	**$98**	**$119**	**$84**	**$70**	**$75**	**$64**	**$114**	**$88**	**$62**	**$31**	20,203					
	TOTAL LABOR ($)	#######	$33,078	#######	$53,742	$52,264	$15,136	$8,040	$74,360	$27,176	$7,848	$45,360	$56,320	$8,904	$81,172	$58,387	$349,265	$38,352	#######	$6,174	$12,257	#######	$100,100	$7,050	$67,712	$23,142	$49,632	$3,720	$2,976						

5' CONCRETE SIDEWALK
FUTURE DEMO EXIST NWE OVERHEAD ELECTRICAL (BY NWE)
DEMO EXIST CHAINLINK FENCE
NWE EASEMENT (TYP)
FUTURE BURIED ELECTRICAL (BY NWE)
3'x10' CONC. APRON
5'x5' CONC. STOOP
54" BUTTERFLY VALVE IN VAULT
HH #1
66" DI FE
20" PVC BWS
GROUNDING TRANSFORMERS & RESISTORS
ARC EXHAUST SECURITY FENCE (TYP. 7 LOCATIONS)
LOW SERVICE PUMPS
REPLACE EXISTING 54" BURIED VALVE W/ 54" PIPE SPOOL
DEMO EXIST NWE UNDERGROUND ELECTRICAL SERVICE
ELECTRICAL ROOM ADDITION
5' CONCRETE SIDEWALK
8" PVC IRR
DEMO EXIST 8" IRRIGATION PIPE
CHOPPER PUMP & WET-WELL
GARAGE
MV
FUTURE 5' CONCRETE SIDEWALK
RELOCATE EXISTING VEHICLE ACCESS GATES TO NORTH AND SOUTH SIDE OF SUBSTATION
LIFT STATION
24" PVC D
12" PVC D
48" DI FE
12" PVC D
IRRIGATION PUMP TRANSFORMER
FUTURE NW ENERGY 5KV SWGR METERING & SERVICE DISCONNECT
FUTURE NW ENERGY 15KV SUBSTATION SWGR & TRANSFORMERS
SURGE TANK
FUTURE DEMO EXIST CHAINLINK FENCE (BY NWE)
SUBSTATION
FUTURE GRAVEL ACCESS DRIVEWAY
FUTURE DEMO EXIST SUBSTATION (BY NWE)
FUTURE DEMO EXIST NWE OVERHEAD ELECTRICAL (BY NWE)
CHAINLINK FENCE
12" PVC OF
26' MOTORIZED CHAINLINK GATE
12" PVC OF
APPROACH EXISTING
APPROACH (REMOVE & REPLACE EXIST CURB & GUTTER W/NEW DROP CURB & GUTTER)
ROAD
RIVER
LOWER
ABANDONED
PROJECT NORTH
TRUE NORTH
0 20' 40' 60'
SCALE

PIPING ABBREVIATIONS

LSD	LOW SERVICE DISCHARGE
RW	RAW WATER
FE	FILTER EFFLUENT
FW	FINISHED WATER
BWS	BACKWASH SUPPLY
D	DRAIN
OF	OVERFLOW
SE	SECONDARY EFFLUENT

LEGEND

FUTURE PH.	BASE BID	EXISTING	DESCRIPTION
			ASPHALT PAVEMENT
			BOLLARDS
			BUILDING
			BUSH OR SHRUB
			CONCRETE
			CONTROL POINT
			CURB BOX
			CURB & GUTTER
			EDGE OF ASPHALT
			EDGE OF GRAVEL
			ELECTRICAL BOX
			FENCE – CHAIN LINK
			FIRE HYDRANT
			GAS
			GAS METER
			GATE
			GRAVEL SURFACING
			GUARD RAIL
			GUY WIRE
			HEDGE
			INLET
			IRRIGATION VALVE
			IRRIGATION LINE
			LIGHT POLE
			MANHOLE
			OVERHEAD ELECTRIC
			PARKING BLOCKS
			POWER POLE
			RAILROAD
			RETAINING WALL
			SANITARY SEWER
			SPRINKLER
			STORM DRAIN
			TELEPHONE RISER
			TRAFFIC SIGN
			TREE – CONIFEROUS
			TREE – DECIDUOUS
			UNDERGROUND ELECTRIC
			UNDERGROUND TELEPHONE
			VALVE
			WATERLINE
			FLOOD PLAIN

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK	APP

SAVED: XREF1:
PLOTTED: XREF2:
USER: XREF3:
DWG VER: XREF4:

BLACK & VEATCH
Building a world of difference.

L'Heureux PageWerner

Thomas, Dean & Hoskins, Inc. TD&H Engineering, Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

PRELIMINARY SITE PLAN
WEST AREA - BASE BID

DESIGNED: DDN
DETAILED: MWC
CHECKED:
APPROVED:
DATE: 08.1.14

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
O.F.1519.0

TDH #12-164

SD-1

5' CONCRETE SIDEWALK
3'x10' CONC. APRON
5'x5' CONC. STOOP
ARC EXHAUST SECURITY FENCE (TYP. 7 LOCATIONS)
LOW SERVICE PUMPS
DEMO EXIST NWE OVERHEAD ELECTRICAL (BY NWE)
DEMO EXIST CHAINLINK FENCE
54" BUTTERFLY VALVE IN VAULT
HH #1
REPLACE EXISTING 54" BURIED VALVE W/ 54" PIPE SPOOL
ELECTRICAL ROOM ADDITION
DEMO EXIST NWE UNDERGROUND ELECTRICAL SERVICE
GROUNDING TRANSFORMERS & RESISTORS
5' CONCRETE SIDEWALK
DEMO EXIST 8" IRRIGATION PIPE
CHOPPER PUMP & WET-WELL
FUTURE RELOCATE LIGHT POLE
FUTURE 5' CONCRETE SIDEWALK
5' CONCRETE SIDEWALK
FUTURE MACHINE SHOP
LIFT STATION
FUTURE BOLLARD (TYP)
NWE EASEMENT (TYP)
BURIED ELECTRICAL (BY NWE)
IRRIGATION PUMP TRANSFORMER
DEMO EXIST CHAINLINK FENCE (BY NWE)
FUTURE DEMO EXIST GARAGE & SIDEWALK COMPLETELY
SUBSTATION
FUTURE 10'x10' CONC. PAD
NW ENERGY 5KV SWGR METERING & SERVICE DISCONNECT
GRAVEL ACCESS DRIVEWAY
NW ENERGY 15KV SUBSTATION SWGR & TRANSFORMERS
DEMO EXIST SUBSTATION (BY NWE)
SURGE TANK
DEMO EXIST NWE OVERHEAD ELECTRICAL (BY NWE)
CHAINLINK FENCE
12" PVC OF
26' MOTORIZED CHAINLINK GATE
APPROACH EXISTING
APPROACH (REMOVE & REPLACE EXIST CURB & GUTTER W/NEW DROP CURB & GUTTER)
ROAD
RIVER
LOWER
GARAGE

NOTE:
CLOUDED FEATURES ON THIS SHEET ARE ALTERNATE BID ITEM NO. 1.

PROJECT NORTH
TRUE NORTH
0 20' 40' 60'
SCALE

PIPING ABBREVIATIONS

LSD	LOW SERVICE DISCHARGE
RW	RAW WATER
FE	FILTER EFFLUENT
FW	FINISHED WATER
BWS	BACKWASH SUPPLY
D	DRAIN
OF	OVERFLOW
SE	SECONDARY EFFLUENT

LEGEND

BID ALTER.	FUTURE PH.	BASE BID	EXISTING	DESCRIPTION
				ASPHALT PAVEMENT
				BOLLARDS
				BUILDING
				BUSH OR SHRUB
				CONCRETE
				CONTROL POINT
				CURB BOX
				CURB & GUTTER
				EDGE OF ASPHALT
				EDGE OF GRAVEL
				ELECTRICAL BOX
				FENCE – CHAIN LINK
				FIRE HYDRANT
			G	GAS
				GAS METER
				GATE
				GRAVEL SURFACING
				GUARD RAIL
				GUY WIRE
				HEDGE
				INLET
				IRRIGATION VALVE
		IRR	IRR	IRRIGATION LINE
				LIGHT POLE
				MANHOLE
		E	E	OVERHEAD ELECTRIC
				PAINT STRIPE
				PARKING BLOCKS
				POWER POLE
				RAILROAD
				RETAINING WALL
			S	SANITARY SEWER
				SPRINKLER
		UE	UE	STORM DRAIN
				TELEPHONE RISER
				TRAFFIC SIGN
				TREE – CONIFEROUS
				TREE – DECIDUOUS
			E	UNDERGROUND ELECTRIC
			T	UNDERGROUND TELEPHONE
				VALVE
			W	WATERLINE
				FLOOD PLAIN

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference®

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc.
TD&H
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

PRELIMINARY SITE PLAN
WEST AREA - BASE BID + BID ALTERNATES

DESIGNED: DDN
DETAILED: MWC
CHECKED:
APPROVED:
DATE: 08.1.14

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
O.F.1519.0

TDH #12-164

SD-1A

BORE & JACK UTILITY TUNNEL
UTILITY TUNNEL ACCESS VAULT
DEMO EXIST SEASONAL CLEARWELL, FOUNDATION & PIPING
REMOVE AND RELOCATE GREAT FALLS WATER TREATMENT PLANT SIGN. COORDINATE FINAL LOCATION W/OWNER
DEMO EXISTING 24" FE IN NEW ELECTRICAL AREA
PROTECT BURIED ELECTRICAL
FUTURE DEMO EXISTING GAS PIPE IN NEW ELECTRICAL AREA
FUTURE GROUNDING XFMR
UTILITY TUNNEL
UTILITY TUNNEL ACCESS
MV
LV
COM
14' GRASS PAVER ACCESS ROAD
66" DI FE
FUTURE 1500KW 2400V GENSET
FUTURE 1500KW 2400V GENSET
FUTURE 5KV GENERATOR PARALLELING SWGR BLDG
DEMO EXISTING 24" FE IN NEW ELECTRICAL AREA
FUTURE REROUTE GAS SERVICE
BACKWASH HOLDING TANK
FUTURE 5' CONCRETE SIDEWALK
FUTURE SULFURIC ACID FEED BUILDING ASSUMED FF EL=3314.0±
20" PVC BWS
48" BYPASS
DEMO EXIST 30" FE IN NEW ELECT. AREA
1500KW 480V GENSET
36" DI FW
66" DI FW
CMU BLOCK FIREWALL (TYP. OF 3)
48" DI FE
FUTURE 480/277V XFMR
T1B
T1A
GRAVEL ACCESS DRIVEWAY
CHEMICAL FEED and UV DISINFECTION BUILDING
ASSUMED MAIN FF EL=3314.0±
LOWER LEVEL FF EL=3300.5±
PB1 & PB1A
HH #4
TREATMENT PLANT LC FEEDERS A&B
JB1 & JB1A
HS AND LS PUMP STATION
480/277V XFMR
5' CONCRETE SIDEWALK
12" ABANDONED
5'x5' CONC. STOOP
ARC EXHAUST SECURITY FENCE (TYP. 7 LOCATIONS)
LOW SERVICE PUMPS
3'x10' CONC. APRON
HH #1
54" BUTTERFLY VALVE IN VAULT
REPLACE EXISTING 54" BURIED VALVE W/ 54" PIPE SPOOL
DEMO EXIST NWE UNDERGROUND ELECTRICAL SERVICE
DEMO EXIST CHAINLINK FENCE
GROUNDING TRANSFORMERS & RESISTORS
ELECTRICAL ROOM ADDITION
5' CONCRETE SIDEWALK
DEMO EXIST 8" IRRIGATION PIPE
CHOPPER PUMP & WET-WELL
BACKWASH CLARIFIER

PROJECT NORTH
TRUE NORTH
0 20' 40' 60'
SCALE

PIPING ABBREVIATIONS

LSD	LOW SERVICE DISCHARGE
RW	RAW WATER
FE	FILTER EFFLUENT
FW	FINISHED WATER
BWS	BACKWASH SUPPLY
D	DRAIN
OF	OVERFLOW
SE	SECONDARY EFFLUENT

LEGEND

BID ALTER.	FUTURE PH.	BASE BID	EXISTING	DESCRIPTION
				ASPHALT PAVEMENT
				BOLLARDS
				BUILDING
				BUSH OR SHRUB
				CONCRETE
				CONTROL POINT
				CURB BOX
				CURB & GUTTER
				EDGE OF ASPHALT
				EDGE OF GRAVEL
				ELECTRICAL BOX
				FENCE – CHAIN LINK
				FIRE HYDRANT
		G	G	GAS
				GAS METER
				GATE
				GRAVEL SURFACING
				GUARD RAIL
				GUY WIRE
				HEDGE
				INLET
				IRRIGATION VALVE
		IRR	IRR	IRRIGATION LINE
				LIGHT POLE
				MANHOLE
		E	E	OVERHEAD ELECTRIC
				PAINT STRIPE
				PARKING BLOCKS
				POWER POLE
				RAILROAD
				RETAINING WALL
			S	SANITARY SEWER
				SPRINKLER
			SD	STORM DRAIN
			T	TELEPHONE RISER
				TRAFFIC SIGN
				TREE – CONIFEROUS
				TREE – DECIDUOUS
			E	UNDERGROUND ELECTRIC
			T	UNDERGROUND TELEPHONE
				VALVE
			W	WATERLINE
				FLOOD PLAIN

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference®

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc. TD&H Engineering, Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

PRELIMINARY SITE PLAN
CENTRAL AREA - BASE BID + BID ALTERNATES

DESIGNED: DDN
DETAILED: MWC
CHECKED:
APPROVED:
DATE: 08.1.14

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
O.F.1519.0

TDH #12-164

SD-2

EDGE OF ASPHALT ROAD
EDGE OF GRAVEL APRON
30' MOTORIZED CHAIN LINK GATE
UPPER RIVER ROAD
FUTURE DEMO & REPLACE CONTROL VALVE &VALVE VAULT
HH
MH
BOLLARD (TYP)
DEMO EXISTING CURB & GUTTER
REPLACE TEE
DEMO VALVE AND CAP PIPE BOTH WAYS
HANDICAP RAMP
6" CONCRETE APPROACH APRON
ASPHALT PAVEMENT
54" DI FE
DEMO EXISTING CURB & GUTTER
DEMO 6" WATER
20" PVC BWS
4'x4' CONCRETE SE FLUME
ADMINISTRATION BUILDING ADDITION
GRASS PAVER BLOCKS
EXTEND CONC. LOADING DOCK
SECONDARY CLARIFICATION BASIN 1931
5' CONCRETE SIDEWALK
BASIN NO. 5 1958
BASIN NO. 4 1952
BASIN NO. 3 1931
PRIMARY CLARIFICATION
BASIN NO. 2 1931
BASIN NO. 1 1952
FUTURE 6" GATE VALVE
CONCRETE SE CONTROL STRUCTURE
DEMO CONCRETE FLUME
CONCRETE SE CONTROL STRUCTURE
FLOCCULATION 1958
BAFFLE MIX (NOT IN USE)
FLOCCULATION 1958
TO SEASONAL FACILITY
FILTER & CLEARWELL BUILDING
1959 SECTION
1952 SECTION
1931 SECTION
1916 SECTION
RELOCATE DRAIN PIPE & DISCHARGE LOCATION
112.5KVA TRANSFORMER & SECONDARY CB
FILTER/HEAD HOUSE
SECONDARY CLARIFICATION BASIN 1931
FUTURE FILTER/HEAD HOUSE GENSET
BUILDING STORAGE CARBON
EXIST PANEL CCP
EXISTING PANELBOARD LC
LIME SILO AREA
HH #2
HH #3
SCRUBBER & CP
COM
UTILITY TUNNEL ACCESS VAULT
DEMO RR SIDING & REPLACE ASPHALT SURFACING
EXISTING MV SWGR
EXISTING LOAD CENTER
FUTURE LV GENSET ELECTRICAL BUILDING

NOTE:
CLOUDED FEATURES ON THIS SHEET ARE ALTERNATE BID ITEM NO. 2.

PROJECT NORTH
TRUE NORTH
0 30' 60' 90'
SCALE

PIPING ABBREVIATIONS

LSD	LOW SERVICE DISCHARGE
RW	RAW WATER
FE	FILTER EFFLUENT
FW	FINISHED WATER
BWS	BACKWASH SUPPLY
D	DRAIN
OF	OVERFLOW
SE	SECONDARY EFFLUENT

LEGEND

BID ALTER.	FUTURE PH.	BASE BID	EXISTING	DESCRIPTION
				ASPHALT PAVEMENT
				BOLLARDS
				BUILDING
				BUSH OR SHRUB
				CONCRETE
				CONTROL POINT
				CURB BOX
				CURB & GUTTER
				EDGE OF ASPHALT
				EDGE OF GRAVEL
				ELECTRICAL BOX
				FENCE – CHAIN LINK
				FIRE HYDRANT
			G	GAS
				GAS METER
				GATE
				GRAVEL SURFACING
				GUARD RAIL
				GUY WIRE
				HEDGE
				INLET
				IRRIGATION VALVE
			IRR	IRRIGATION LINE
				LIGHT POLE
				MANHOLE
			E	OVERHEAD ELECTRIC
				PAINT STRIPE
				PARKING BLOCKS
				POWER POLE
				RAILROAD
				RETAINING WALL
			S	SANITARY SEWER
				SPRINKLER
			SD	STORM DRAIN
			T	TELEPHONE RISER
				TRAFFIC SIGN
				TREE – CONIFEROUS
				TREE – DECIDUOUS
			E	UNDERGROUND ELECTRIC
			T	UNDERGROUND TELEPHONE
				VALVE
			W	WATERLINE
				FLOOD PLAIN

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference®

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc.
Engineering Consultants
TD&H

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

PRELIMINARY SITE PLAN
EAST AREA - BASE BID + BID ALTERNATES

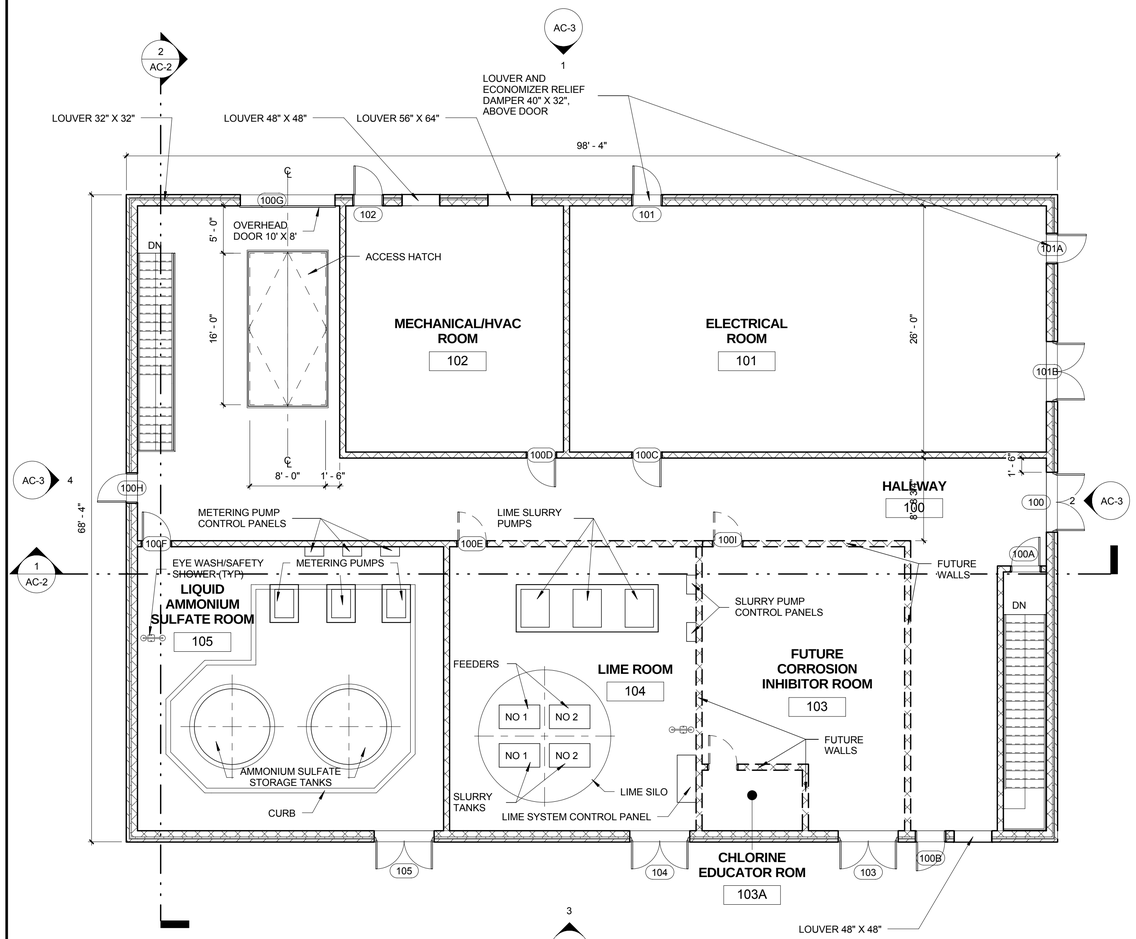
DESIGNED: DDN
DETAILED: MWC
CHECKED:
APPROVED:
DATE: 08.1.14

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

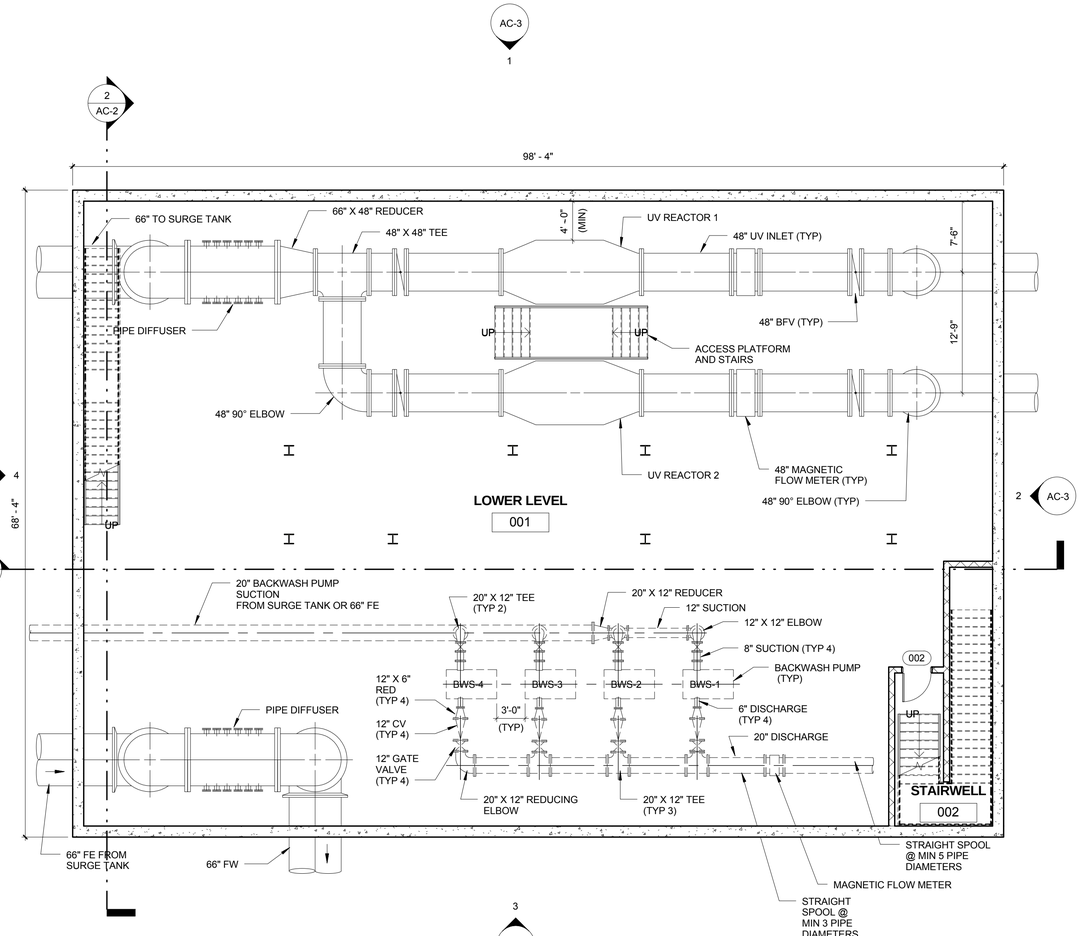
PROJECT NO.
O.F.1519.0

TDH #12-164

SD-3



1 MAIN LEVEL
1/8" = 1'-0"



2 LOWER LEVEL
1/8" = 1'-0"

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

CHEMICAL FEED AND UV DISINFECTION BUILDING
ARCHITECTURAL FLOOR PLANS

DESIGNED:	
DETAILED:	
CHECKED:	
APPROVED:	
DATE:	

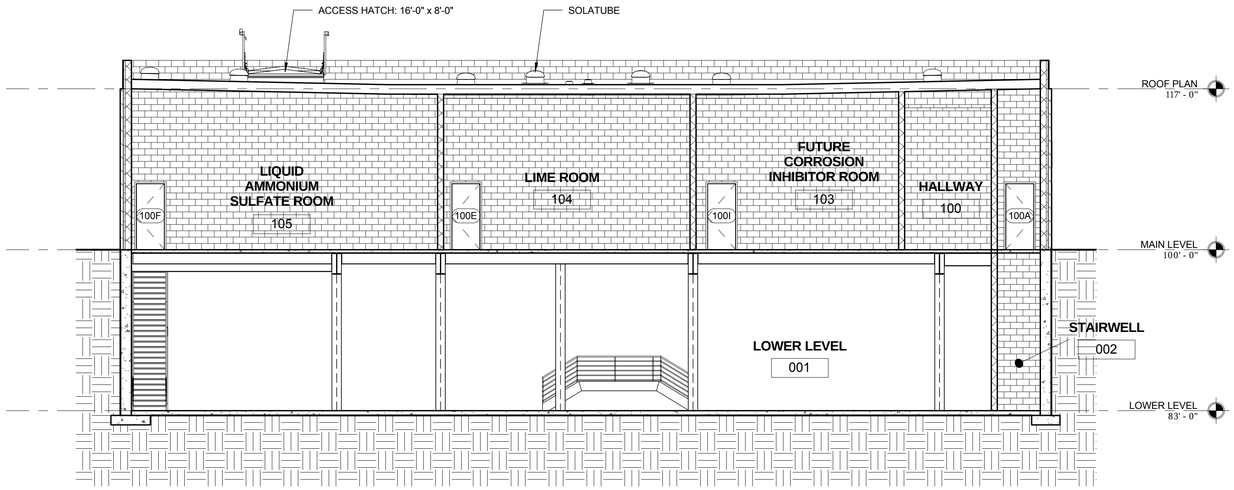
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
0.F. 1519.0

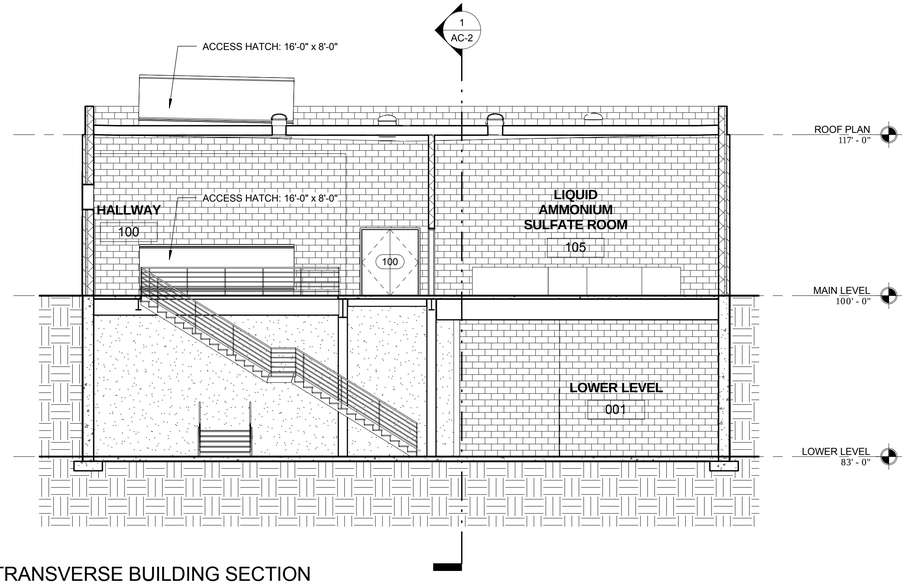
LPW #12-039

AC-1

D7075



1 LONGITUDINAL BUILDING SECTION
1/8" = 1'-0"



2 TRANSVERSE BUILDING SECTION
1/8" = 1'-0"

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

CHEMICAL FEED AND UV DISINFECTION BUILDING

BUILDING SECTIONS

DESIGNED:
DETAILED:
CHECKED:
APPROVED:
DATE:

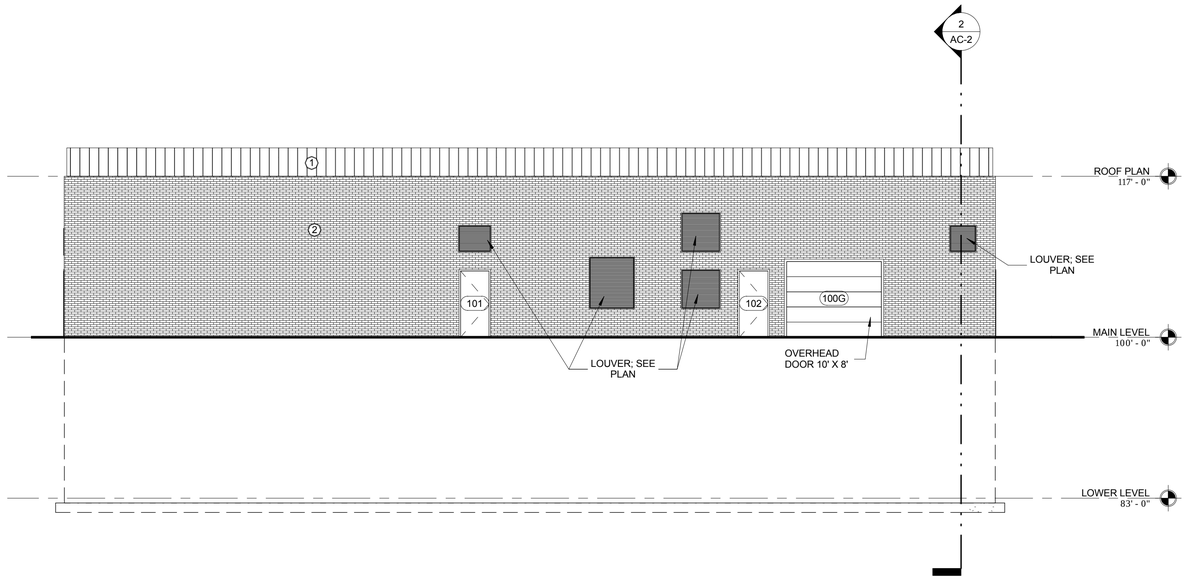
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
0.F. 1519.0

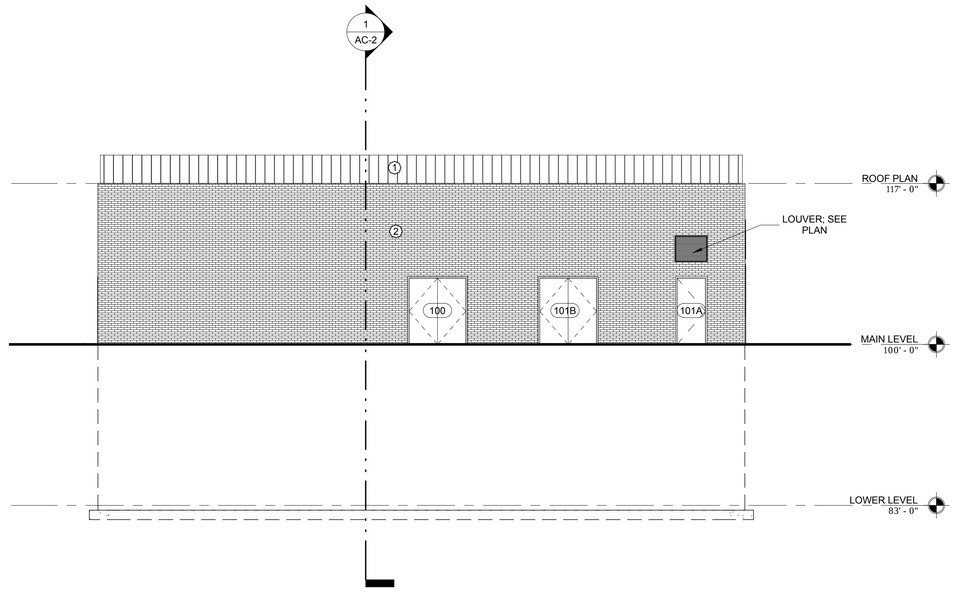
LPW #12-039

AC-2

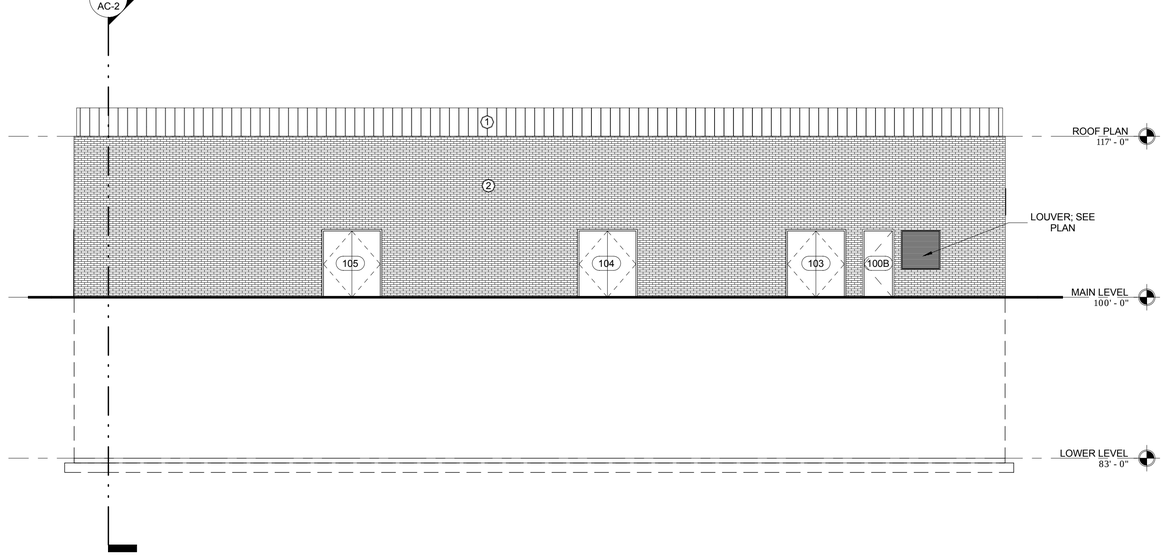
D7075



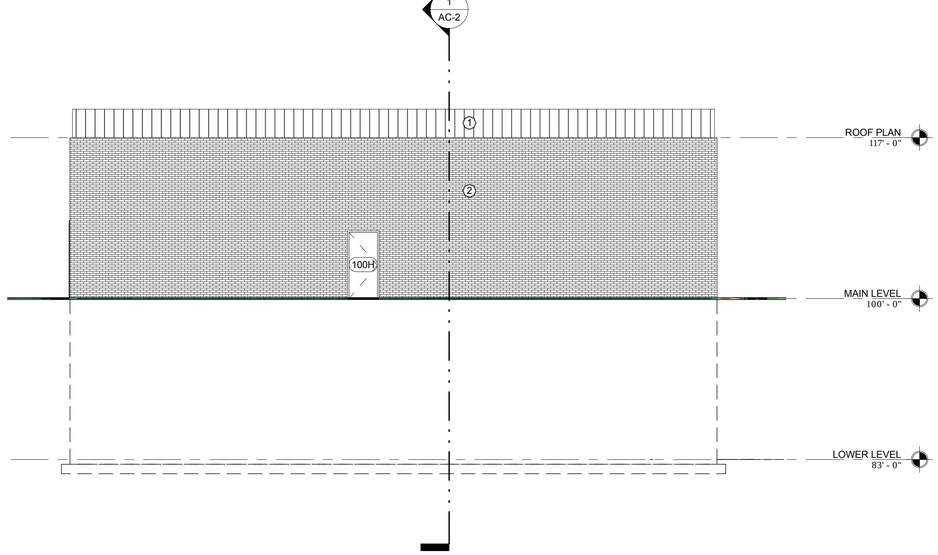
1 NORTH ELEVATION
1/8" = 1'-0"



2 EAST ELEVATION
1/8" = 1'-0"



3 SOUTH ELEVATION
1/8" = 1'-0"



4 WEST ELEVATION
1/8" = 1'-0"

EXTERIOR FINISH SCHEDULE

Mark	Description	Comments
1	METAL SIDING	
2	BRICK	
D		

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc.
TD&H
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

CHEMICAL FEED AND UV DISINFECTION BUILDING
EXTERIOR ELEVATIONS

DESIGNED:
DETAILED:
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

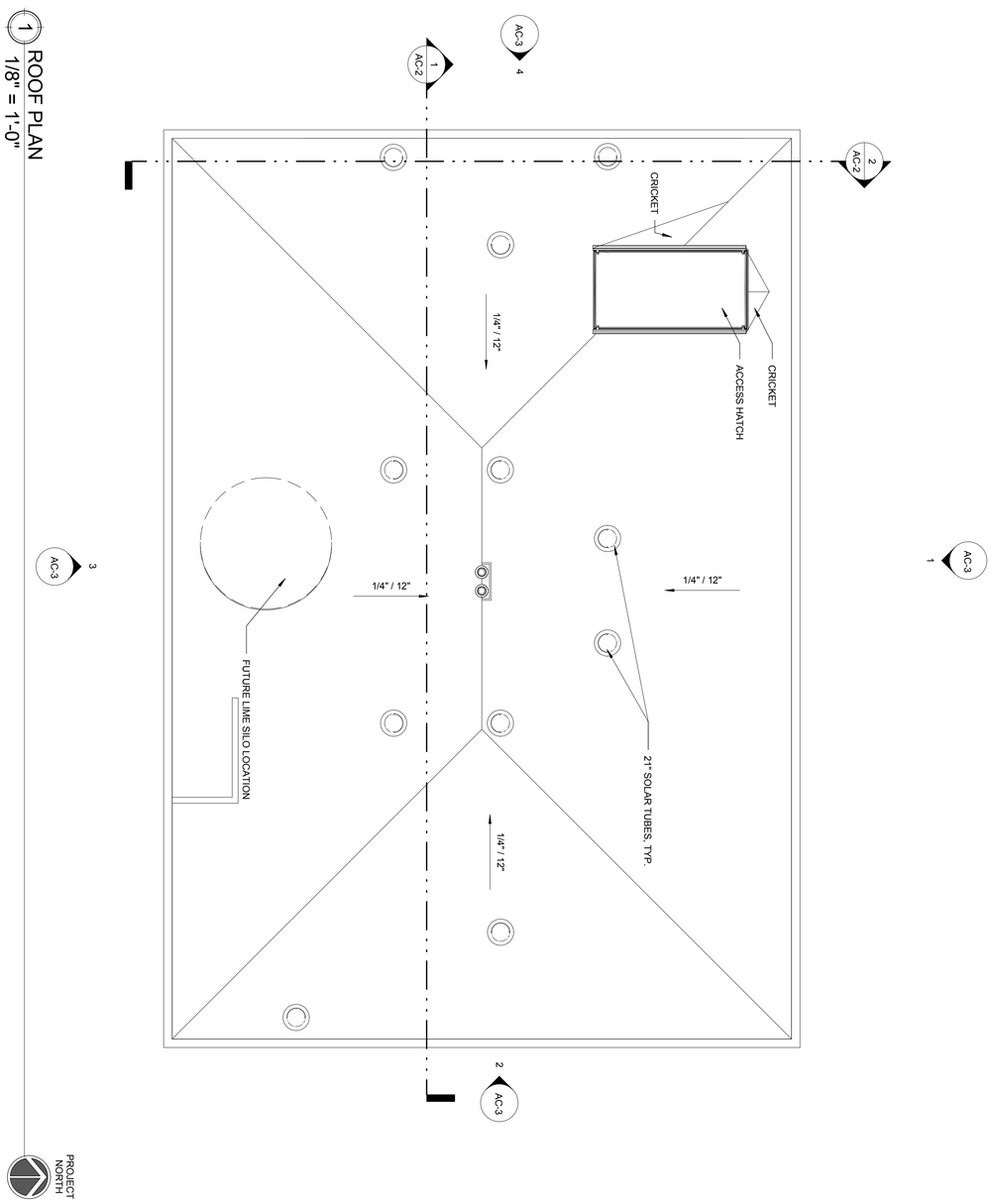
PROJECT NO.
0.F. 1519.0

LPW #12-039

AC-3

D7075

D7075



AC-4

LPW #12-039

O.F. 1519.0
PROJECT NO.

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT FULL SCALE
0 1/2 1

DESIGNED:
DETAILED:
CHECKED:
APPROVED:
DATE:

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

CHEMICAL FEED AND UV DISINFECTION BUILDING

ROOF PLAN

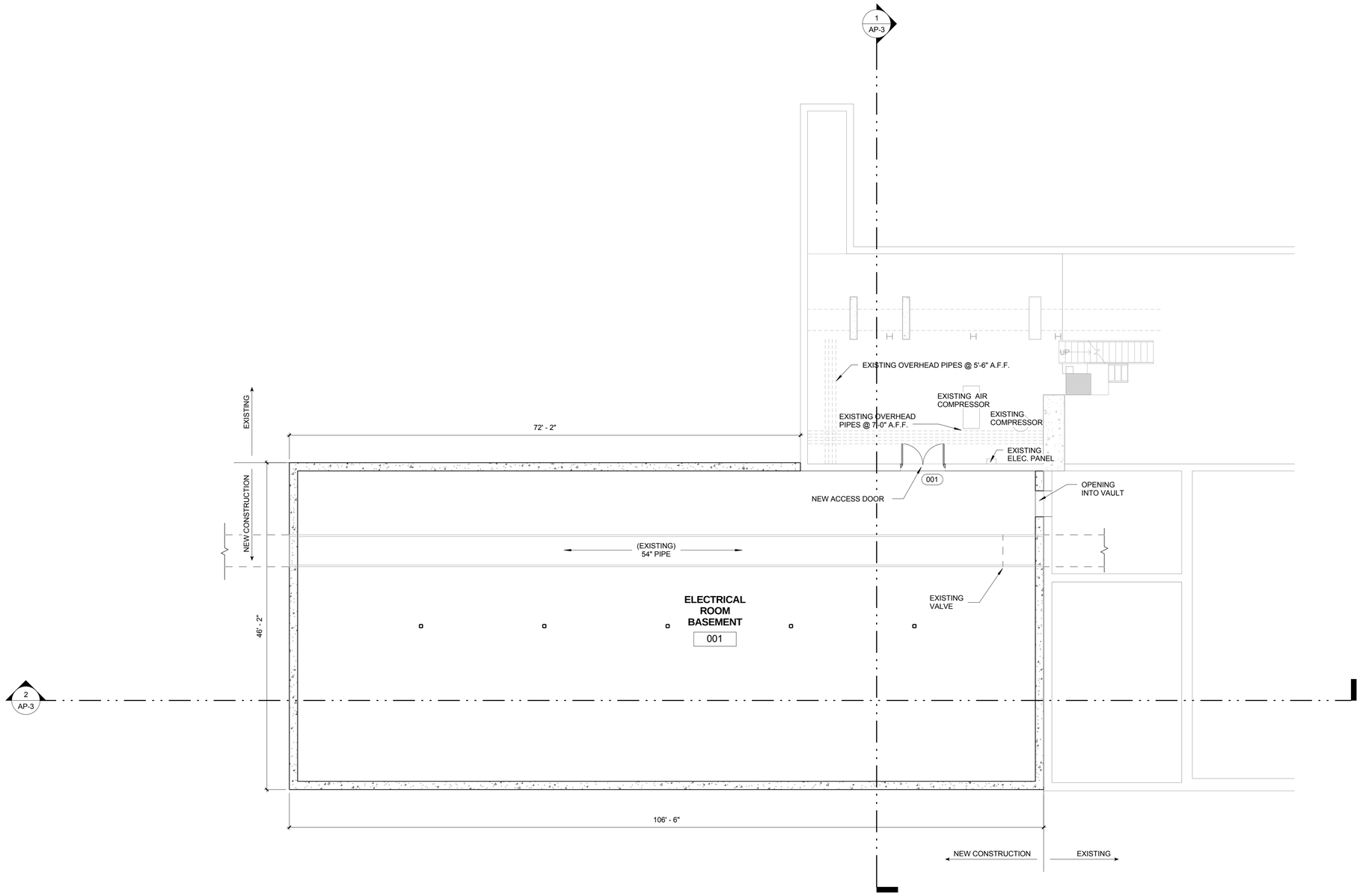
BLACK & VEATCH
B

Thomas, Dean & Hoskins, Inc.
TD&H
Engineering Consultants

L'Heureux Page Werner
LPW

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK	APP

SAVED:		XREF1:	
PLOTTED:		XREF2:	
USER:	DWG VER:	XREF3:	
		XREF4:	



1 ELECTRICAL ROOM BASEMENT LEVEL
1/8" = 1'-0"

PROJECT NORTH

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
B

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc.
TD&H
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

ELECTRICAL ROOM ADDITION
BASEMENT LEVEL FLOOR PLAN

DESIGNED:
DETAILED:
CHECKED:
APPROVED:
DATE:

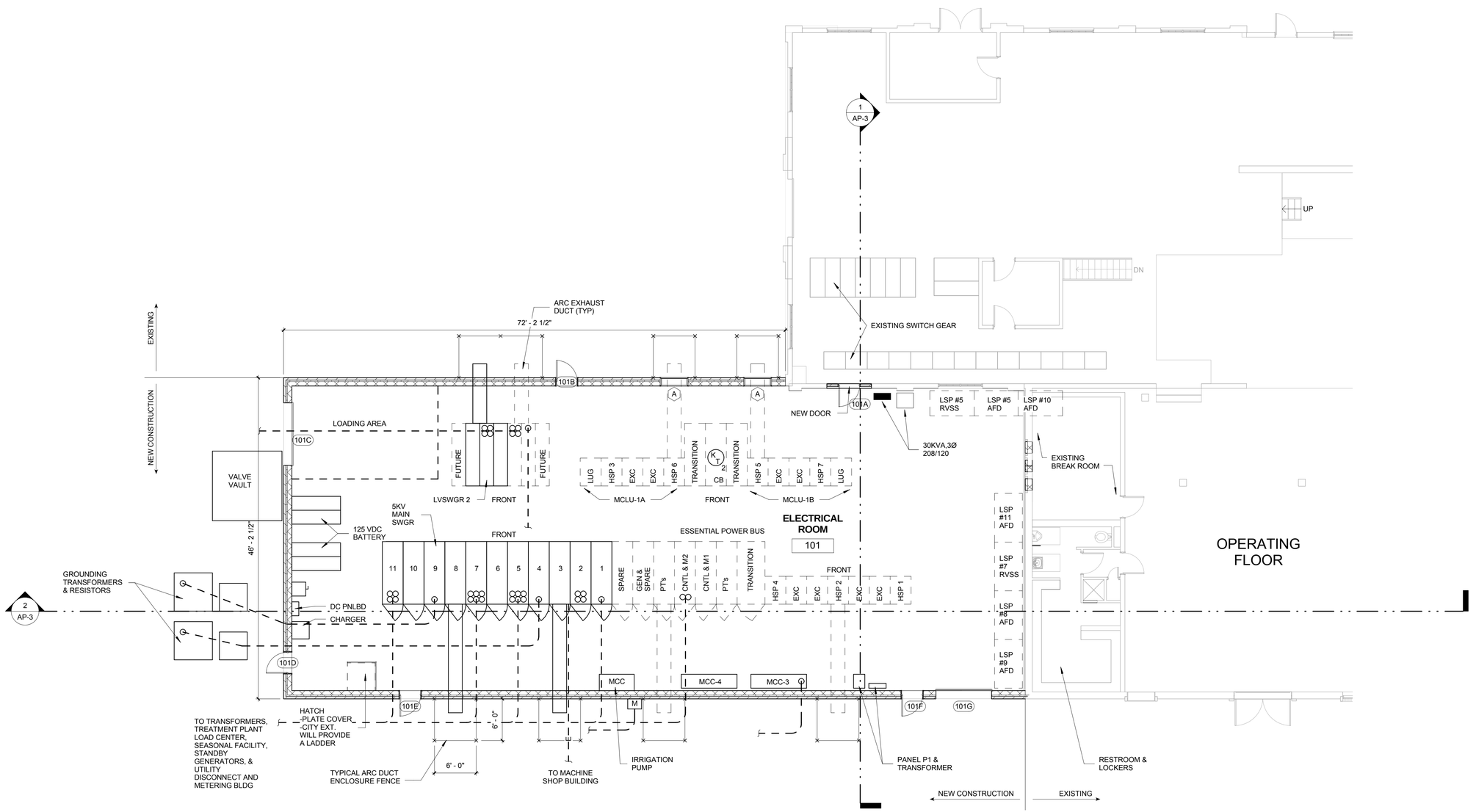
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
0.F. 1519.0

LPW #12-039

AP-1

D7075



1 ELECTRICAL ROOM MAIN LEVEL

1/8" = 1'-0"

PROJECT NORTH

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

ELECTRICAL ROOM ADDITION
MAIN LEVEL FLOOR PLAN

DESIGNED:
DETAILED:
CHECKED:
APPROVED:
DATE:

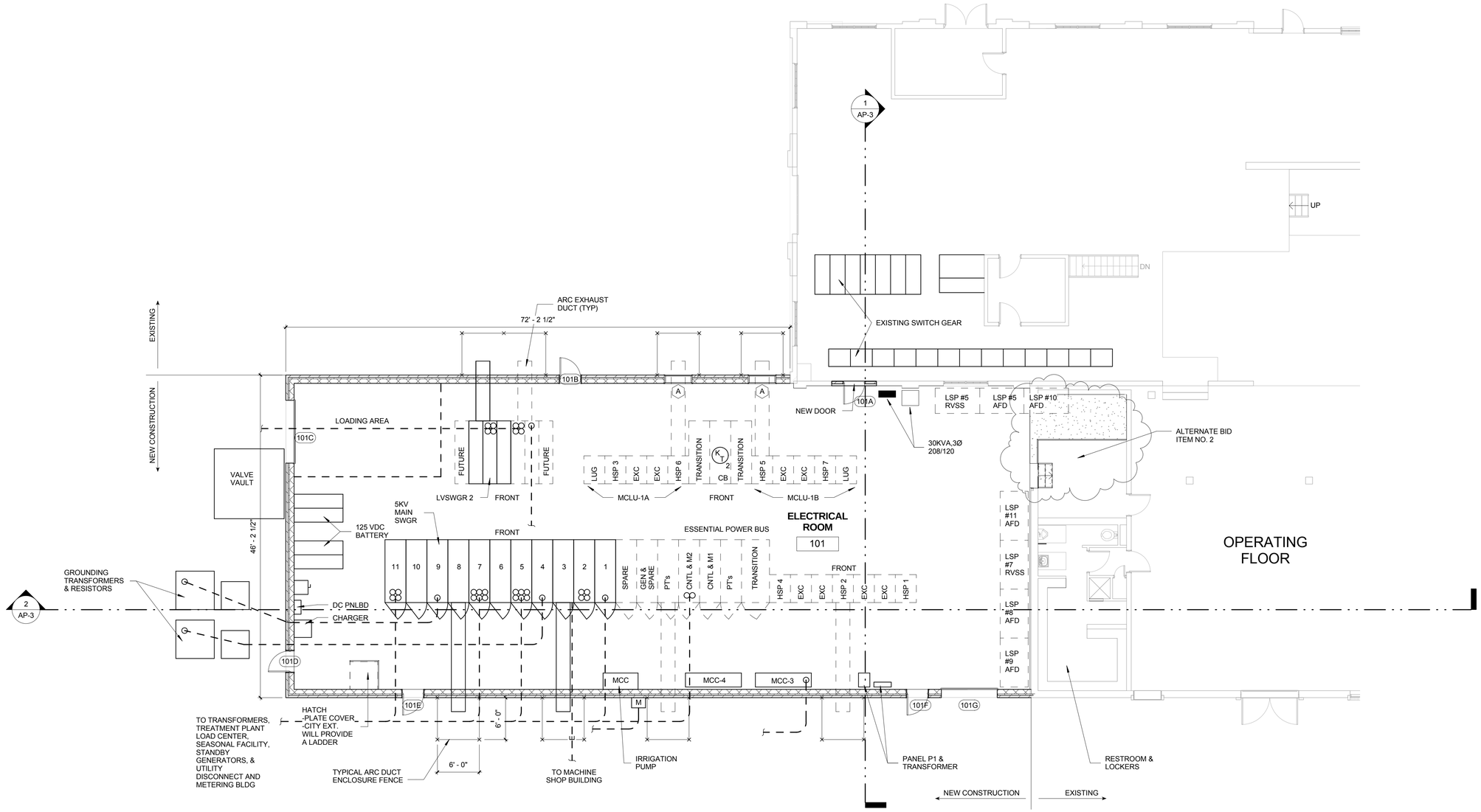
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
O.F. 1519.0

LPW #12-039

AP-2

D7075



1 ELECTRICAL ROOM MAIN LEVEL - WITH ALTERNATE BID ITEMS
1/8" = 1'-0"

PROJECT NORTH

NO.	DATE	BY	CK	APP	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc. Engineering Consultants TD&H

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

ELECTRICAL ROOM ADDITION
MAIN LEVEL FLOOR PLAN - BASE BID + BID ALTERNATES

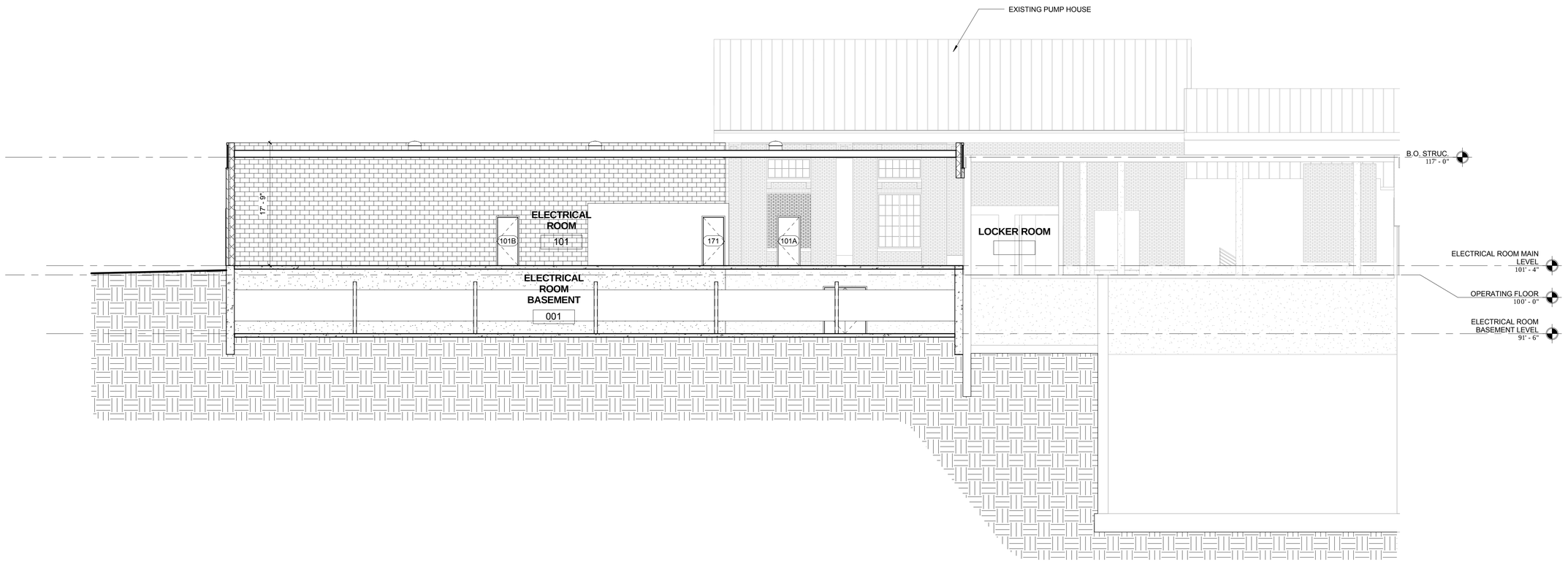
DESIGNED:
DETAILED:
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
O.F. 1519.0
LPW #12-039

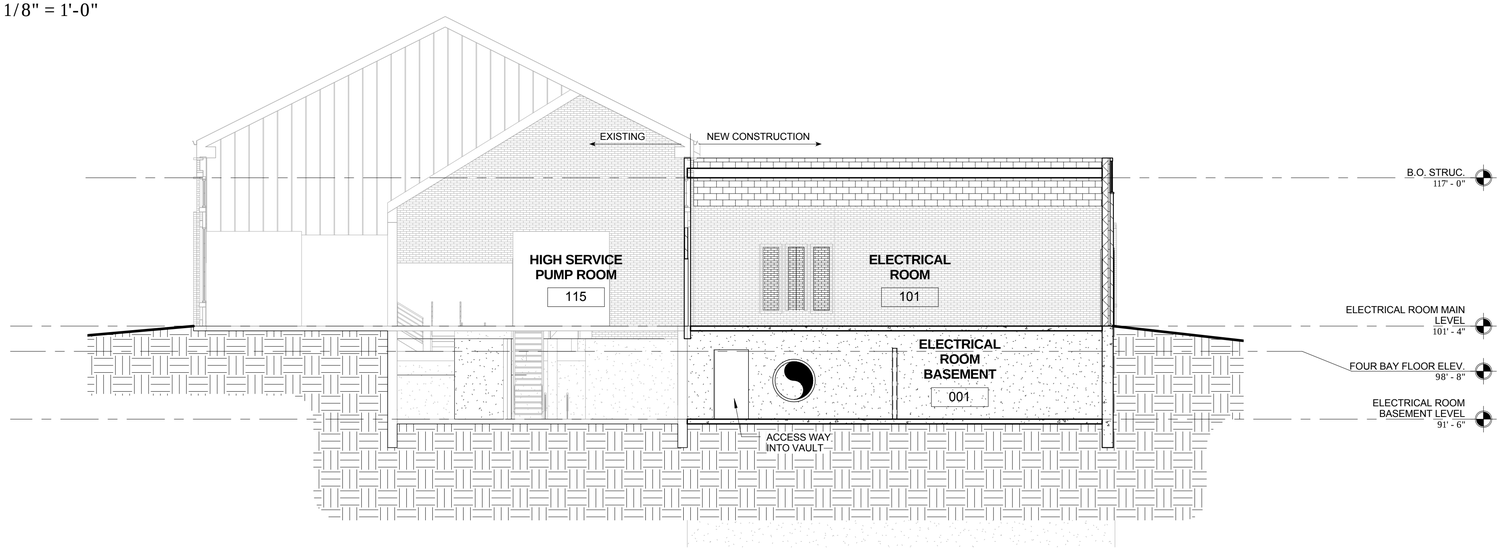
AP-2A

D7075



2 LONGITUDINAL

1/8" = 1'-0"



1 TRANSVERSE

1/8" = 1'-0"

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
DWG VER:
SAVED:
PLOTTED:
USER:

BLACK & VEATCH

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

ELECTRICAL ROOM ADDITION

BUILDING SECTIONS

DESIGNED:
DETAILED:
CHECKED:
APPROVED:
DATE:

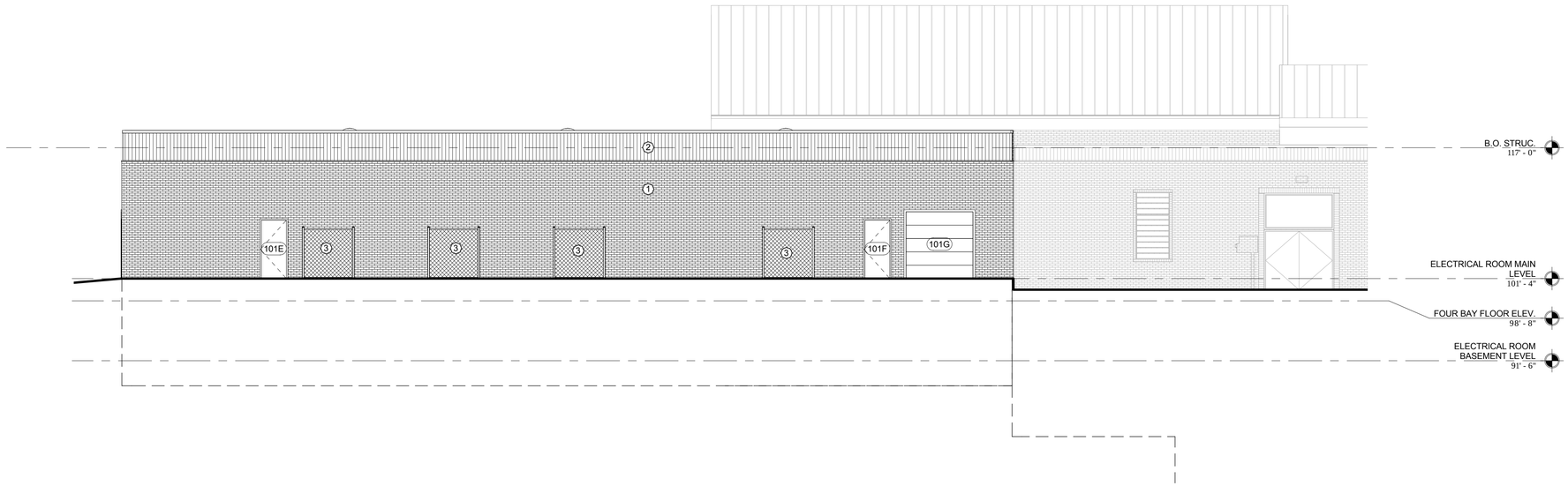
0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

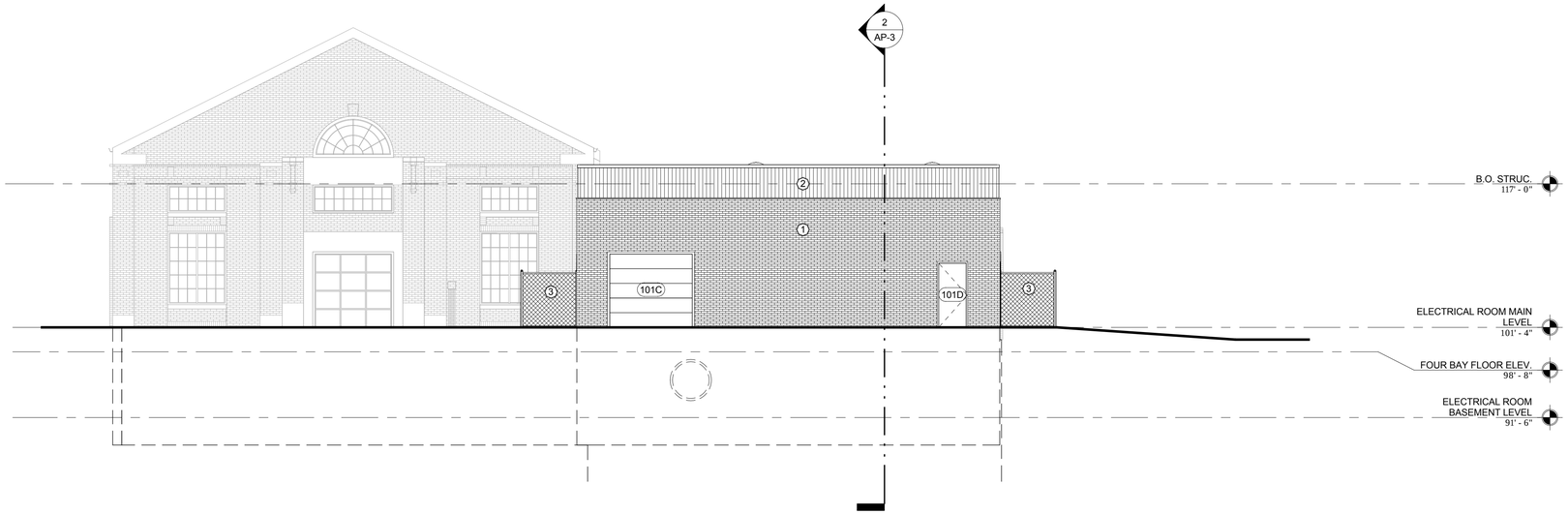
PROJECT NO.
O.F. 1519.0
LPW #12-039

AP-3

D7075



1 WEST ELEVATION
1/8" = 1'-0"



2 NORTH ELEVATION
1/8" = 1'-0"

EXTERIOR FINISH SCHEDULE

Mark	Description	Comments
1	BRICK VENEER	
2	METAL SIDING	
3	CHAIN LINK FENCE	

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
B

L'Heureux PageWerner

Thomas, Dean & Hoskins, Inc.
TD&H
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

ELECTRICAL ROOM ADDITION
EXTERIOR ELEVATIONS

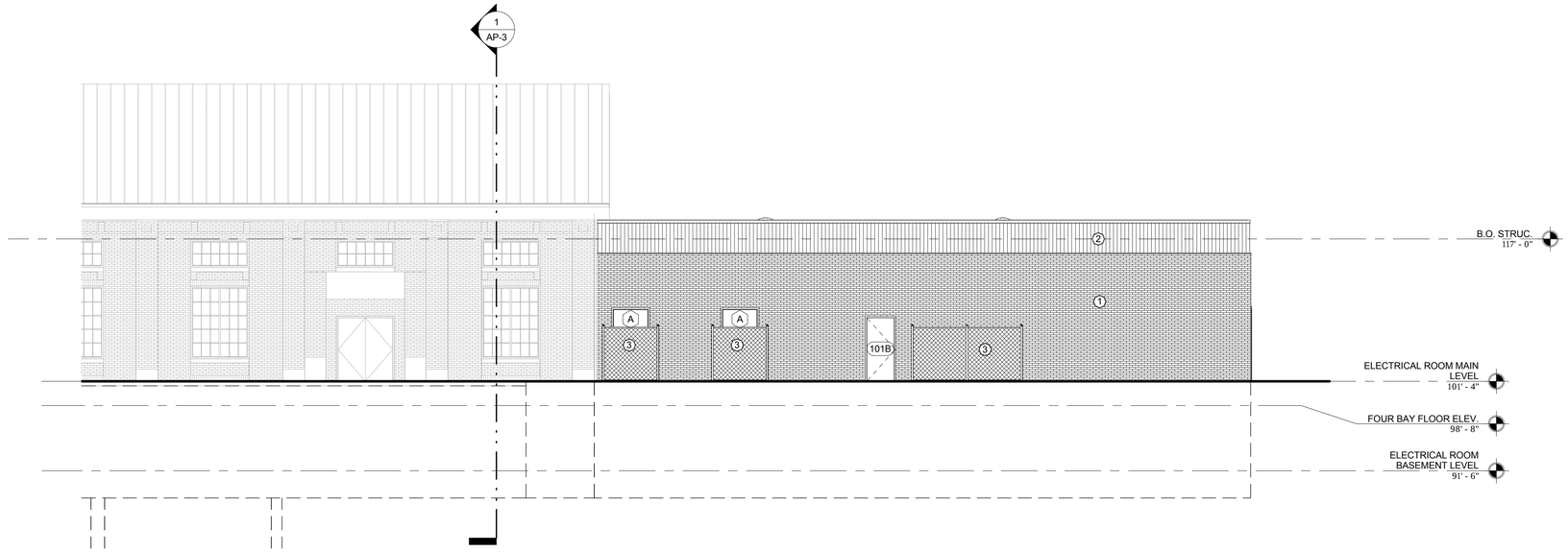
DESIGNED:
DETAILED:
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

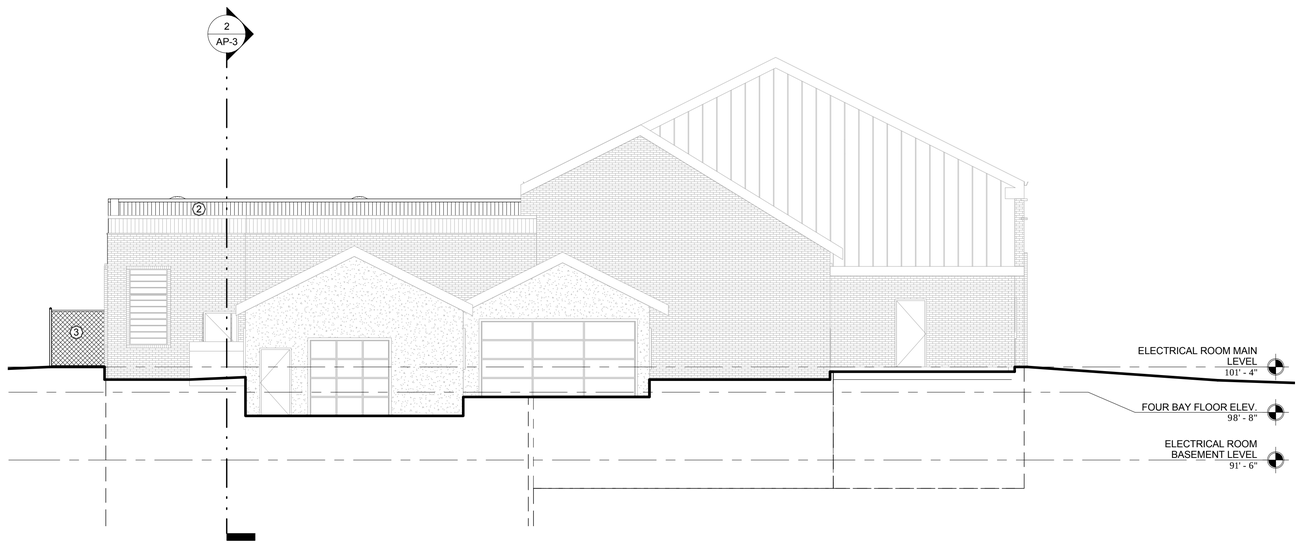
PROJECT NO.
0.F. 1519.0
LPW #12-039

AP-4

D7075



1 EAST ELEVATION
1/8" = 1'-0"



2 SOUTH ELEVATION
1/8" = 1'-0"

EXTERIOR FINISH SCHEDULE

Mark	Description	Comments
1	BRICK VENEER	
2	METAL SIDING	
3	CHAIN LINK FENCE	

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
B.

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc.
TD&H
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

ELECTRICAL ROOM ADDITION
EXTERIOR ELEVATIONS

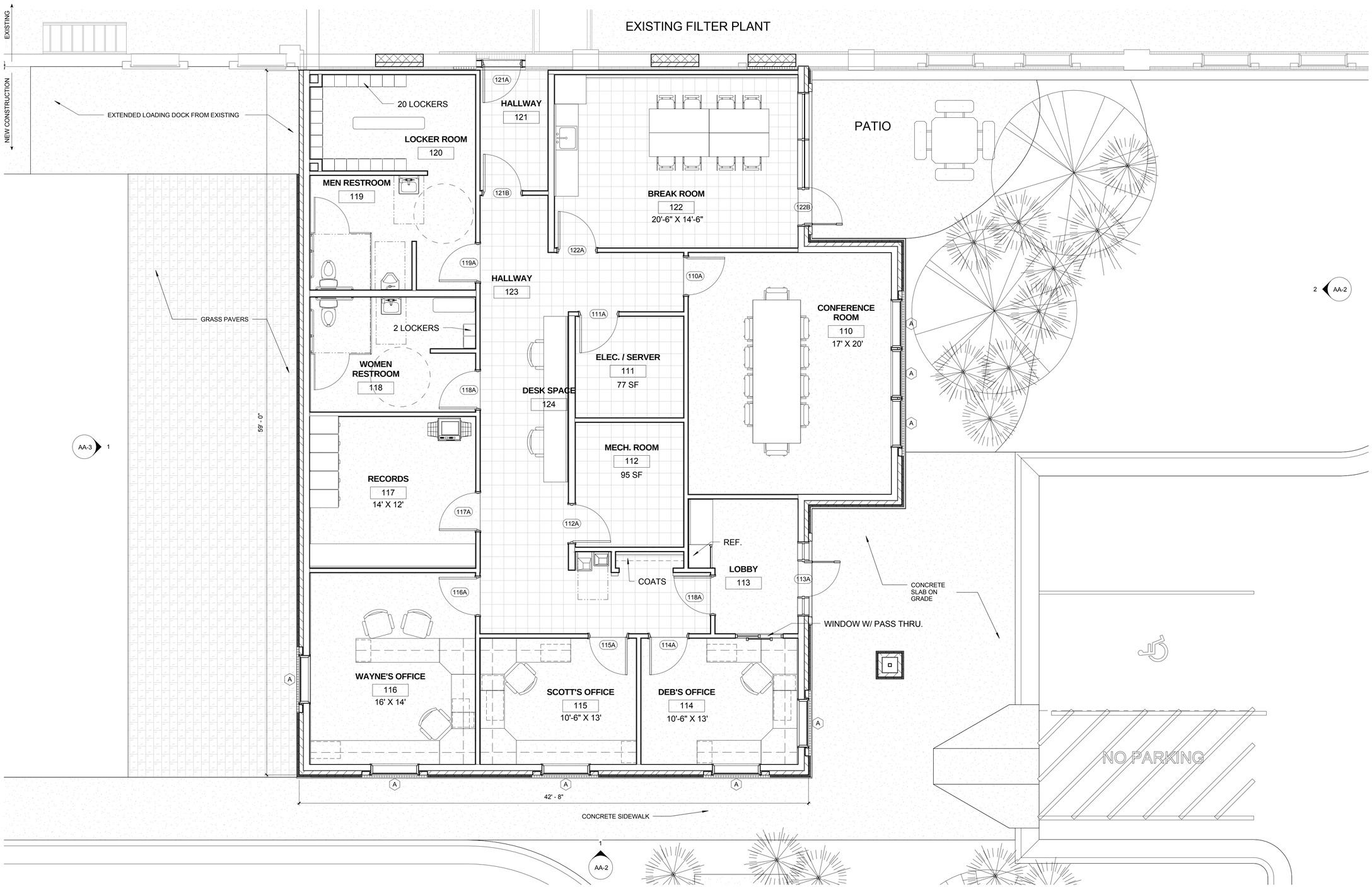
DESIGNED:
DETAILED:
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
0.F. 1519.0
LPW #12-039

AP-5

D7075



1 MAIN FLOOR PLAN
1/4" = 1'-0"

PROJECT NORTH

ALTERNATE BID ITEM NO. 2

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH

L'Heureux PageWerner

Thomas, Dean & Hoskins, Inc.
TD&H Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

ADMINISTRATION BUILDING ADDITION
MAIN FLOOR PLAN - ALTERNATE BID ITEM NO. 2

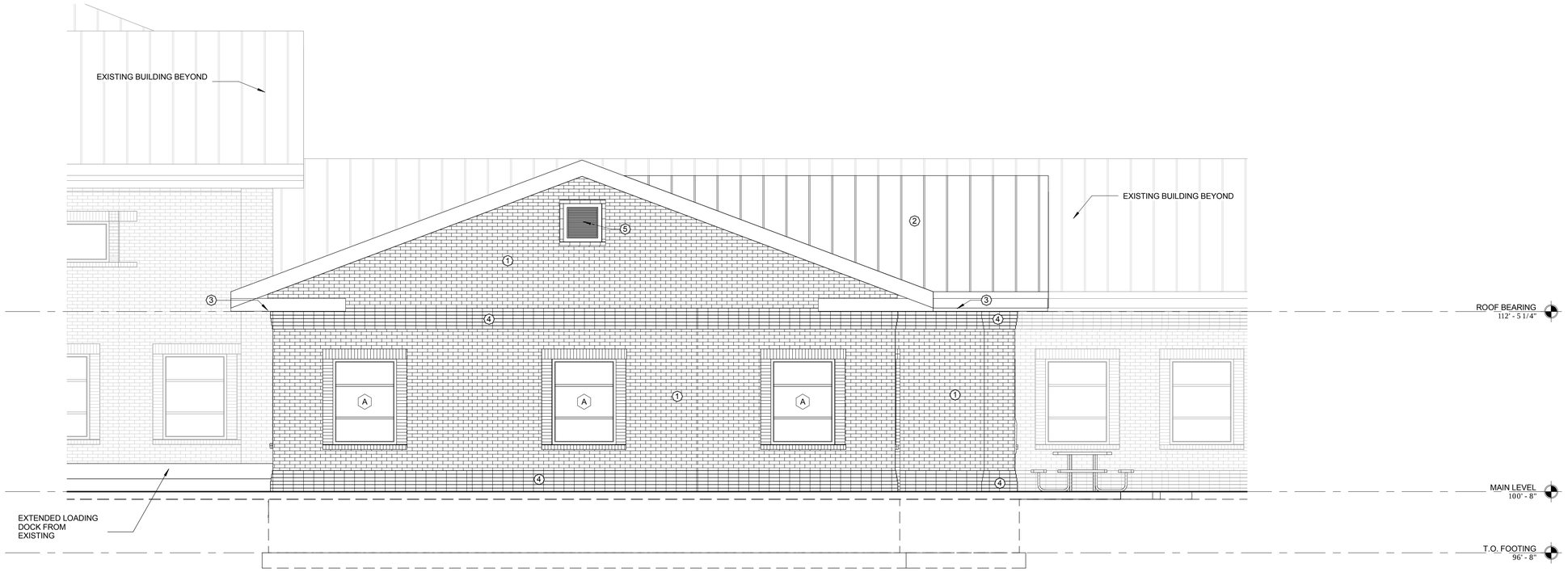
DESIGNED:	
DETAILED:	
CHECKED:	
APPROVED:	
DATE:	

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

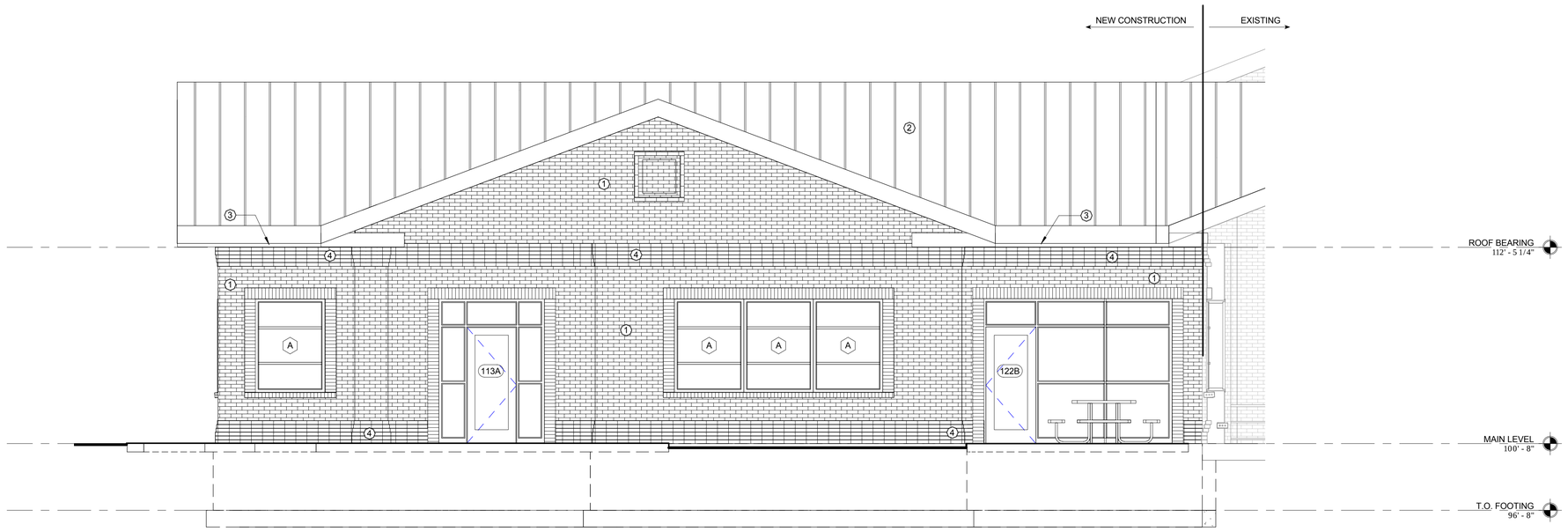
PROJECT NO.
O.F. 1519.0
LPW #12-039

AA-1

D7075



1 EAST ELEVATION
1/4" = 1'-0"



2 SOUTH ELEVATION
1/4" = 1'-0"

EXTERIOR FINISH SCHEDULE

Mark	Description	Comments
1	BRICK VENEER; TYPE 1	
2	PRE-FINISHED METAL ROOFING TO MATCH EXISTING	
3	PRE-FINISHED METAL SOFFIT TO MATCH EXISTING	
4	BRICK VENEER; TYPE 2	
5	METAL ROOF VENT	

ALTERNATE BID ITEM NO. 2

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

ADMINISTRATION BUILDING ADDITION
EXTERIOR ELEVATIONS - ALTERNATE BID ITEM NO. 2

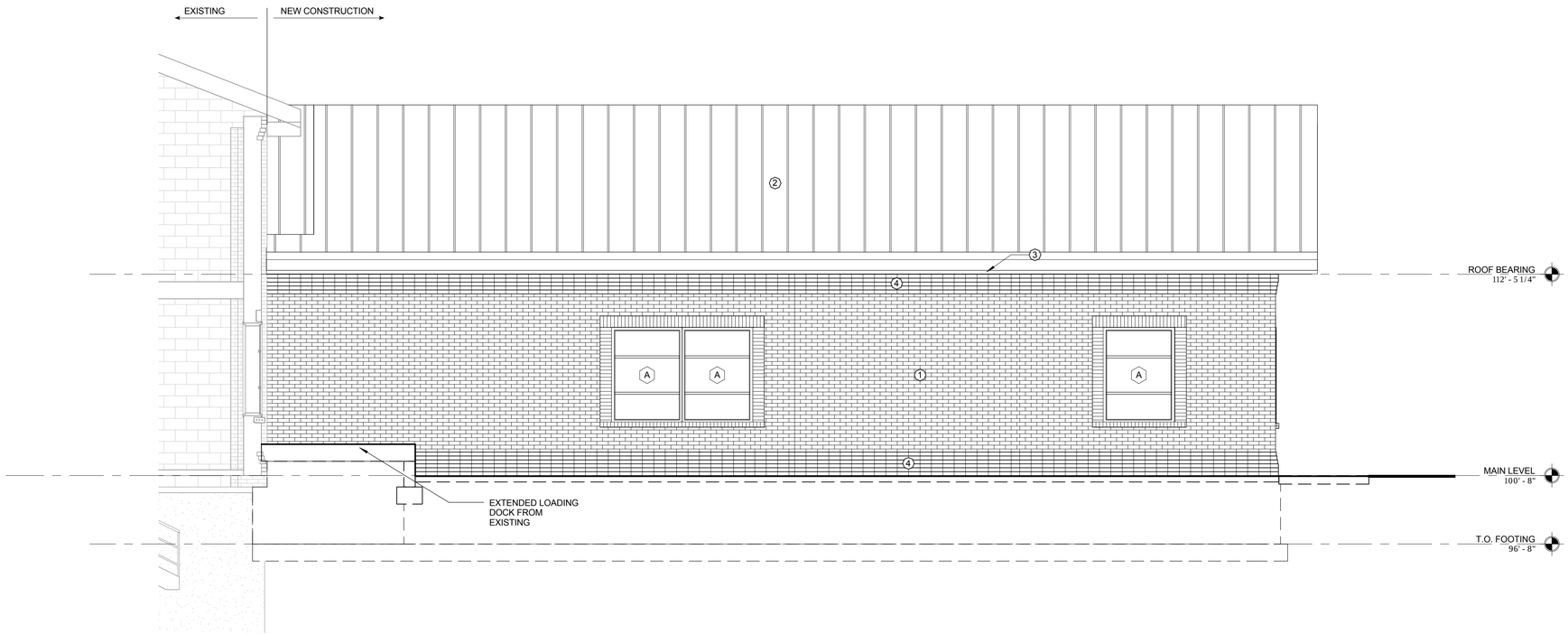
DESIGNED:
DETAILED:
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
O.F. 1519.0
LPW #12-039

AA-2

D7075



1 NORTH ELEVATION
1/4" = 1'-0"

EXTERIOR FINISH SCHEDULE

Mark	Description	Comments
1	BRICK VENEER; TYPE 1	
2	PRE-FINISHED METAL ROOFING TO MATCH EXISTING	
3	PRE-FINISHED METAL SOFFIT TO MATCH EXISTING	
4	BRICK VENEER; TYPE 2	
5	METAL ROOF VENT	

ALTERNATE BID ITEM NO. 2

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

SAVED:
PLOTTED:
USER:
DWG VER:
XREF1:
XREF2:
XREF3:
XREF4:

BLACK & VEATCH

L'Heureux PageWerner

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

ADMINISTRATION BUILDING ADDITION
EXTERIOR ELEVATIONS - ALTERNATE BID ITEM NO. 2

DESIGNED:
DETAILED:
CHECKED:
APPROVED:
DATE:

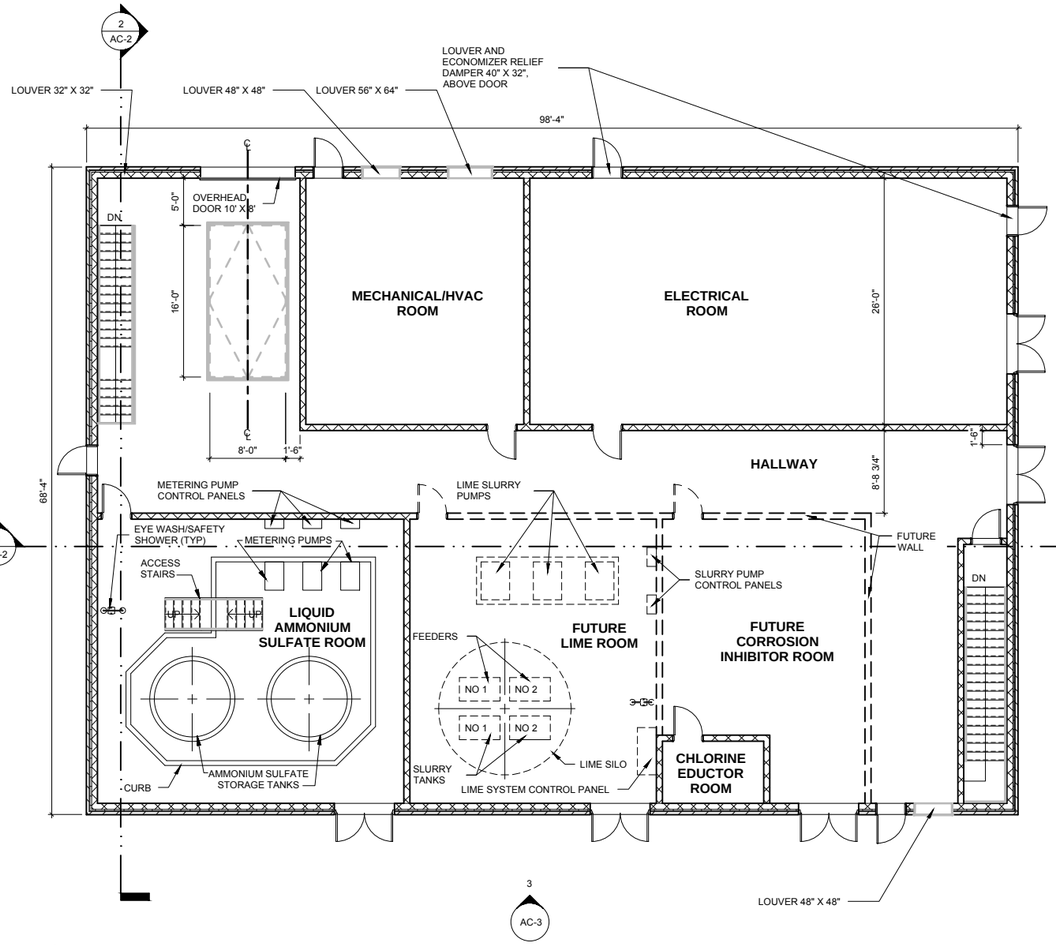
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
O.F. 1519.0

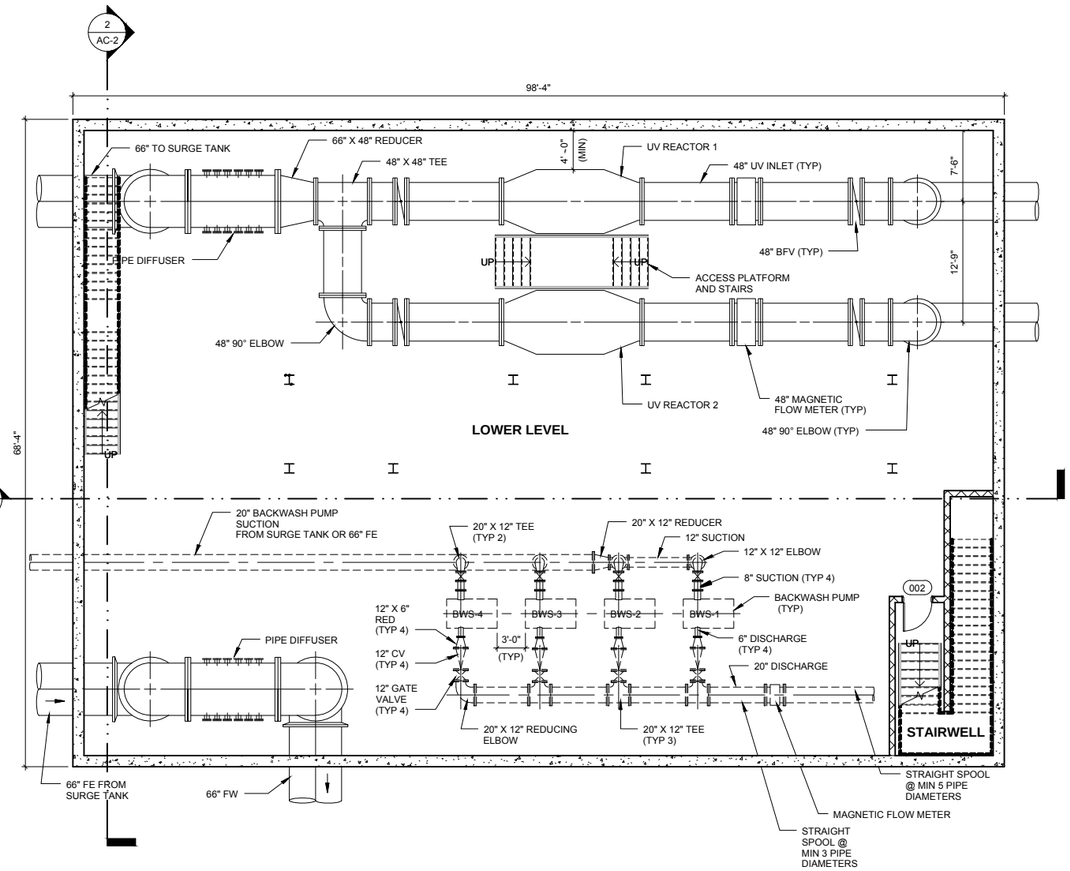
LPW #12-039

AA-3

D7075



1 **LEVEL 1**
1/8" = 1'-0"



2 **BASEMENT**
1/8" = 1'-0"

NO.	BY	CK	APP

REVISIONS AND RECORD OF ISSUE

DATE

SAVED:
PLOTTED:
USER:

XREF1:
XREF2:
XREF3:
XREF4:

DWG VER:

BLACK & VEATCH
Building a world of difference.

L'Heureux Page Werner

TD&H
Engineering, Consultants, Limited

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES

UV-CHEMICAL BUILDING
FLOOR PLANS
PHASE 1

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

CC-1
SHEET
OF

TASK 282C

FD7000
D7010

PL-01-PLC-01

TYP OF 2

BOOSTER PUMP 1 RUN STATUS

BOOSTER PUMP 1 FAIL

BOOSTER PUMP SYSTEM CHLORINE FEED MODE

BOOSTER PUMPS PRESSURE

BOOSTER PUMPS WATER LOW PRESSURE

CHLORINE FEEDER SYSTEM WATER LOW PRESSURE

INTERMEDIATE TANK INLET CL2 SERVICE WATER VALVE OPEN/CLOSE COMMAND

INTERMEDIATE TANK INLET CL2 SERVICE WATER VALVE OPEN STATUS

INTERMEDIATE TANK INLET CL2 SERVICE WATER VALVE CLOSE STATUS

CHLORINE FEEDER CHF-21 FEED RATE COMMAND

DISCHARGE CHLORINE RESIDUAL

CHLORINE FEEDER SYSTEM CHF-21 CL2 FEED RATE VALVE

CHLORINE FEEDER SYSTEM CHF-21 IN-REMOTE

CHLORINE FEEDER SYSTEM CHF-21 FAIL

CHLORINE FEEDER SYSTEM CHF-21 FEEDER ENABLE COMMAND

CHLORINE FEEDER CHF-22 FEED RATE COMMAND

DISCHARGE CHLORINE RESIDUAL

CHLORINE FEEDER SYSTEM CHF-22 CL2 FEED RATE VALVE

CHLORINE FEEDER SYSTEM CHF-22 IN-REMOTE

CHLORINE FEEDER SYSTEM CHF-22 FAIL

CHLORINE FEEDER SYSTEM CHF-22 FEEDER ENABLE COMMAND

1 ½"-CL2-PVC-2

FROM EXISTING CHLORINE SUPPLY

PUMP CONTROL PANEL (SEE SPECS.)

HS 26 HOR

AFD

PSI

PTI

PSI L

PT

PI 20

PSI 20

2-1/2"-SW-PVC-2

FROM WATER SUPPLY

2-1/2"-SW-PVC-2

BOOSTER PUMP DUTY

HYDROPNUEMATIC DUTY TANK

AFD

PT

(NOTE 4)

(NOTE 4)

BOOSTER PUMP STANDBY

BOOSTER PUMP STANDBY

PUMP PACKAGE

1 ½"-CL2-PVC-2

FE 26

LOR

HS 21

FI 21

PSHL 21

CHF-21 DUTY

LOR

HS 23

FI 23

PSHL 23

CHF-23 STANDBY

PI 21

S

S

2-1/2"-SW-PVC-2

1"-CL2-PVC-2

1"-CL2-PVC-2

PI 23

2-1/2"-CL2-PVC-2

TO SUPPLEMENTAL CHLORINATION POINT

NOTES:
1. SEE P&ID LEGEND ON DRAWINGS P-01, P-02, AND P-03.
2. ALL SYSTEM CODES ARE "CL2" UNLESS OTHERWISE NOTED.
3. LOCAL CONTROL DEVICES, SUCH AS LIGHTS AND SWITCHES, LOCATED ON MCCs OR AT EQUIPMENT, MAY NOT BE SHOWN ON THIS P&ID.
4. DRAIN VALVE WITH HOSE CONNECTION.
5. PIPE SIZES ARE PRELIMINARY AND WILL BE FINALIZED DURING DESIGN.

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

SAVED:
PLOTTED:
USER:
DWG VER:
XREF1:
XREF2:
XREF3:
XREF4:

BLACK & VEATCH Building a world of difference

L'Heureux Page Werner

TD&H Engineering

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

P&ID
CHLORINE GAS

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

I-1
SHEET
OF

TASK 282C

FD7000
07075

LAS STORAGE TANK TNK-01 LEVEL

LAS STORAGE TANK TNK-02 LEVEL

1"-LAS-CPVC-1 → B | PLAS-02 — TO VACUUM BREAKERS

1"-LAS-CPVC-1 → PLAS-02 | C — FROM RELIEF VALVES AND CALIBRATION COLUMS

6"-LAS-CPVC-1

6"-LAS-CPVC-1

NOTE 3

LAH 01 · LAH 02 · LAX 01 · I · HS 01 · LT 01 · LSH 01 · LSH 02 · LT 02

CHEMICAL TRUCK UNLOADING PANEL

2"-LAS-CPVC-1

2"-LAS-CPVC-1

Q — TRUCK UNLOADING CONNECTION

Q — TRUCK UNLOADING CONNECTION

LIT 01 · LE 01

LIQUID AMMONIUM SULFATE STORAGE TANK NO.1

TNK-01

LIT 02 · LE 02

LIQUID AMMONIUM SULFATE STORAGE TANK NO.2

TNK-02

ELEVATION A (NOTE 6)

3"-LAS-CPVC-1

NOTE 3

1"-LAS-CPVC-1

1"-LAS-CPVC-1

3"-LAS-CPVC-1

2"-LAS-CPVC-1

2"-LAS-CPVC-1

2"-LAS-CPVC-1

2"-LAS-CPVC-1

2"-LAS-CPVC-1 → A | PLAS-02 — TO LIQUID AMMONIUM SULFATE METERING PUMPS

NOTES :
1. SEE LEGEND ON DRAWINGS P-01, P-02 AND P-03.
2. SYSTEM CODE IS LAS UNLESS OTHERWISE NOTED.
3. LOCATE P-TRAP FILL VALVE NO MORE THAN 5 FEET ABOVE FINISHED FLOOR
4. LOCATE LEVEL INDICATION SUCH THAT IT CAN BE VIEWED FROM THE TRUCK
   UNLOADING CONNECTION.
5. LOCAL CONTROL DEVICES, SUCH AS INDICATING LIGHTS AND SWITCHES, LOCATED
   ON MCCs OR AT EQUIPMENT, MAY NOT BE INDICATED ON THIS P&ID.
6. THE ENTIRE TANK OVERFLOW HEADER SHALL BE INSTALLED AT ELEVATION A.

TASK 282C

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

SAVED: XREF1:
PLOTTED: XREF2:
USER: XREF3:
DWG VER: XREF4:

BLACK & VEATCH Building a world of difference®

L'Heureux Page Werner

TD&H Engineering

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

P&ID
LIQUID AMMONIUM SULFATE
SHEET 1

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

I-2
SHEET
2 OF

FD7000
D7076

AMMONIA PUMP PP-01 IN-REMOTE
AMMONIA PUMP PP-01 RUNNING
AMMONIA PUMP PP-01 FAIL
AMMONIA PUMP PP-01 RUN CMD
AMMONIA PUMP PP-01 SPEED INDICATION
AMMONIA PUMP PP-01 SPEED SETPOINT
AMMONIA PUMP PP-01 STROKE LENGTH
AMMONIA PUMP PP-01 STROKE LENGTH SETPOINT
AMMONIA PUMP PP-02 IN-REMOTE
AMMONIA PUMP PP-02 RUNNING
AMMONIA PUMP PP-02 FAIL
AMMONIA PUMP PP-02 RUN CMD
AMMONIA PUMP PP-02 SPEED INDICATION
AMMONIA PUMP PP-02 SPEED SETPOINT
AMMONIA PUMP PP-02 STROKE LENGTH
AMMONIA PUMP PP02 STROKE LENGTH SETPOINT
AMMONIA PUMP PP-01 FLOW METER FIT-6611

FAIL YA | RUN YA | SIK | OOR HS | PAH | YA | I

PUMP CONTROL PANEL (TYP)

B PLAS-01
FROM AMMONIUM SULFATE STORAGE TANK VENT

PLAS-01 C
TO AMMONIUM SULFATE STORAGE TANK VENT

1"-LAS-CPVC-1

12"

EL A+2'

PLAS-03 E
FROM CALIBRATION COLUMNS AND RELIEF VALVES

ANTI - SIPHON LOOP

PI 01 | PI 01 | PSH 01

FIT | FE

HS 01
NOTE 4
PP-01 DUTY PUMP

PI 02 | PI 02 | PSH 02

NOTE 5 (TYP)

HS 02
NOTE 4
PP-02 DUTY PUMP

1"-LAS-CPVC-1

2"-LAS-CPVC-1

UV SYSTEM EFFLUENT

A PLAS-01
FROM AMMONIUM SULFATE STORAGE TANKS

F PLAS-03
TO AMMONIUM SULFATE METERING PUMPS

METERING PUMPS

THREADED CAP(TYP)

A PLAS-03
FROM AMMONIUM SULFATE METERING PUMPS

NOTE:
1. SEE LEGEND ON DRAWINGS P-01, P-02 AND P-03.
2. SYSTEM CODE IS LAS UNLESS OTHERWISE NOTED.
3. LOCAL CONTROL DEVICES, SUCH AS INDICATING LIGHTS AND SWITCHES, LOCATED ON MCCs OR AT EQUIPMENT, MAY NOT BE INDICATED ON THIS P&ID.
4. THE P&ID INDICATES A L-R SWITCH PROVIDED AS PART OF THE METERING PUMP MOUNTED ELECTRONIC STROKE LENGTH CONTROLLER, WITH LOCAL STROKE LENGTH CONTROL PROVIDE BY A MECHANISM AT THE PUMP. FOR METERING PUMPS BY SUPPLIERS PROVIDING LOCAL STROKE LENGTH CONTROL FROM THE METERING PUMP CONTROL PANEL, AN L-R SWITCH AND A LOCAL STROKE LENGTH ADJUSTMENT DEVICE SHALL BE PROVIDED ON THE PANEL.
5. CLEAR PVC PIPE 6 INCHES LONG WITH THREADED CAP.

TASK 282C

NO.	BY	CK.	APP	DATE	REVISIONS AND RECORD OF ISSUE

SAVED:
PLOTTED:
USER:
XREF1:
XREF2:
XREF3:
XREF4:
DWG VER:

BLACK & VEATCH Building a world of difference®

L'Heureux Page Werner

TD&H Engineering, Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

P&ID
LIQUID AMMONIUM SULFATE
SHEET 2

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

I-3
SHEET
2 OF

FD7000
D7076

AMMONIA PUMP PP-03 IN-REMOTE
AMMONIA PUMP PP-03 RUNNING
AMMONIA PUMP PP-03 FAIL
AMMONIA PUMP PP-03 RUN CMD
AMMONIA PUMP PP-03 SPEED INDICATION
AMMONIA PUMP PP-03 SPEED SETPOINT
AMMONIA PUMP PP-03 STROKE LENGTH
AMMONIA PUMP PP-03 STROKE LENGTH SETPOINT

PUMP CONTROL PANEL (TYP)

FAIL RUN OOR
YA YA SIK HS
PAH YA
I

PLAS-02 E
TO AMMONIA SULFATE STORAGE TANK VENT

1"-LAS-CPVC-1

PI 03
PI 03
PSH 03

NOTE 5

1"-LAS-CPVC-1

E PLAS-02
TO AMMONIA SULFATE METERING PUMPS

PI 03

HS 03
NOTE 4

PP-03 STANDBY PUMP

F PLAS-02
FROM AMMONIA SULFATE STORAGE TANKS

1"-LAS-CPVC-1

NOTE:
1. SEE LEGEND ON DRAWINGS P-01, P-02 AND P-03.
2. SYSTEM CODE IS LAS UNLESS OTHERWISE NOTED.
3. LOCAL CONTROL DEVICES, SUCH AS INDICATING LIGHTS AND SWITCHES, LOCATED ON MCCs OR AT EQUIPMENT, MAY NOT BE INDICATED ON THIS P&ID.
4. THE P&ID INDICATES A L-R SWITCH PROVIDED AS PART OF THE METERING PUMP MOUNTED ELECTRONIC STROKE LENGTH CONTROLLER, WITH LOCAL STROKE LENGTH CONTROL PROVIDE BY A MECHANISM AT THE PUMP. FOR METERING PUMPS BY SUPPLIERS PROVIDING LOCAL STROKE LENGTH CONTROL FROM THE METERING PUMP CONTROL PANEL, AN L-R SWITCH AND A LOCAL STROKE LENGTH ADJUSTMENT DEVICE SHALL BE PROVIDED ON THE PANEL.
5. CLEAR PVC PIPE 6 INCHES LONG WITH THREADED CAP.

TASK 282C

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

SAVED:
PLOTTED:
USER:
XREF1:
XREF2:
XREF3:
XREF4:
DWG VER:

BLACK & VEATCH Building a world of difference
TD&H Engineering, Consultants
L'Heureux Page Werner

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

P&ID
LIQUID AMMONIUM SULFATE
SHEET 3

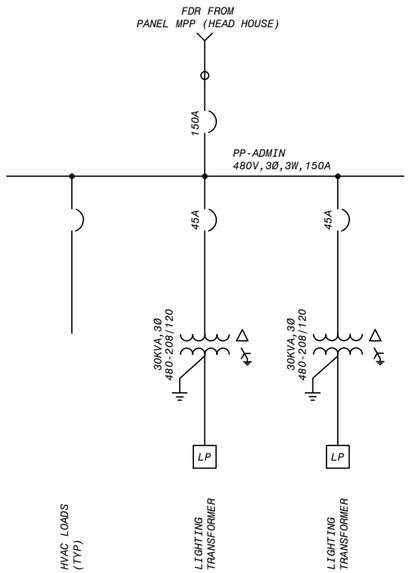
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

I-4
SHEET
2 OF

FD7000
07075



ADMINISTRATION BUILDING ADDITION
ONE-LINE DIAGRAM
NO SCALE

THIS SHEET ALL
ALTERNATE
BID ITEM NO.2

TASK 282C

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK	APP

SAVED:
PLOTTED:
USER:
XREF1:
XREF2:
XREF3:
XREF4:
DWG VER:

BLACK & VEATCH
Building a world of difference®

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc.
TD&H
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

ADMINISTRATION BUILDING ADDITION
ONE-LINE DIAGRAM
BID ALTERNATES

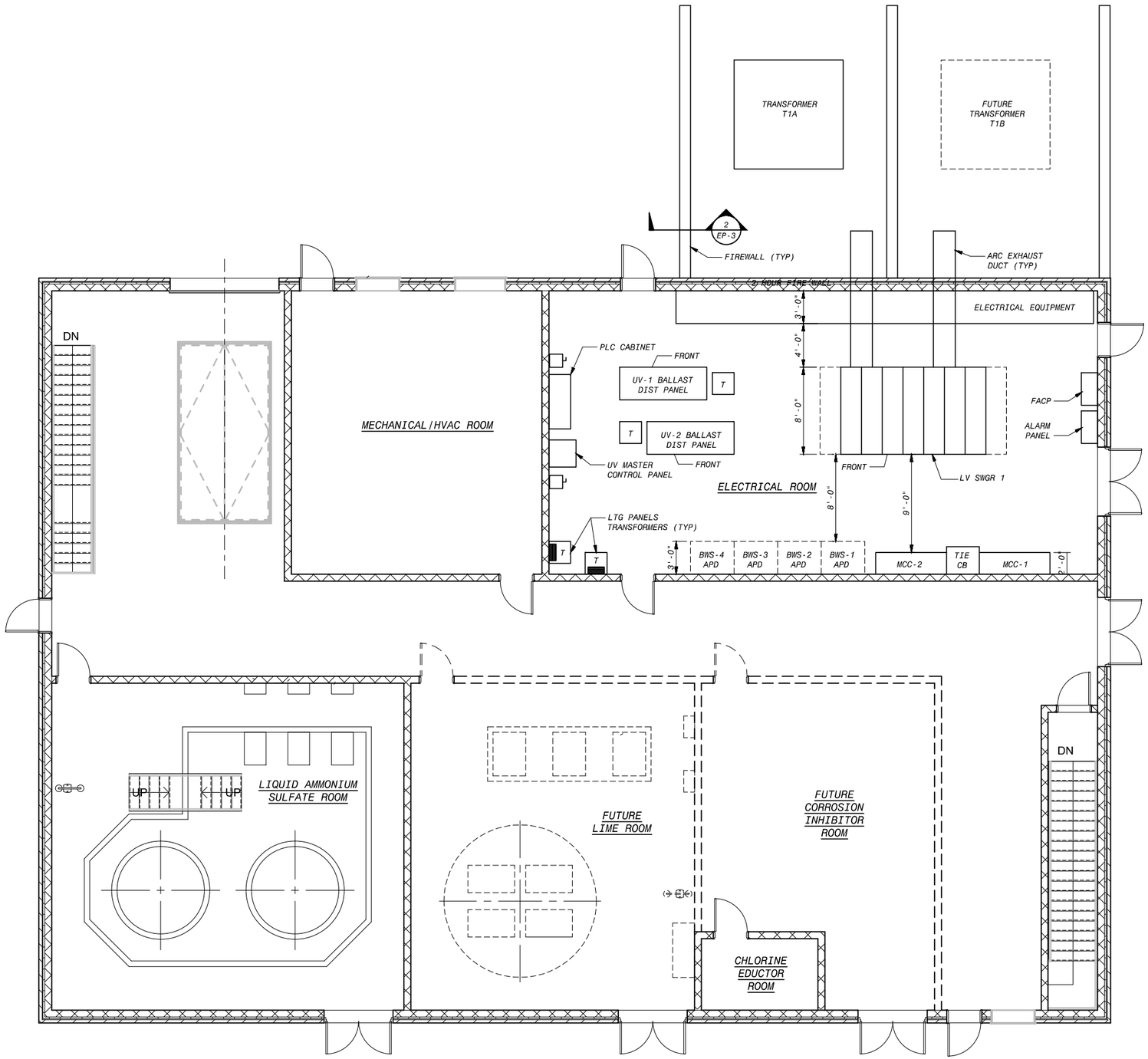
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

EA-1
SHEET
OF

FD7000
D7075



CHEMICAL FEED AND UV DISINFECTION BUILDING
UPPER LEVEL PLAN
3/16" = 1'-0"

6' 4' 2' 0 5' 10'
3/16"=1'-0"

TASK 282C

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference®

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc.
TD&H
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

CHEMICAL FEED AND UV DISINFECTION BUILDING
UPPER LEVEL PLAN

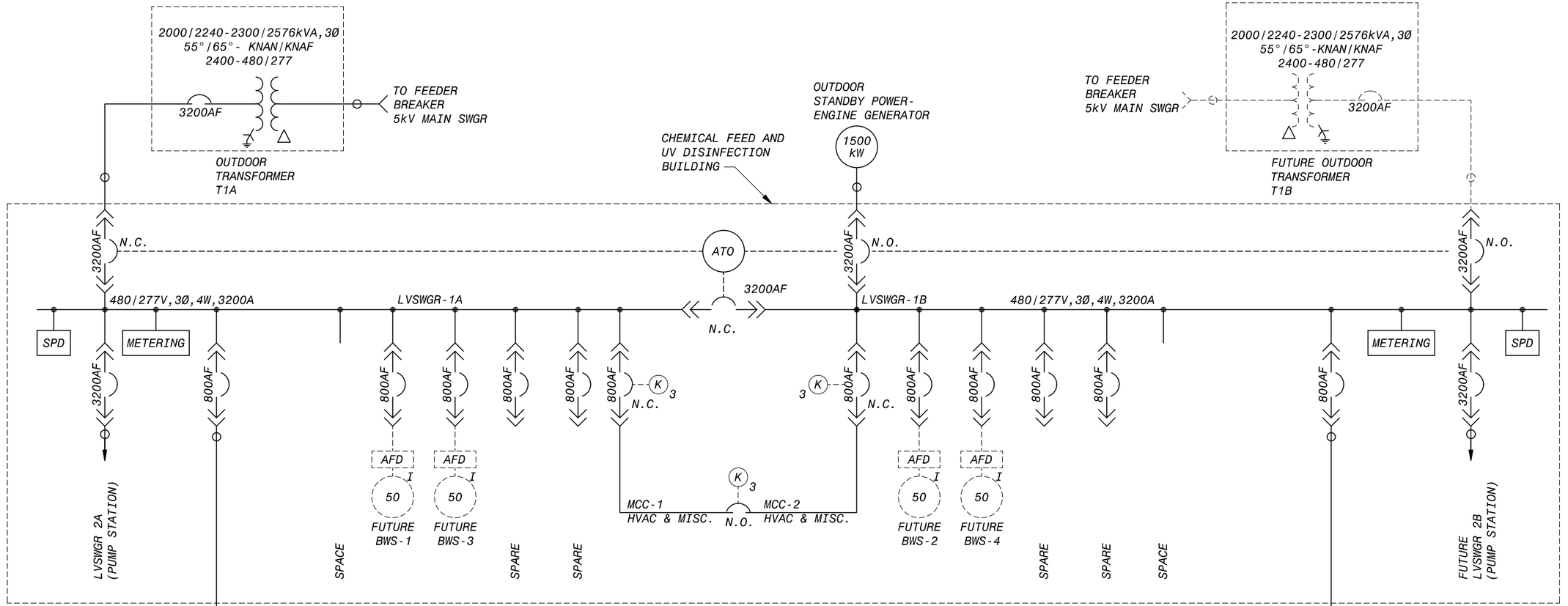
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

EC-1
SHEET
OF

FD7000
D7075



LOW VOLTAGE SWGR 1 ONE-LINE DIAGRAM

NO SCALE

	ARC EXHAUST PLENUM						
SPACE FOR FUTURE SECTION	MCC-1 FDR K3 800AF	SPACE	SPD	ATO CONTROLS	SPD	SPACE	MCC-2 FDR K3 800AF	SPACE FOR FUTURE SECTION
	SPARE 800AF	FUTURE BWSP-1 AFD FDR 800AF	METERING		METERING	FUTURE BWSP-2 AFD FDR 800AF	SPARE 800AF	
	SPARE 800AF	FUTURE BWSP-3 AFD FDR 800AF	MCB + CTS 3200AF	TIE CB 3200AF	MCB + CTS 3200AF	FUTURE BWSP-4 AFD FDR 800AF	SPARE 800AF	
	BW TREATMENT FACILITY TRANSFORMER 800AF	LV SWGR 2 FDR 3200AF		GEN CB 3200AF		FUTURE LV SWGR-2B FDR 3200AF	CARBON BLDG TRANSFOMER FDR 800AF	

LOW VOLTAGE SWGR 1 ELEVATION

NO SCALE

TASK 282C

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG NEW:

BLACK & VEATCH Building a world of difference

L'Heureux Page Werner

TD&H Thomas, Dean & Hoskins, Inc. Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

LOW VOLTAGE SWGR 1 ONE-LINE DIAGRAM

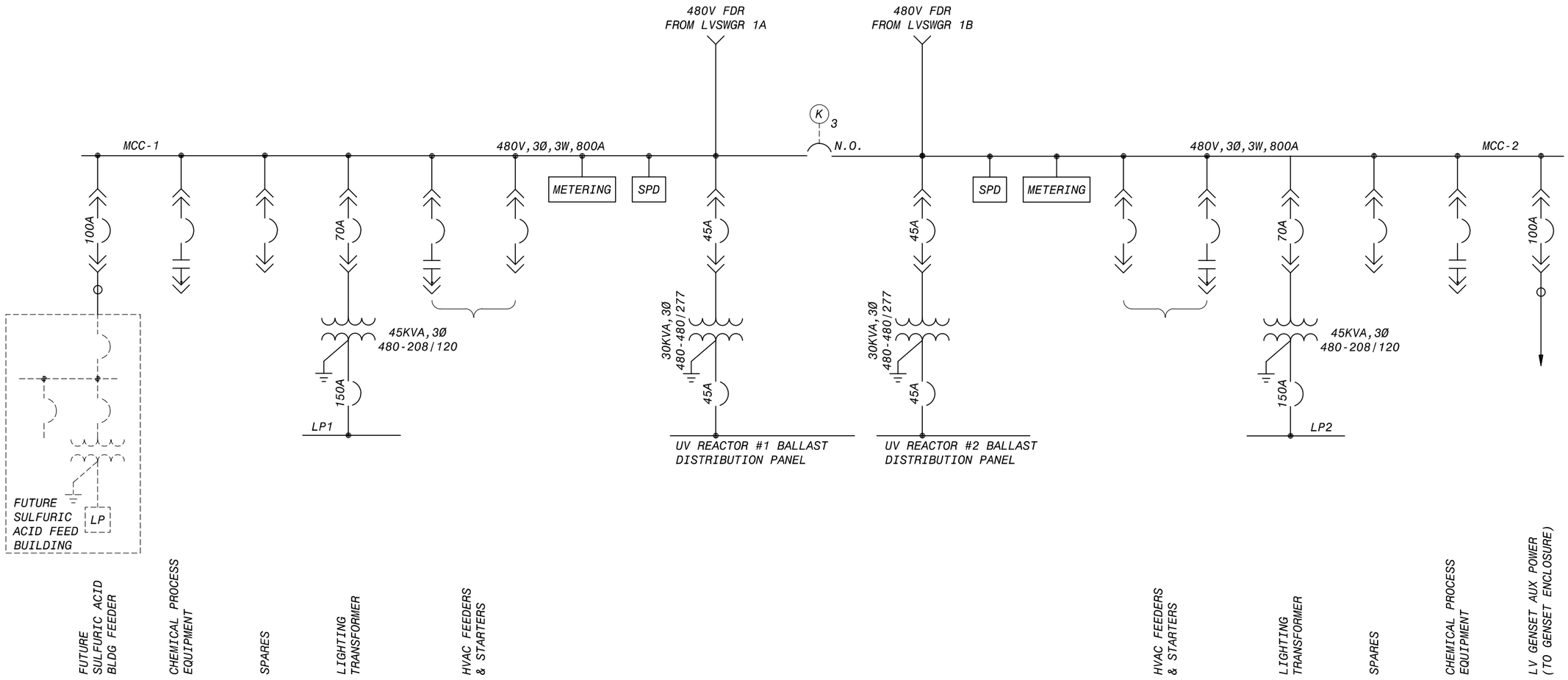
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO. 177716

EC-2 SHEET OF

FD7000
D7075



MCC-1 AND MCC-2 ONE-LINE DIAGRAM
(CHEMICAL FEED AND UV DISINFECTION BUILDING)
NO SCALE

TASK 282C

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

SAVED:
PLOTTED:
USER:
XREF1:
XREF2:
XREF3:
XREF4:
DWG VER:

BLACK & VEATCH
Building a world of difference

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc.
TD&H
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

MCC-1 AND MCC-2 ONE-LINE DIAGRAM

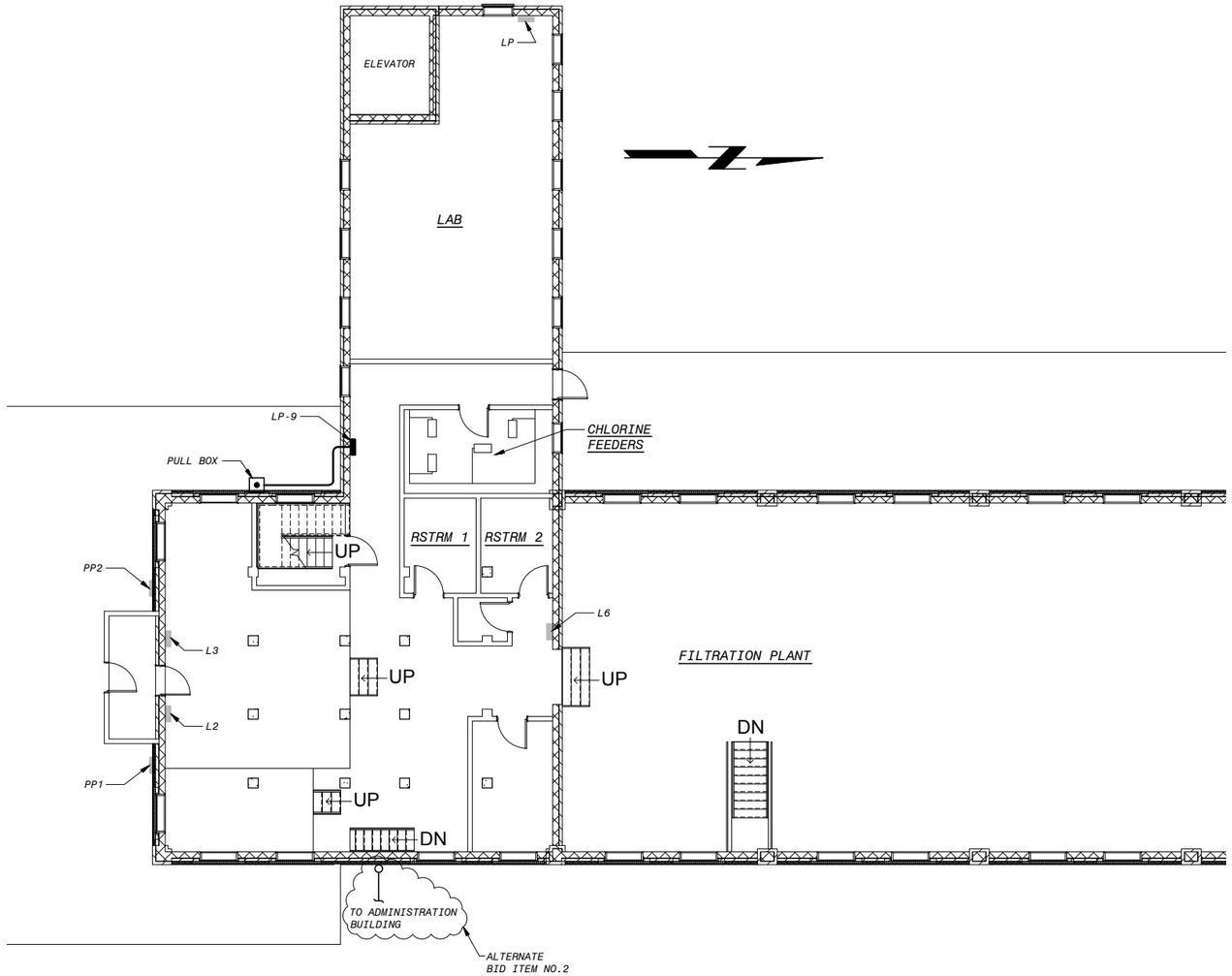
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

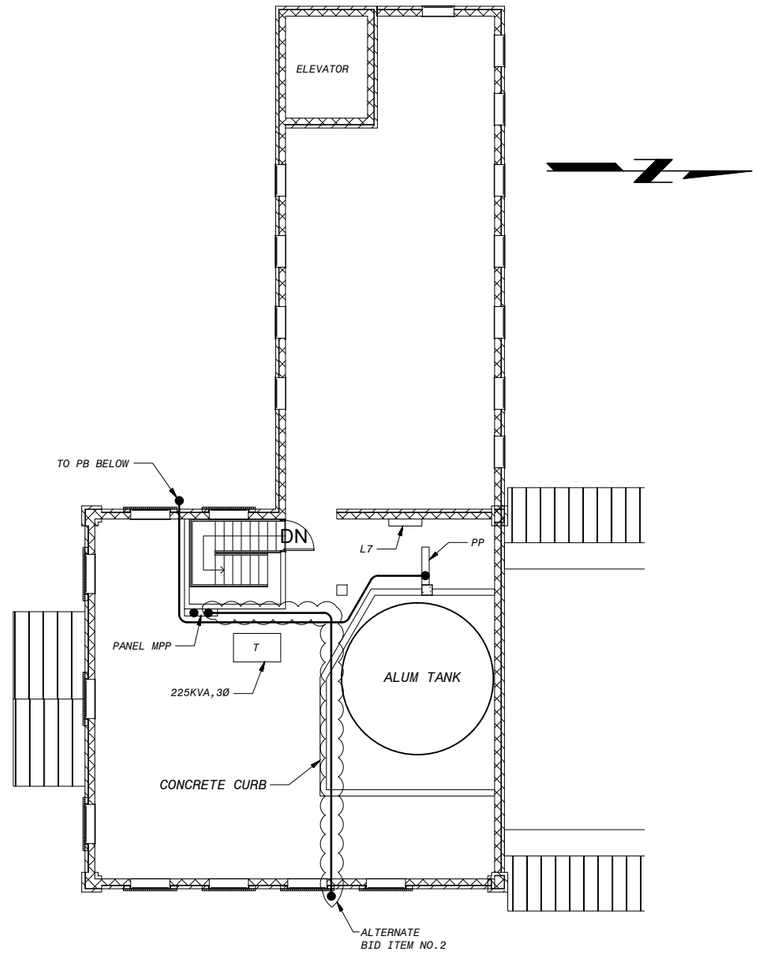
EC-3
SHEET
OF

F07000
D7075



MAIN FILTRATION PLANT/HEAD HOUSE LEVEL 1

1/8" = 1'-0"



HEAD HOUSE LEVEL 2

1/8" = 1'-0"

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

HEAD HOUSE
LEVELS
BASE BID + BID ALTERNATES

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

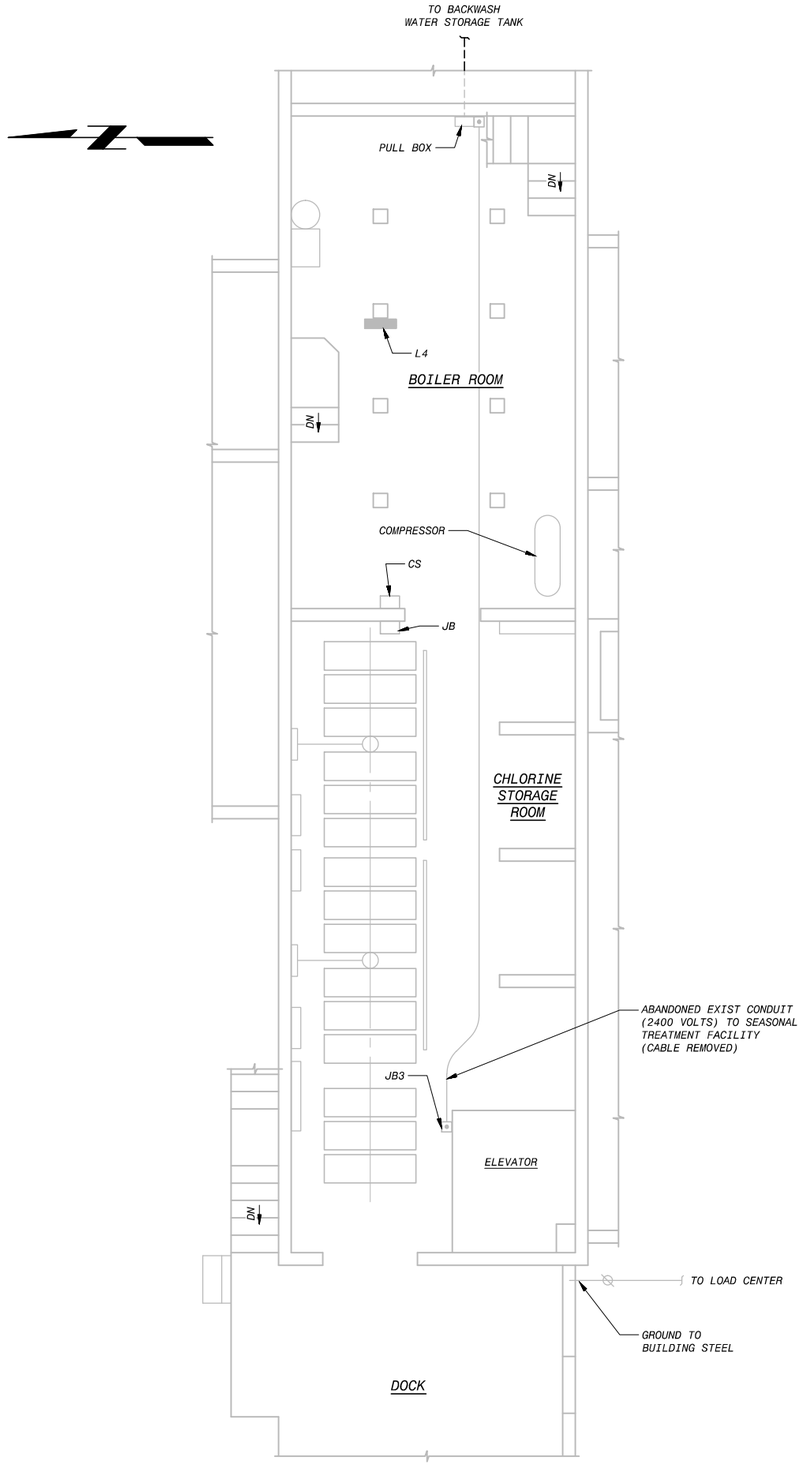
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

EH-1
SHEET
OF

TASK 282C

FD7000
D7075



BASEMENT FLOOR PLAN
1/4" = 1'-0"

THIS SHEET ALL
ALTERNATE
BID ITEM NO.2

TASK 282C

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference.

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc.
TD&H
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

HEAD HOUSE
BASEMENT FLOOR PLAN
BID ALTERNATES

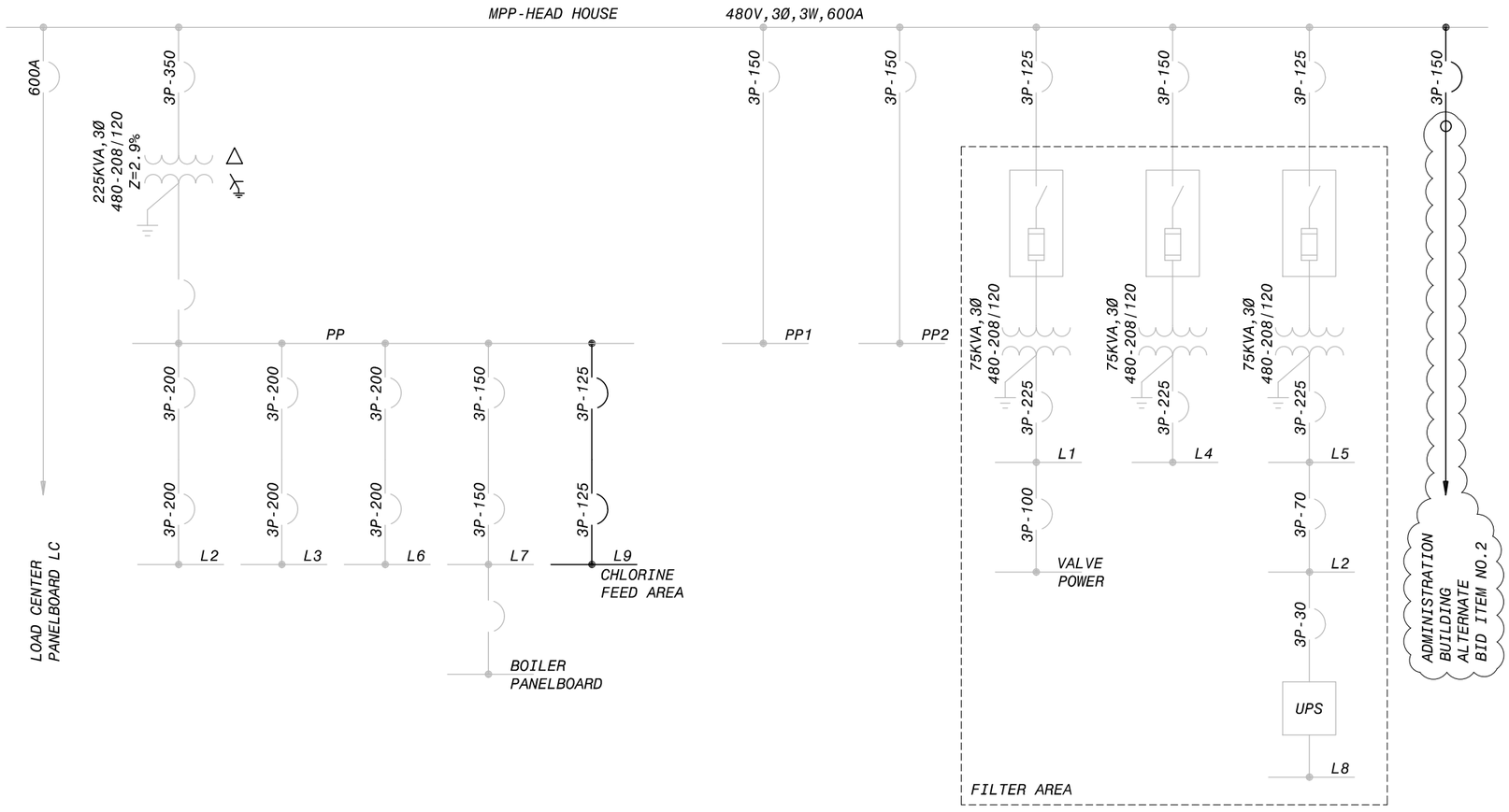
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

EH-2
SHEET
OF

FD7000
D7075



HEAD HOUSE/FILTER BUILDING
ONE-LINE DIAGRAM

NO SCALE

TASK 282C

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference®

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

L'Heureux Page Werner

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

HEAD HOUSE/FILTER BUILDING
ONE-LINE DIAGRAM
BASE BID + BID ALTERNATES

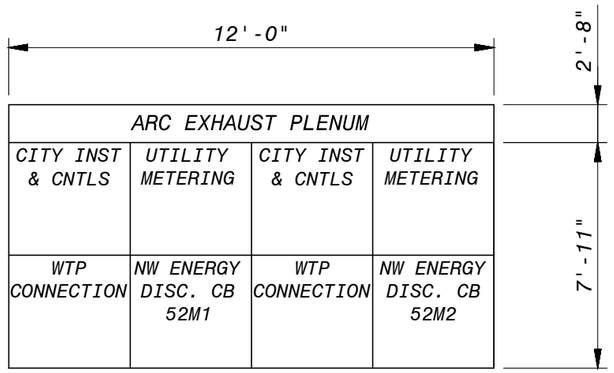
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

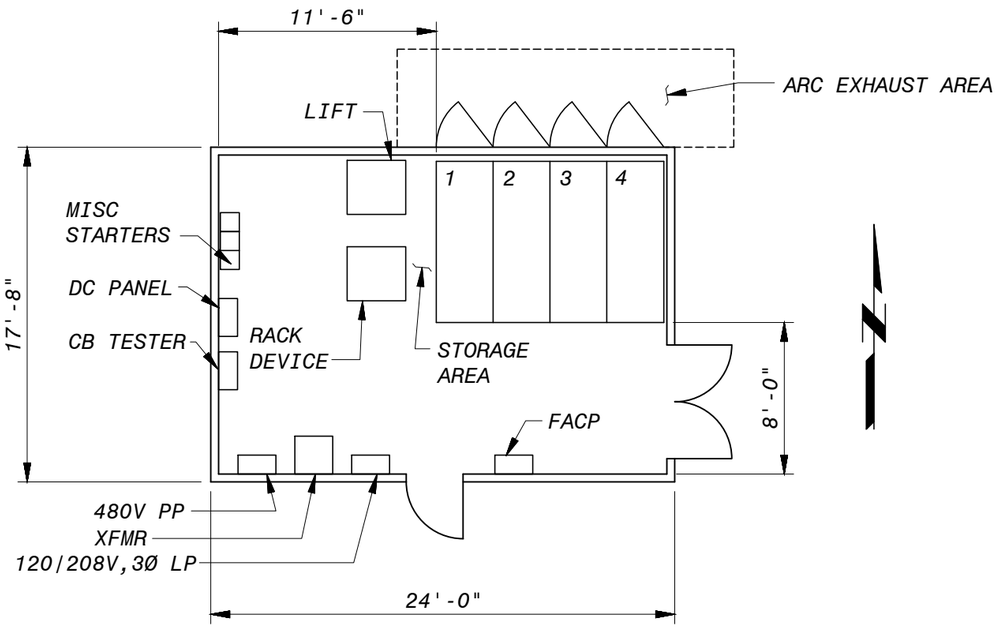
EH-3
SHEET
OF

FD7000
D7075



5kV SWGR ELEVATION

NOT TO SCALE



NW ENERGY METERING & SERVICE DISCONNECT BUILDING PLAN

NO SCALE

THIS SHEET ALL ALTERNATE BID ITEM NO.1

TASK 282C

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

L'Heureux Page Werner

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

NW ENERGY METERING & SERVICE DISCONNECT BUILDING PLAN
BID ALTERNATE

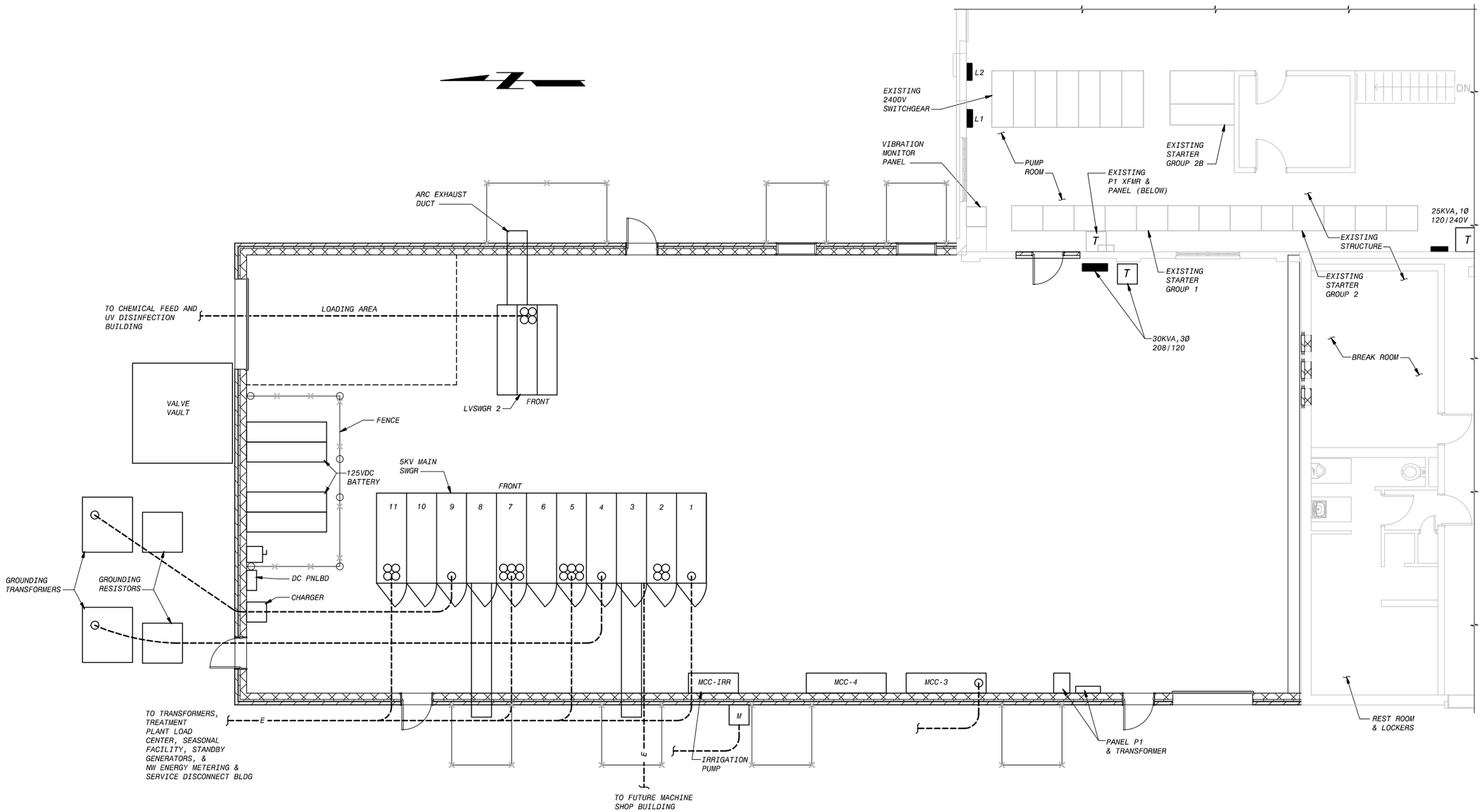
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

EM-1
SHEET
OF

FD7000
D7075



ELECTRICAL ROOM ADDITION
(PUMP STATION BUILDING)

3/16" = 1'-0"

6' 4' 2' 0 5' 10'

3/16"=1'-0"

TASK 282C

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference

L'Heureux Page Werner

TD&H Engineering

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

PUMP STATION BUILDING PLAN
ELECTRICAL ROOM ADDITION
BASE BID

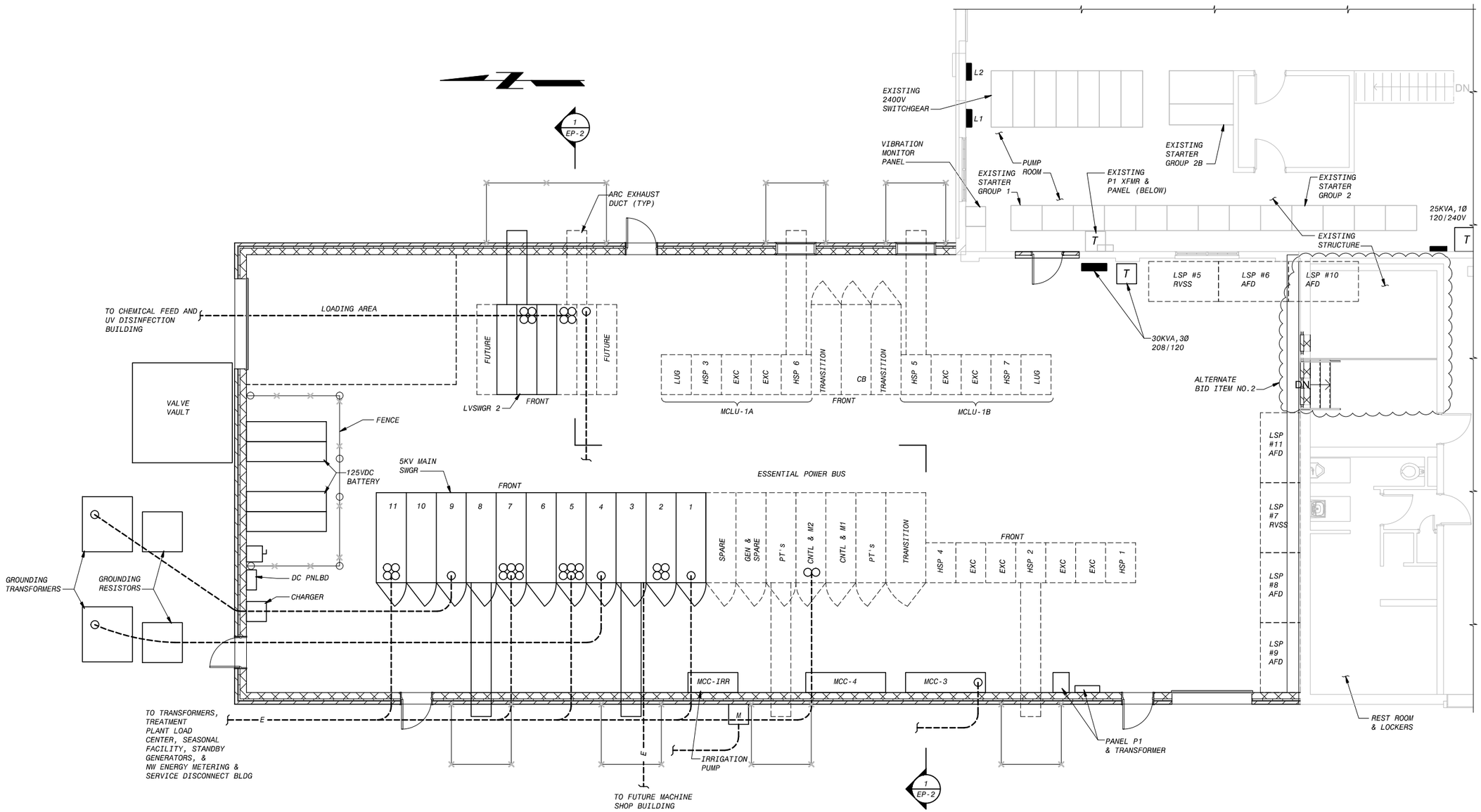
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

EP-1
SHEET
OF

FD7000
D7075



ELECTRICAL ROOM ADDITION
(PUMP STATION BUILDING)

3/16" = 1'-0"

6' 4' 2' 0 5' 10'

3/16"=1'-0"

TASK 282C

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference

L'Heureux Page Werner

Thorson, Baer & Hopkins, Inc.
TD&H
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

PUMP STATION BUILDING PLAN
ELECTRICAL ROOM ADDITION
BASE BID + BID ALTERNATES

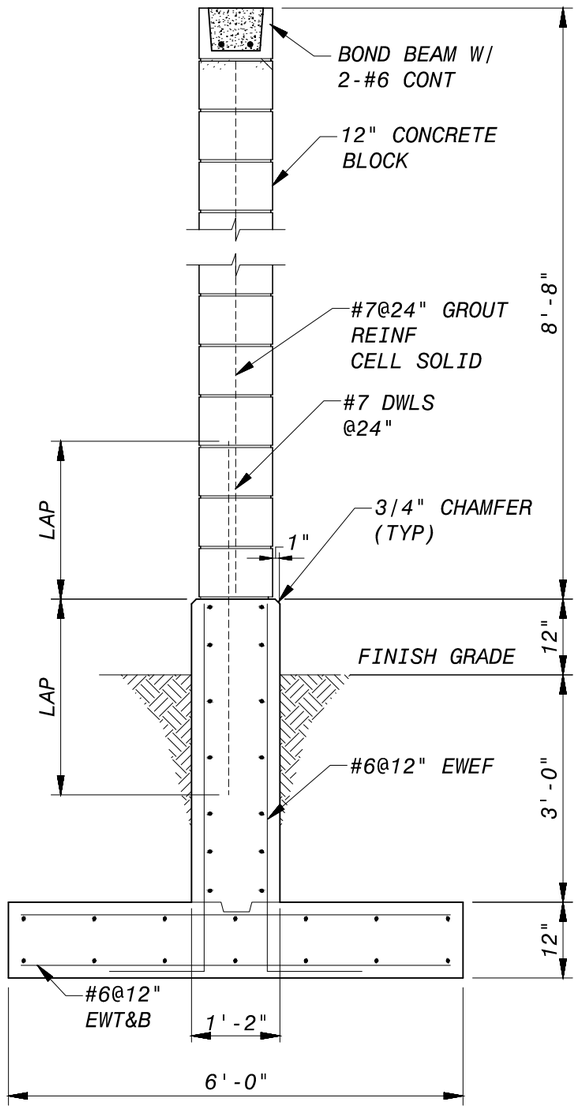
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

EP-1A
SHEET
OF

FD7000
D7075



2 SECTION
EC-1 1/2" = 1'-0"

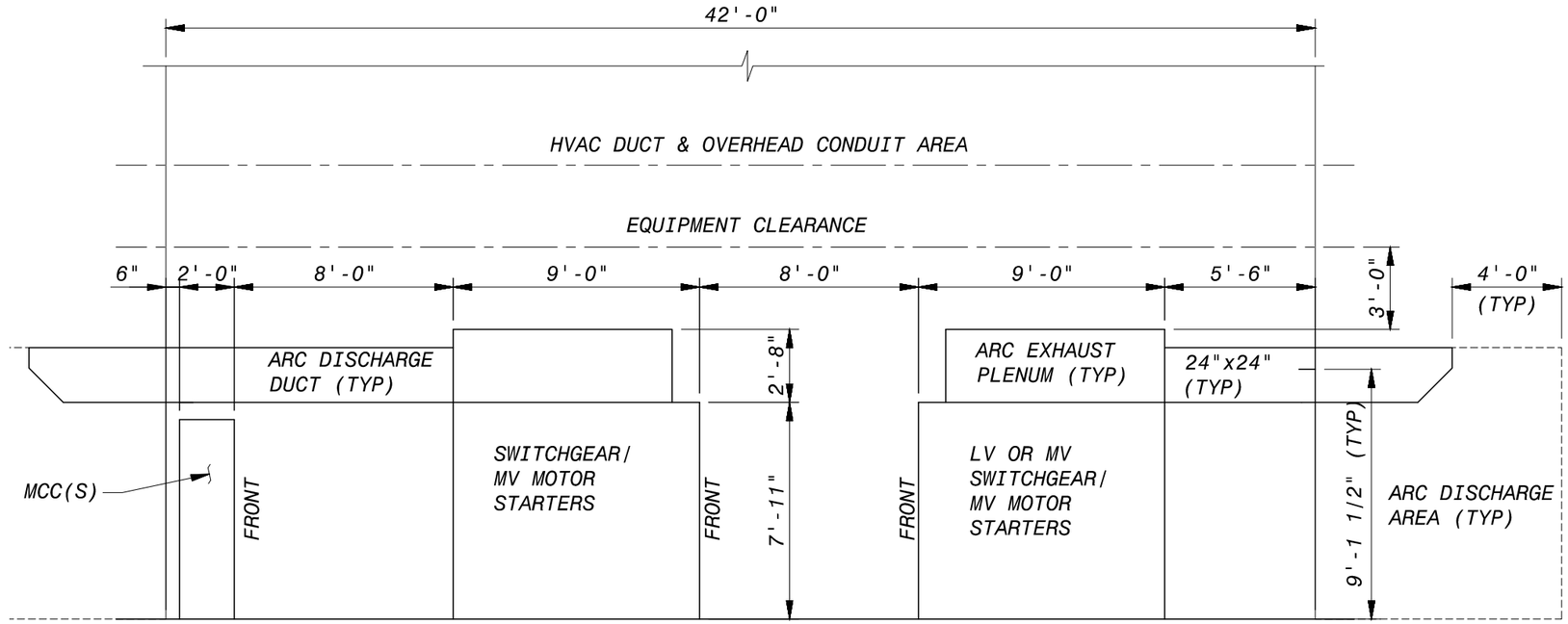
33'

2'-8"

ARC EXHAUST PLENUM										
1U AUX.PWR TRANSFORMERS	2U TRANSFORMER T1A FDR	3U SPARE (FUTURE MCLU-1A FDR)	4U PT	5U CONTROLS	6U CONTROLS	7U TRANSITION	8U CONTROLS	9U STARTERS GROUP NO(S) 2A & 2B	10U SPARE (FUTURE MCLU-1B FDR)	11U SPARE (FUTURE TRANSFORMER T1B FDR)
1L SPARE (FUTURE SEASONAL FACILITY FDR)	2L LC FDR A	3L STARTER GROUP NO. 1	4L GND TRANSFOMER	5L MCB 52-M)	6L TIE 52-T	7L MCB 52-M2	8L PT	9L GND TRANSFORMER	10L STARTER GROUP NO. 3	11L LC FDR B

7'-11"

5kV MAIN SWGR ELEVATION
NOT TO SCALE



1 SECTION
EP-1A 3/16" = 1'-0"

TASK 282C

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference

L'Heureux Page Werner

TD&H Thomas, Dean & Hoskins, Inc. Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

DETAILS AND SECTIONS

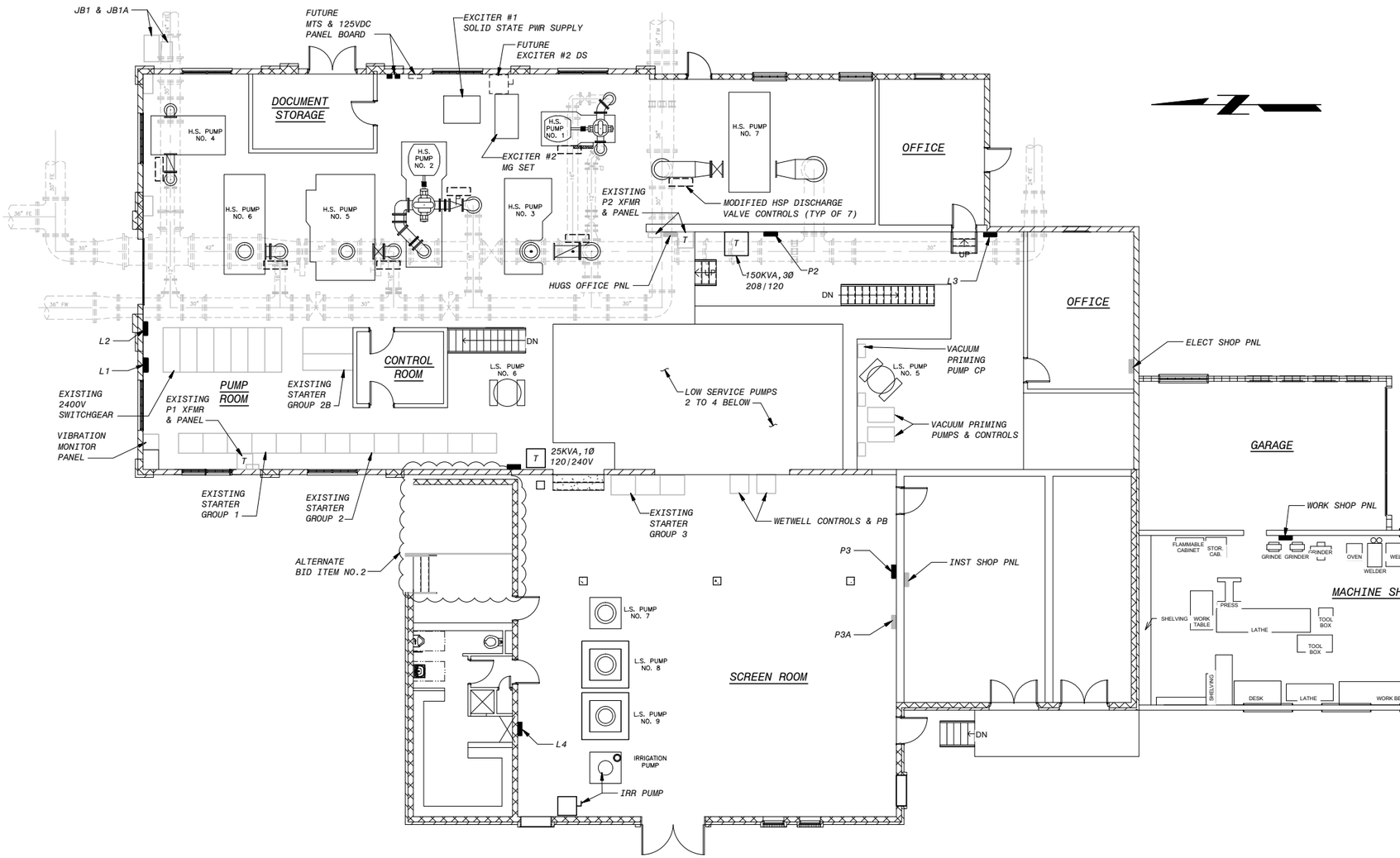
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

EP-2
SHEET
OF

FD7000
D7075



PUMP STATION - LEVEL 1

1/8" = 1'-0"

TASK 282C

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

PUMP STATION LEVEL 1

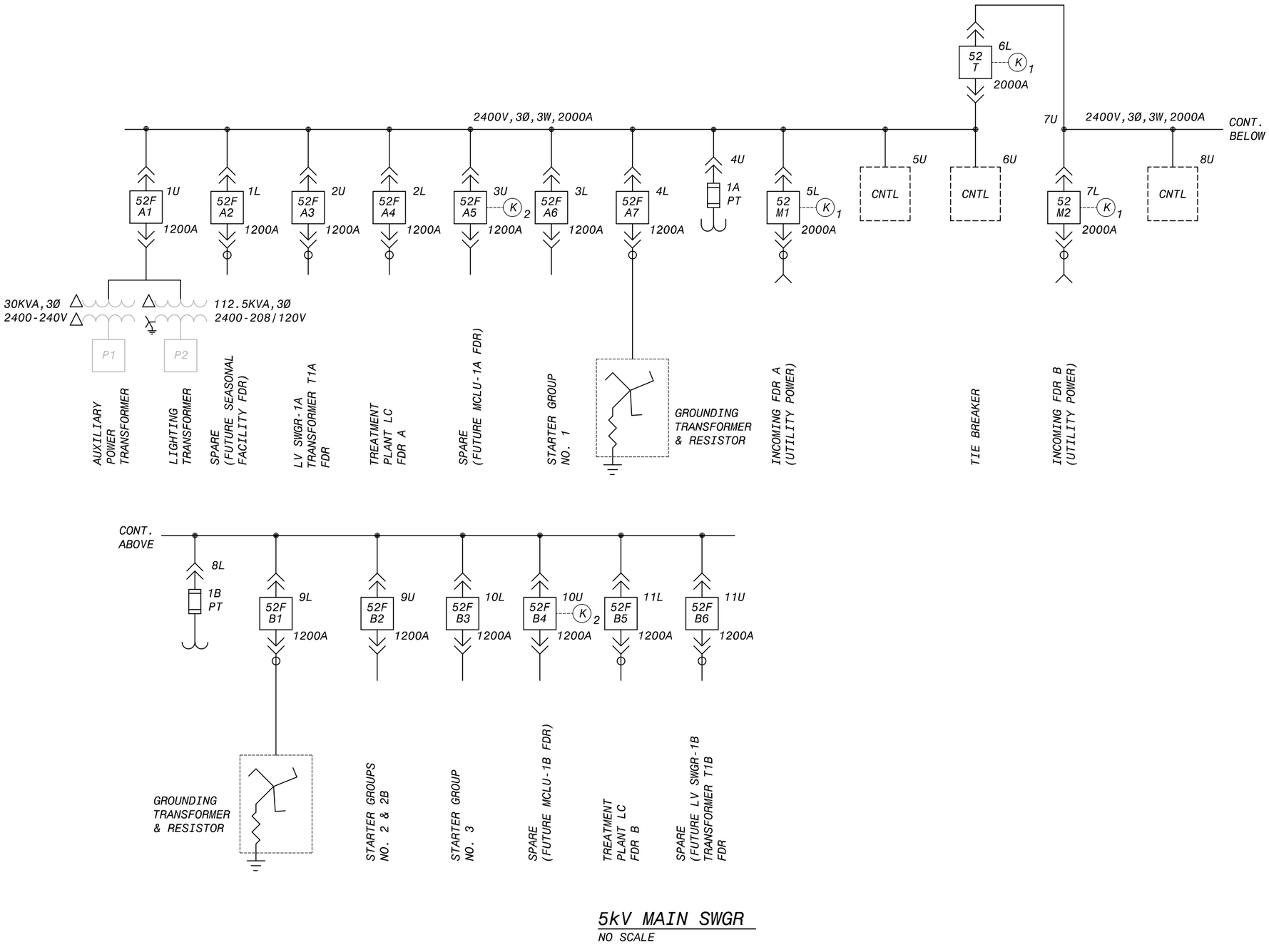
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

EP-3
SHEET
OF

FD7000
D7075



5kV MAIN SWGR

NO SCALE

TASK 282C

F07000
D7075

NO.	BY	CK	APP	REVISIONS AND RECORD OF ISSUE	DATE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

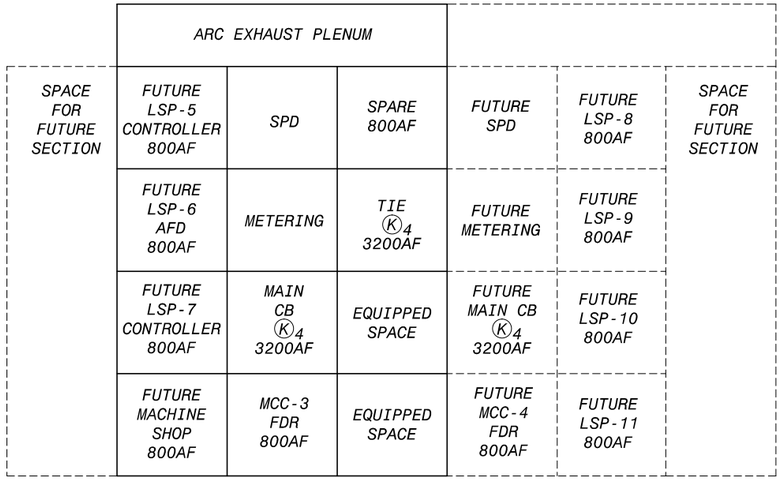
5KV MAIN SWGR ONE-LINE DIAGRAM

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

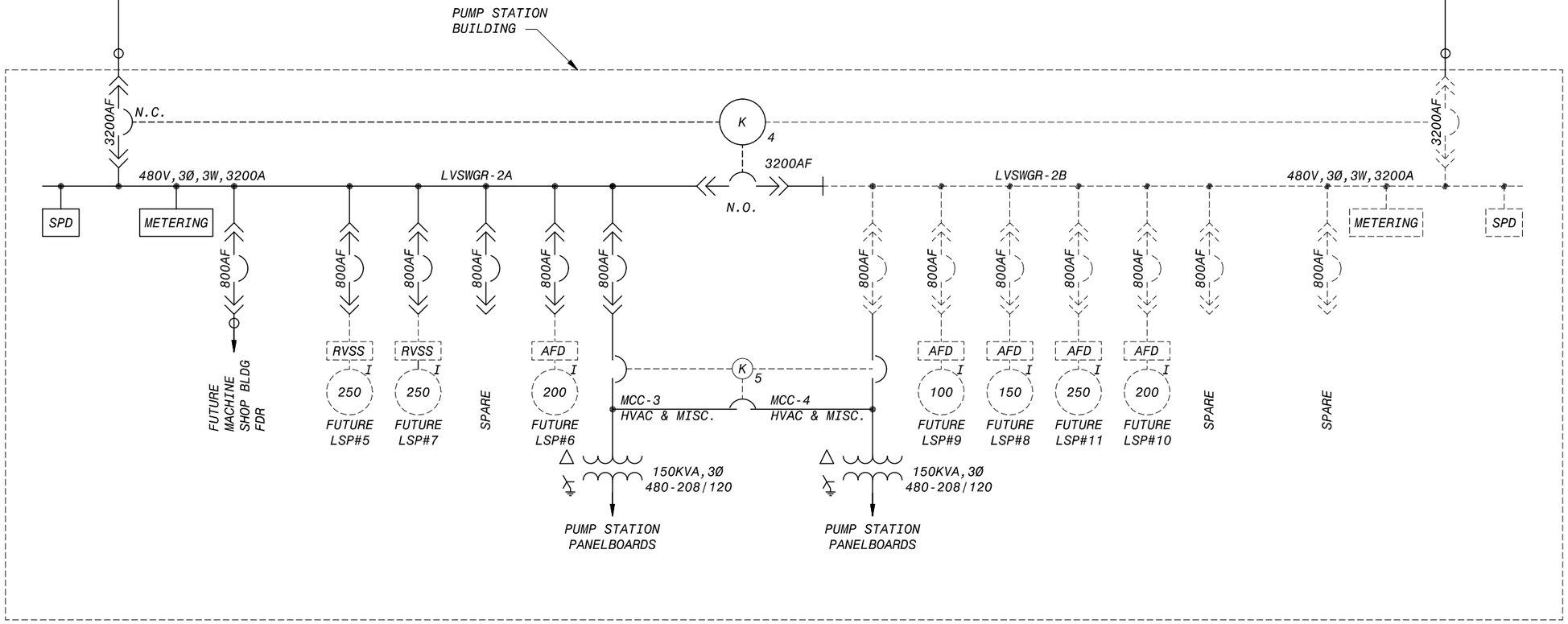
PROJECT NO.
177716

EP-4
SHEET
OF



LOW VOLTAGE SWGR 2 ELEVATION

NO SCALE



LOW VOLTAGE SWGR 2 ONE-LINE DIAGRAM

(PUMP STATION BUILDING - ELECTRICAL ROOM ADDITION)

NO SCALE

TASK 282C

FD7000
D7075

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

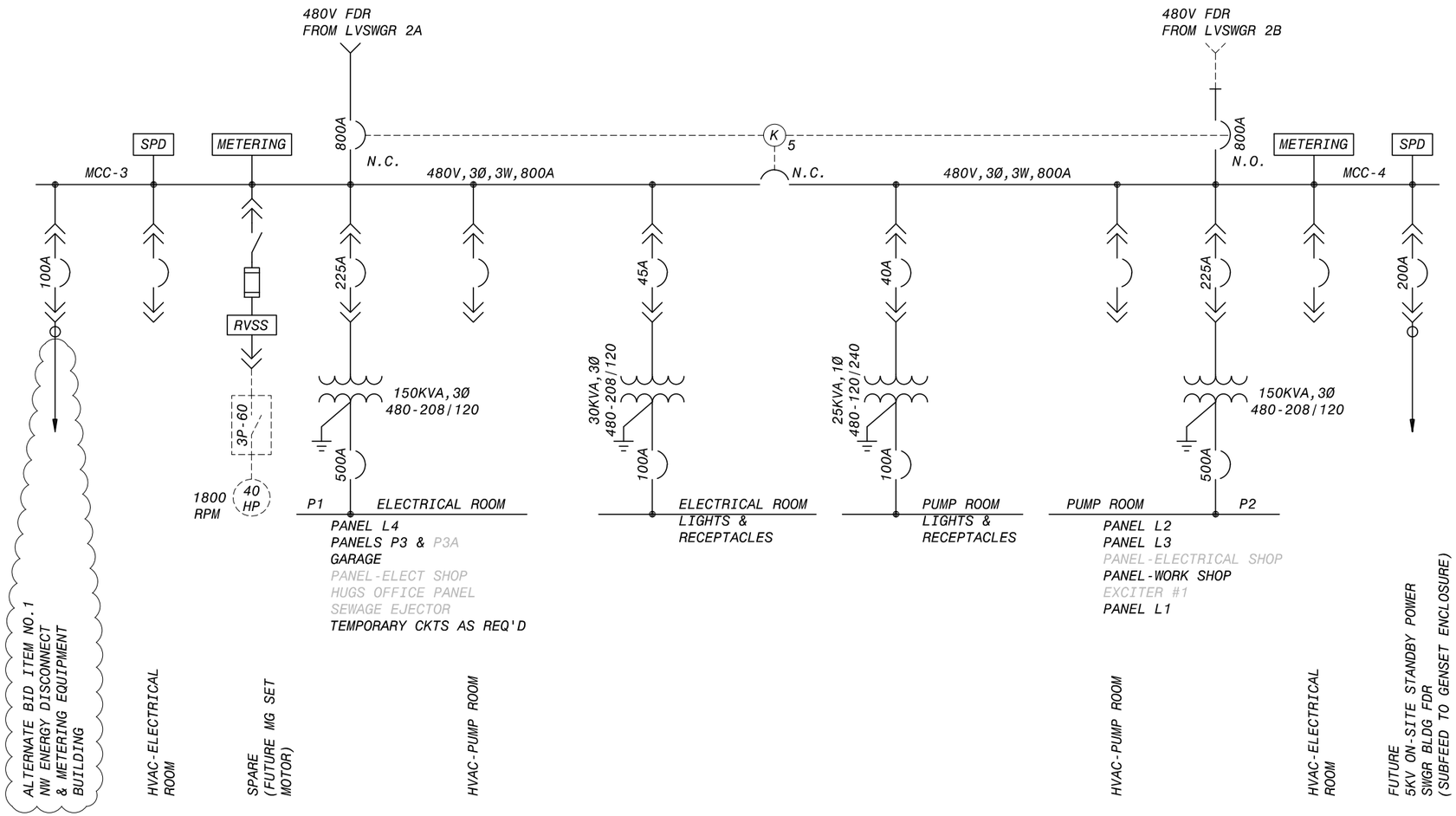
PHASE 1
LOW VOLTAGE SWGR 2 ONE-LINE DIAGRAM

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

EP-5
SHEET
OF



MCC-3 AND MCC-4 ONE-LINE DIAGRAM

(PUMP STATION BUILDING - ELECTRICAL ROOM ADDITION)

NO SCALE

NOTE:

PANEL BOARD AND EQUIPMENT IDENTIFIED WITH SCREENED NAMES ARE EXISTING PANEL BOARDS AND WILL BE RE-POWERED FROM NEW PANEL BOARDS P1 OR P2.

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:

SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference®

L'Heureux Page Werner

TD&H
Thomas, Dean & Hoskins, Inc.
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

MCC-3 AND MCC-4 ONE-LINE DIAGRAM

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

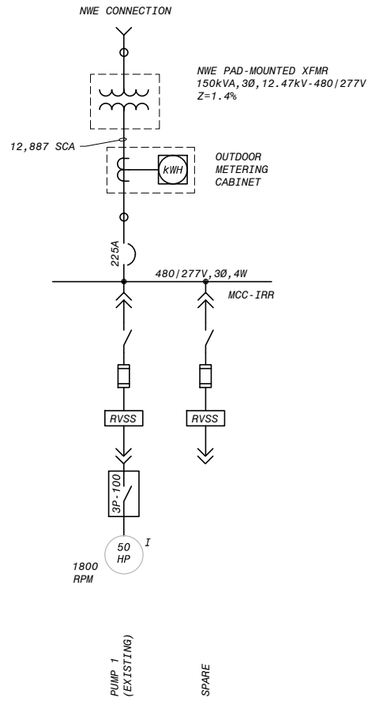
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

EP-6
SHEET
OF

TASK 282C

FD7000
D7075



IRRIGATION PUMP ONE-LINE DIAGRAM
(PUMP STATION BUILDING)
NO SCALE

TASK 282C

F07000
D7075

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG XREF:

BLACK & VEATCH
Building a world of difference®

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc.
TD&H
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHAE 1

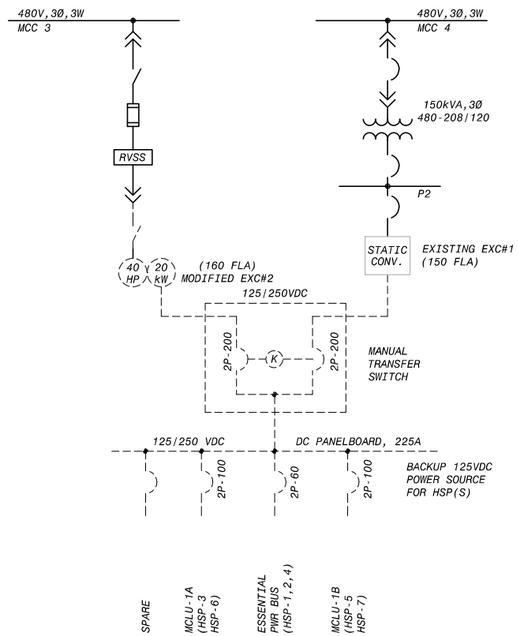
IRRIGATION PUMP
ONE-LINE DIAGRAM

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

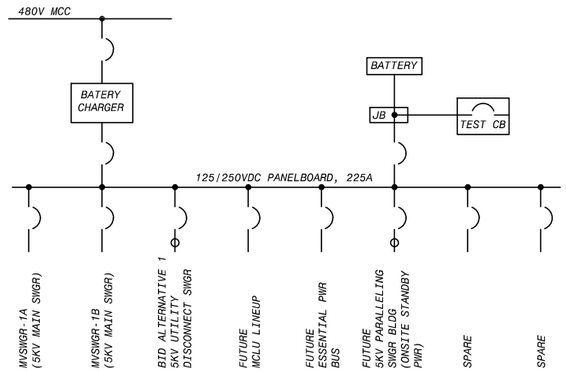
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

EP-7
SHEET
OF



125VDC MOTOR EXCITATION
POWER DISTRIBUTION ONE-LINE DIAGRAM
(PUMP STATION BUILDING)
NO SCALE



125VDC SWITCHGEAR CONTROL POWER
ONE-LINE DIAGRAM
(PUMP STATION BUILDING)
NO SCALE

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG NEW:

BLACK & VEATCH
Building a world of difference®

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc.
TD&H
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

125VDC POWER DISTRIBUTION
ONE-LINE DIAGRAMS

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

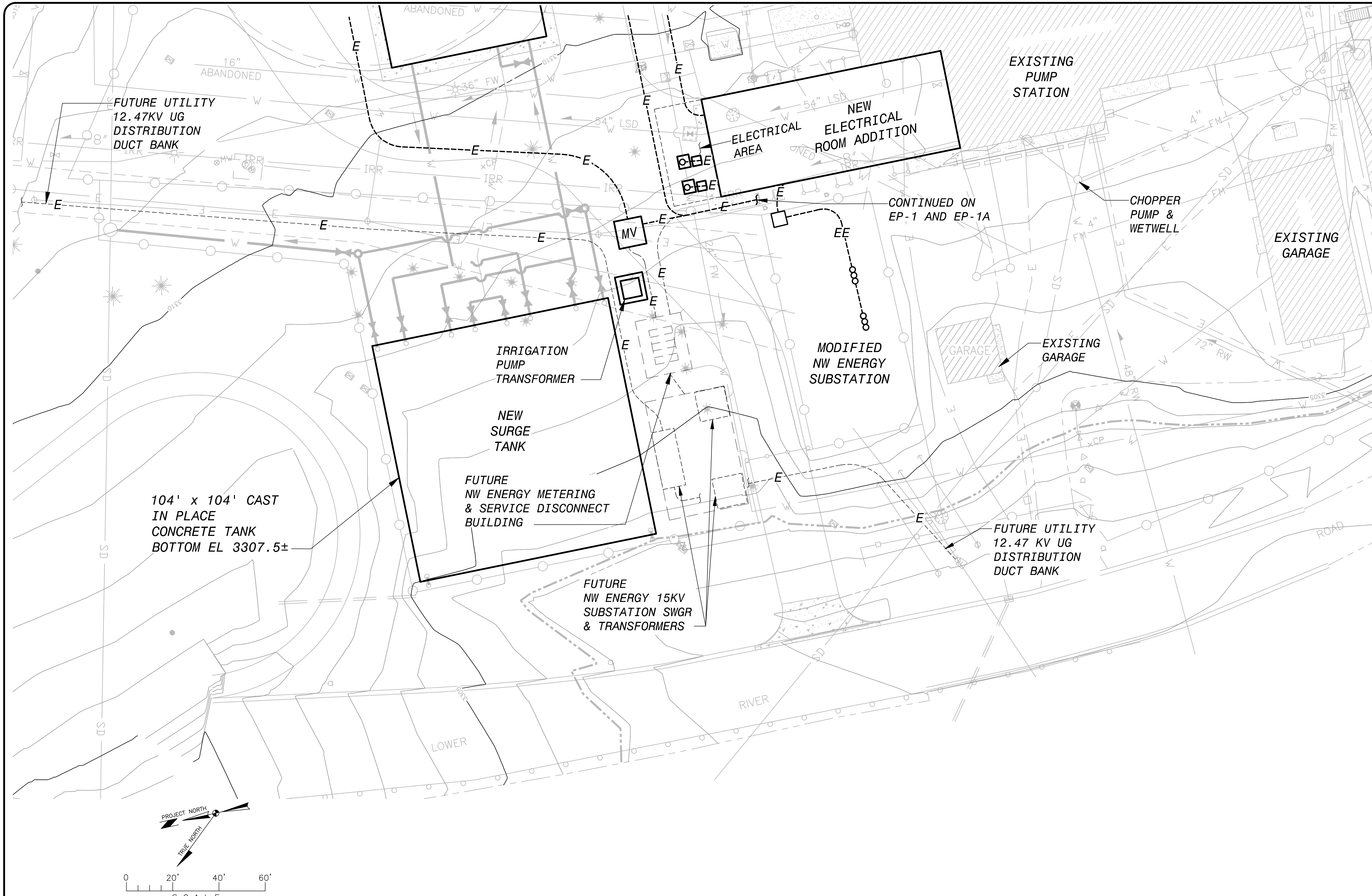
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

EP-8
SHEET
OF

TASK 282C

FD7000
D7075


FUTURE UTILITY
12.47KV UG
DISTRIBUTION
DUCT BANK
EXISTING
PUMP
STATION
ELECTRICAL
AREA
NEW
ELECTRICAL
ROOM ADDITION
CONTINUED ON
EP-1 AND EP-1A
CHOPPER
PUMP &
WETWELL
EXISTING
GARAGE
MV
IRRIGATION
PUMP
TRANSFORMER
MODIFIED
NW ENERGY
SUBSTATION
EXISTING
GARAGE
NEW
SURGE
TANK
FUTURE
NW ENERGY METERING
& SERVICE DISCONNECT
BUILDING
104' x 104' CAST
IN PLACE
CONCRETE TANK
BOTTOM EL 3307.5±
FUTURE UTILITY
12.47 KV UG
DISTRIBUTION
DUCT BANK
FUTURE
NW ENERGY 15KV
SUBSTATION SWGR
& TRANSFORMERS
16" ABANDONED
ABANDONED
GARAGE
ROAD
RIVER
LOWER
PROJECT NORTH
TRUE NORTH
0 20' 40' 60'
SCALE

TASK 282C

FD7000
D7075

NO. | BY | CK | APP | DATE | REVISIONS AND RECORD OF ISSUE

SAVED:
PLOTTED:
USER:
XREF1:
XREF2:
XREF3:
XREF4:
DWG VER:

BLACK & VEATCH
Building a world of difference.

TD&H

L'Heureux Page Werner

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

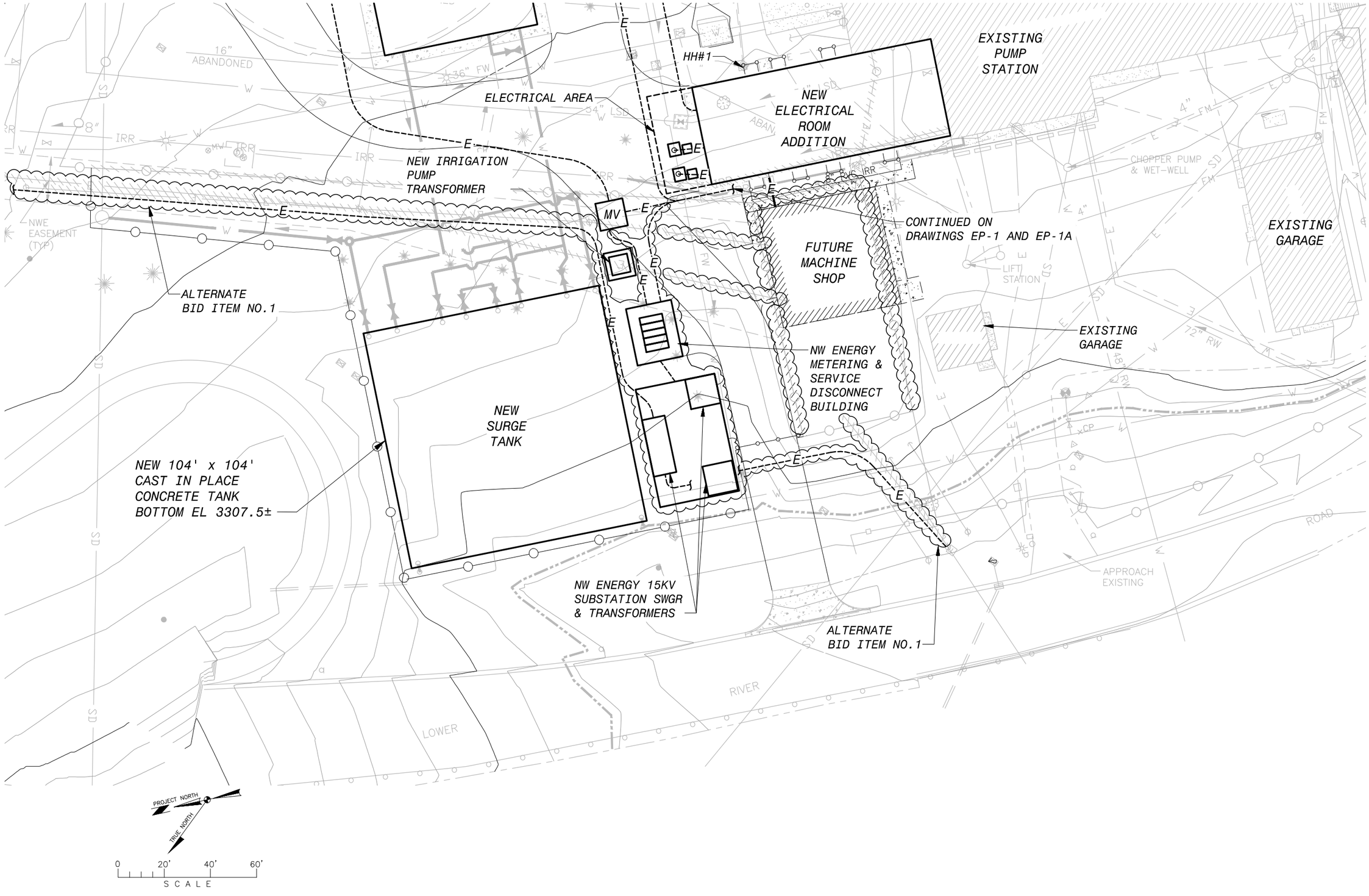
WEST ELECTRICAL
SITE PLAN

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

GE-1
SHEET
OF



TASK 282C

NO.	BY	CK	APP	REVISIONS AND RECORD OF ISSUE	DATE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

WEST ELECTRICAL
SITE PLAN
BASE BID + BID ALTERNATE

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

GE-1A
SHEET
OF

FD7000
D7075

NEW UTILITY TUNNEL
EXISTING UTILITY TUNNEL
FUTURE GROUNDING XFMR
(7) 3 1/2"
COM
FUTURE 5KV GENERATOR PARALLELING SWGR BUILDING
FUTURE SULFURIC ACID FEED BUILDING
NEW 1500KW 480V GENSET
FUTURE 1500KW 2400V GENSET
FUTURE 1500KW 2400V GENSET
MV
LV
MV
PB1 & PB1A
BACKWASH WATER TREATMENT FACILITY-150KVA TRANSFORMER
HH#4
T1B
T1A
NEW CHEMICAL FEED AND UV DISINFECTION BUILDING
TREATMENT PLANT LOAD CENTER FEEDERS
TREATMENT PLANT LC FEEDERS A&B
JB1 & JB1A
EXISTING PUMP STATION
HH#1
ELECTRICAL AREA
NEW ELECTRICAL ROOM ADDITION
8" PVC IRR
MV
FUTURE MACHINE SHOP
PROJECT NORTH
TRUE NORTH
0 20' 40' 60'
SCALE

TASK 282C

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

L'Heureux Page Werner

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES - PHASE 1

CENTRAL AREA ELECTRICAL
SITE PLAN

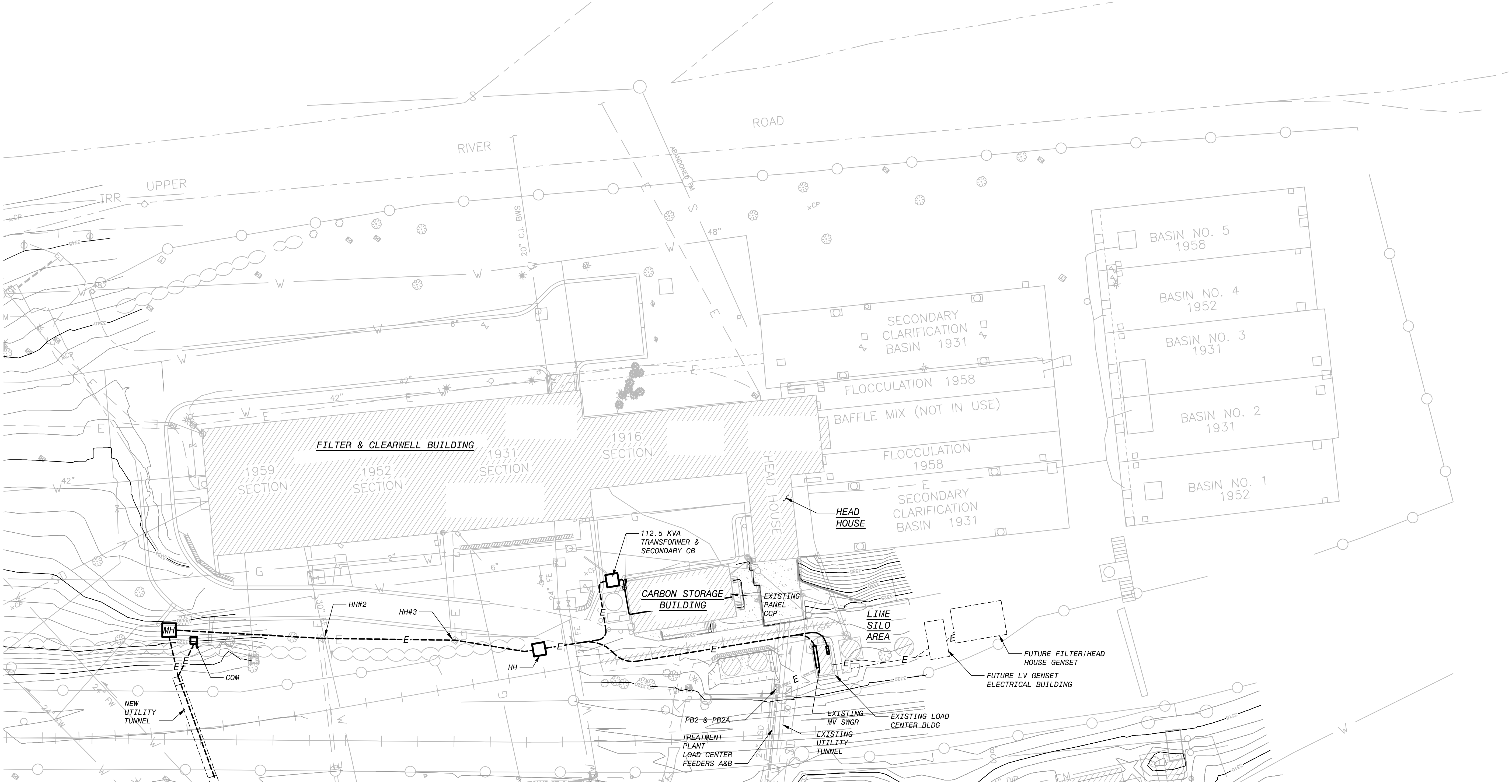
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

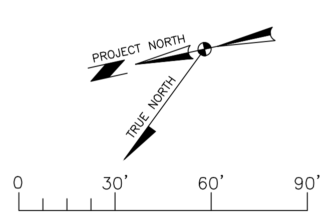
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

GE-2
SHEET
OF

FD7000
D7075





TASK 282C

NO. | BY | CK | APP
REVISIONS AND RECORD OF ISSUE
DATE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference.

L'Heureux Page Werner

TD&H
Thomas, Dean & Hoskins, Inc.
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

EAST AREA ELECTRICAL
SITE PLAN

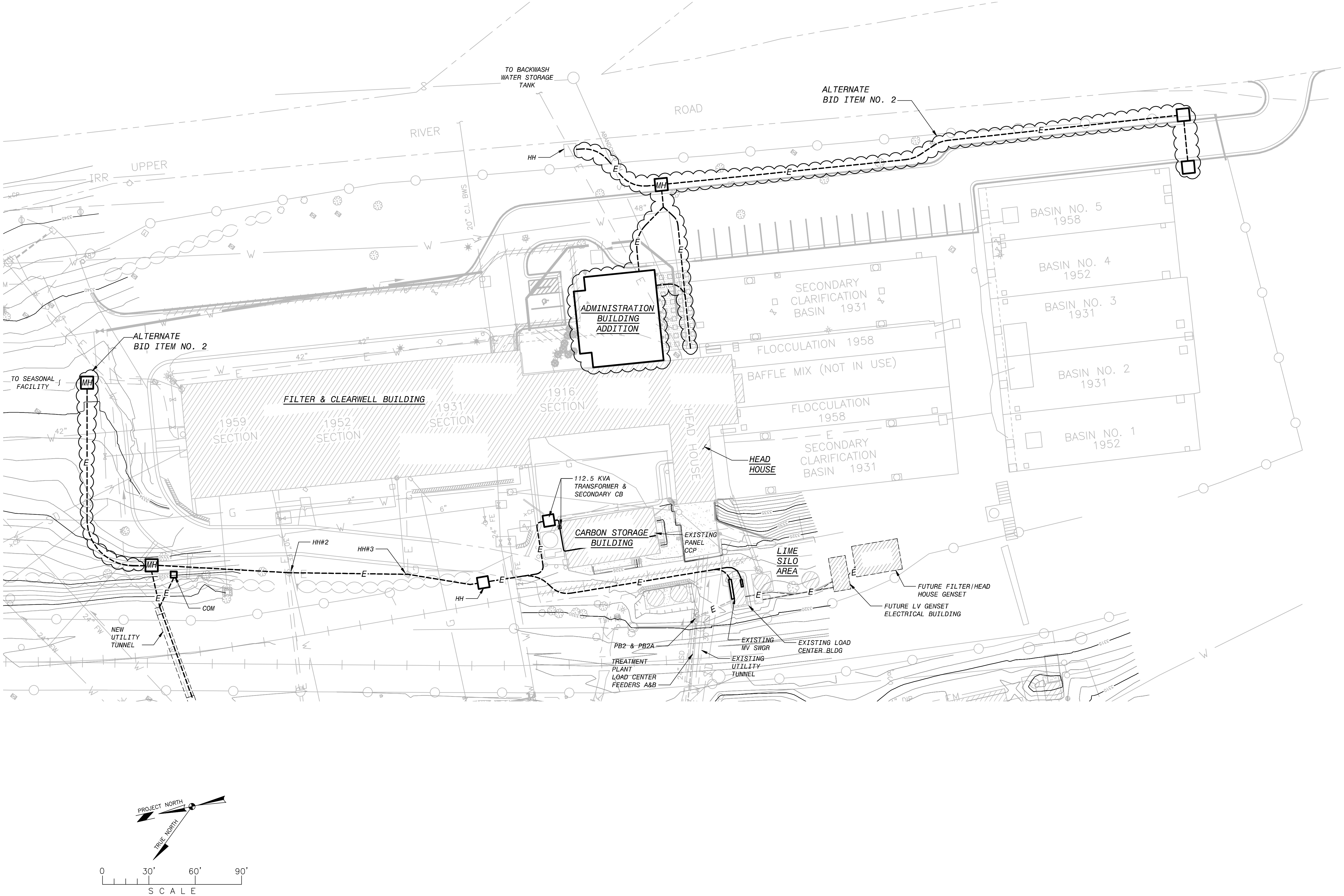
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

GE-3
SHEET
OF

FD7000
D7075



TO BACKWASH WATER STORAGE TANK
ALTERNATE BID ITEM NO. 2
ROAD
RIVER
UPPER
IRR
HH
MH
20" C.I. BWS
48"
ADMINISTRATION BUILDING ADDITION
SECONDARY CLARIFICATION BASIN 1931
FLOCCULATION 1958
BAFFLE MIX (NOT IN USE)
FLOCCULATION 1958
SECONDARY CLARIFICATION BASIN 1931
BASIN NO. 5 1958
BASIN NO. 4 1952
BASIN NO. 3 1931
BASIN NO. 2 1931
BASIN NO. 1 1952
ALTERNATE BID ITEM NO. 2
TO SEASONAL FACILITY
FILTER & CLEARWELL BUILDING
1959 SECTION
1952 SECTION
1931 SECTION
1916 SECTION
HEAD HOUSE
HEAD HOUSE
112.5 KVA TRANSFORMER & SECONDARY CB
CARBON STORAGE BUILDING
EXISTING PANEL CCP
LIME SILO AREA
HH#2
HH#3
COM
NEW UTILITY TUNNEL
FUTURE FILTER/HEAD HOUSE GENSET
FUTURE LV GENSET ELECTRICAL BUILDING
PB2 & PB2A
TREATMENT PLANT LOAD CENTER FEEDERS A&B
EXISTING MV SWGR
EXISTING LOAD CENTER BLDG
EXISTING UTILITY TUNNEL
PROJECT NORTH
TRUE NORTH
0 30' 60' 90'
SCALE

TASK 282C

NO.	DATE	REVISIONS AND RECORD OF ISSUE	BY	CK	APP

XREF1: XREF2: XREF3: XREF4:
SAVED: PLOTTED: USER: DWG VER:

BLACK & VEATCH Building a world of difference.
L'Heureux Page Werner
TD&H Thomas, Dean & Hoskins, Inc. Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT FACILITY UPGRADES-PHASE 1

EAST AREA ELECTRICAL SITE PLAN

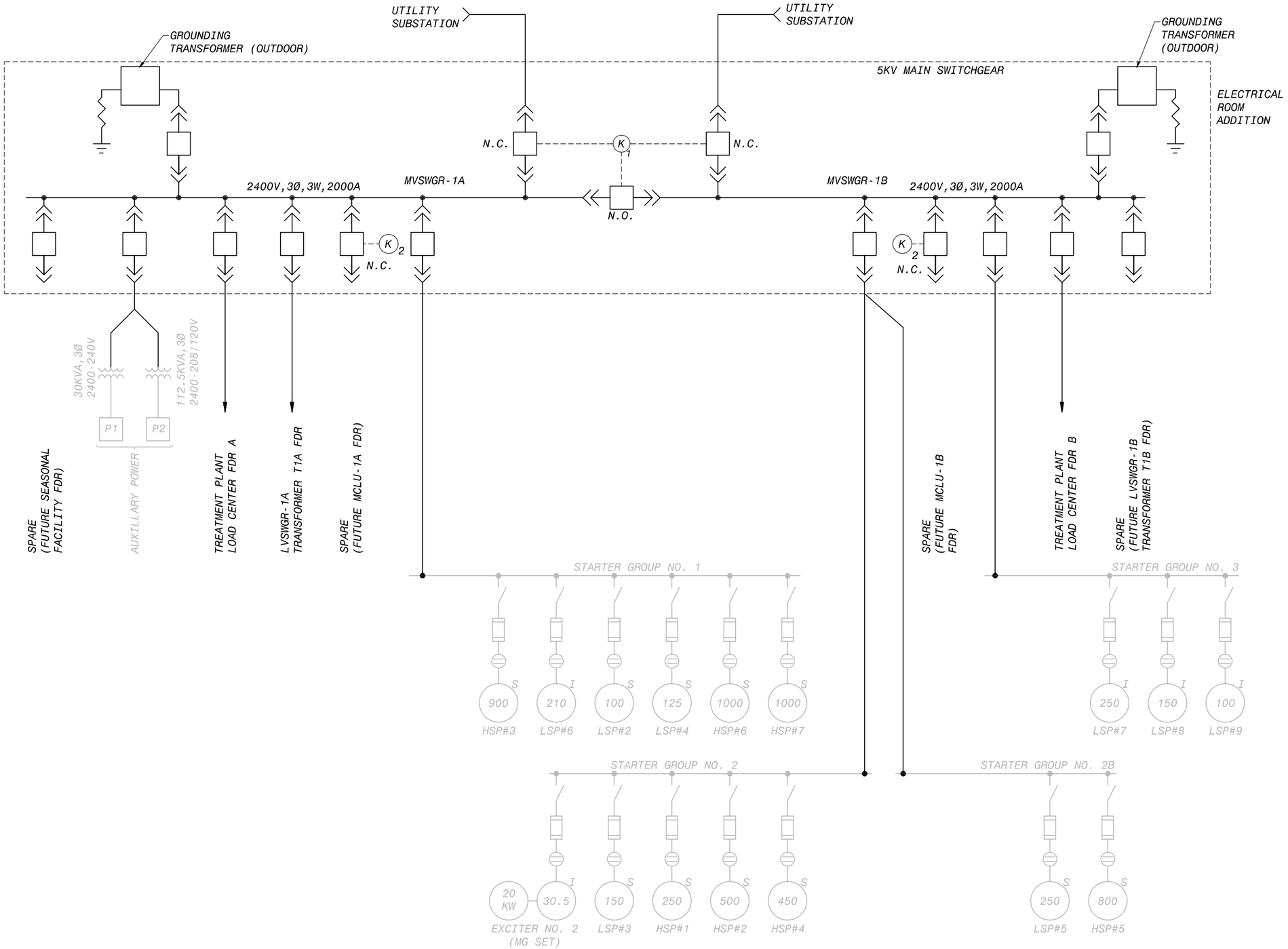
DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO. 177716

GE-3A
SHEET
OF

FD7000
D7075



NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference®

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE1

PARTIAL POWER DISTRIBUTION
FUNCTIONAL DIAGRAM

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

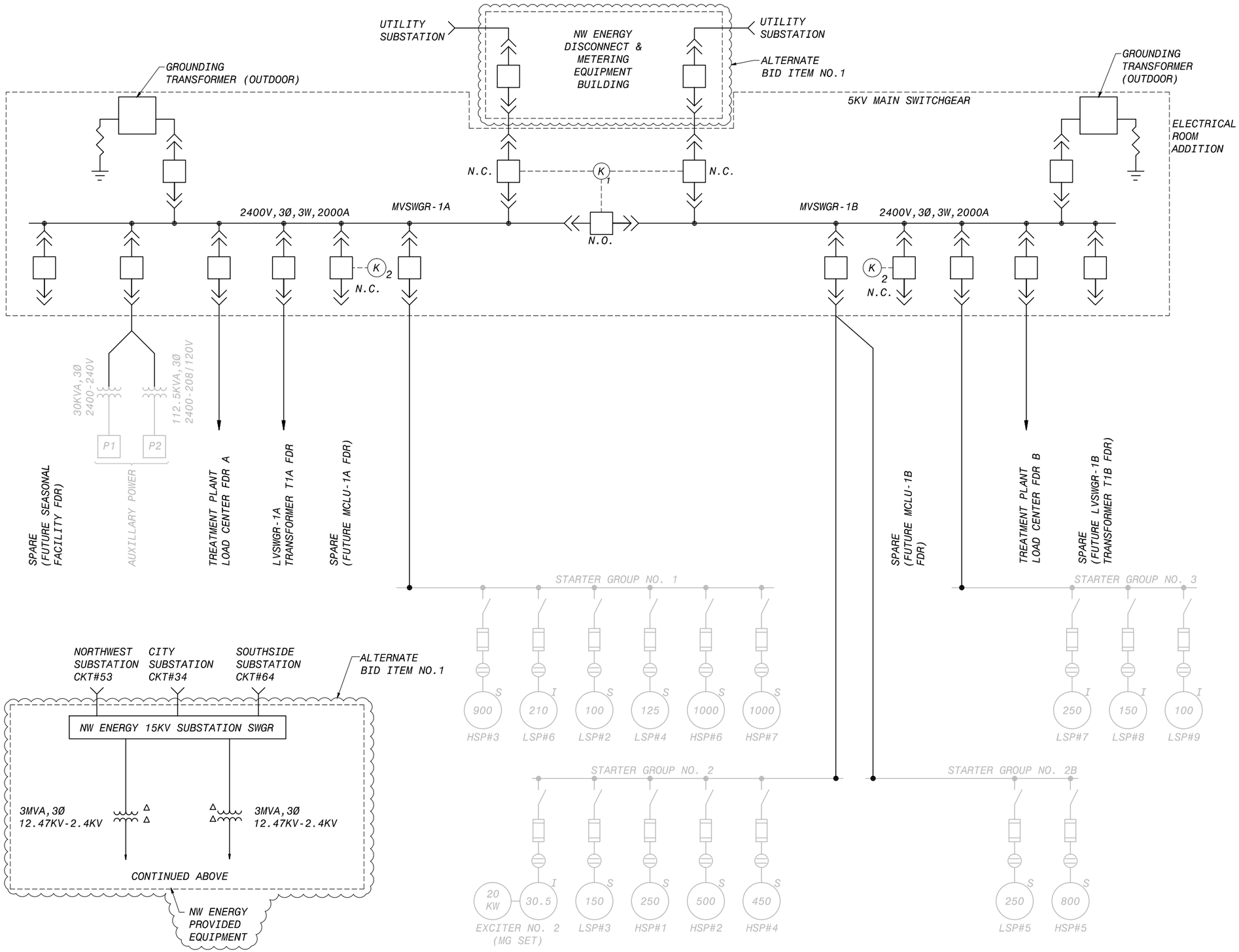
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

GE-4
SHEET
OF

TASK 282C

FD7000
D7075



NO.	BY	CK	APP	REVISIONS AND RECORD OF ISSUE	DATE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference®

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc. TD&H Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

PARTIAL POWER DISTRIBUTION
FUNCTIONAL DIAGRAM
BASE BID + BID ALTERNATE

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

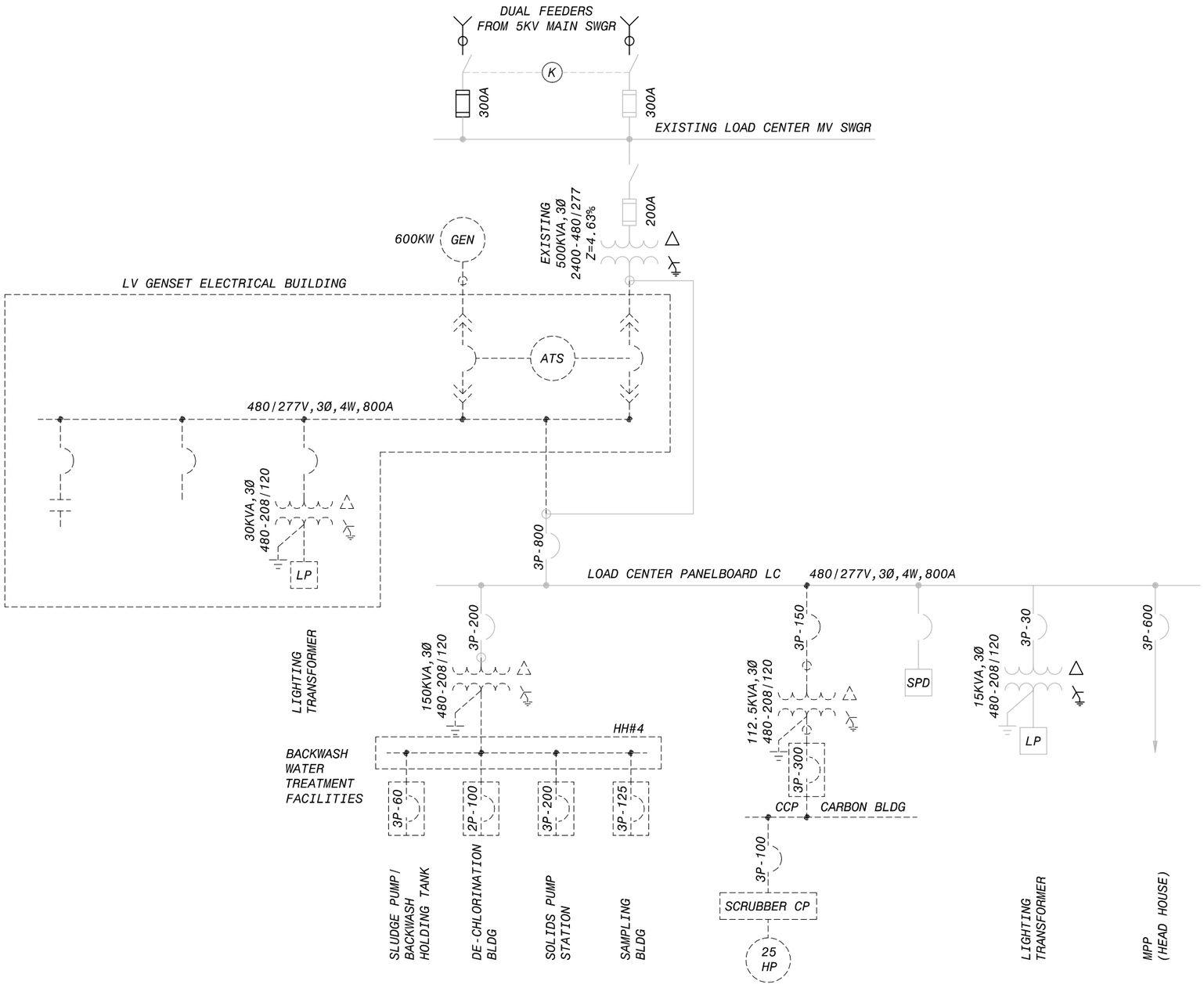
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

GE-5
SHEET
OF

TASK 282C

FD7000
D7075



LOAD CENTER
ONE-LINE DIAGRAM
NO SCALE

TASK 282C

NO.	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

XREF1:
XREF2:
XREF3:
XREF4:
SAVED:
PLOTTED:
USER:
DWG VER:

BLACK & VEATCH
Building a world of difference®

L'Heureux Page Werner

Thomas, Dean & Hoskins, Inc.
TD&H
Engineering Consultants

CITY OF GREAT FALLS, MONTANA
WATER TREATMENT PLANT
FACILITY UPGRADES-PHASE 1

LOAD CENTER BUILDING DISTRIBUTION
ONE-LINE DIAGRAM

DESIGNED: BJB
DETAILED: TSH
CHECKED:
APPROVED:
DATE:

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
177716

GE-6
SHEET
OF

FD7000
D7075