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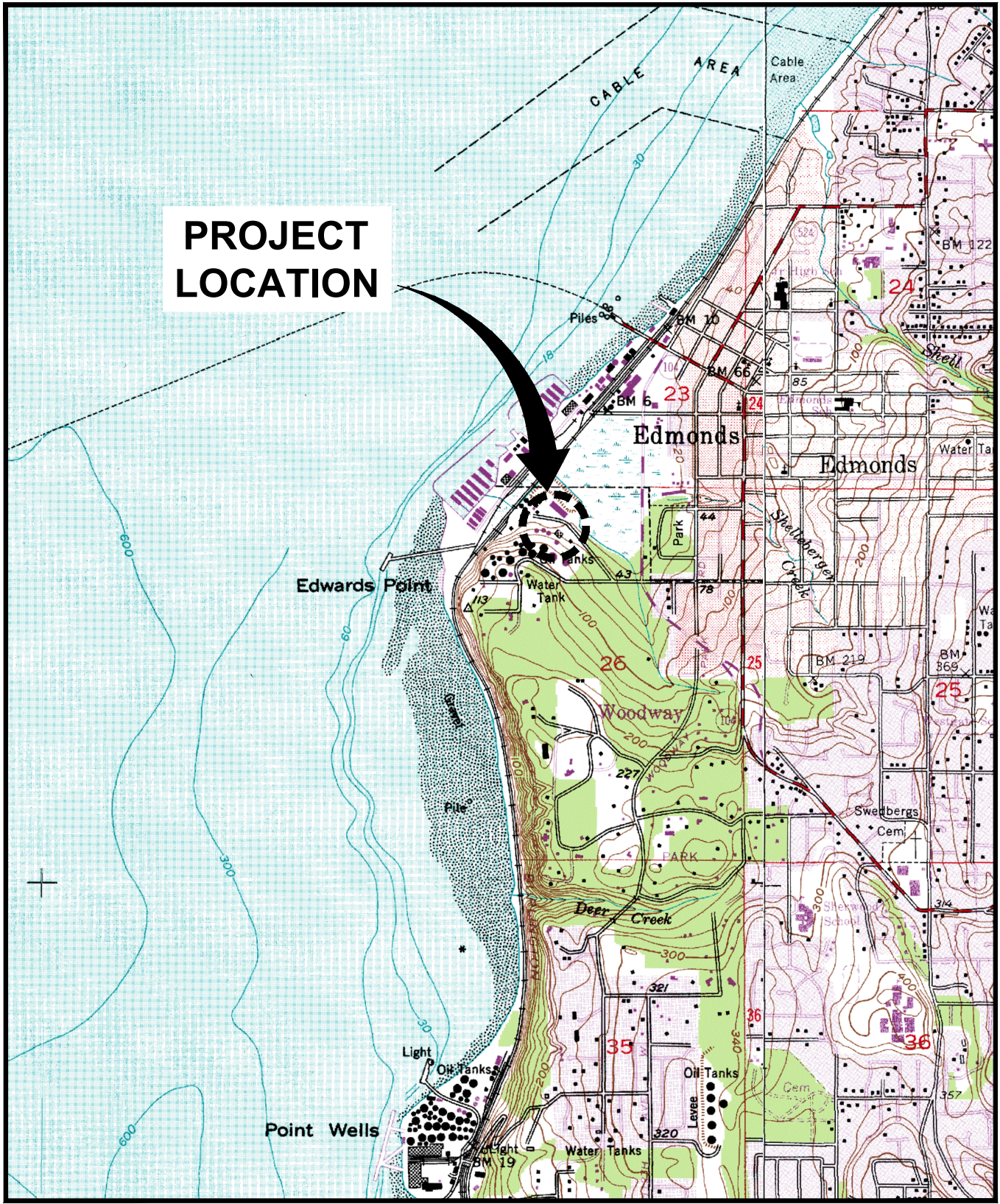
# CONSTRUCTION DRAWINGS FOR

# SYSTEM DESIGN SPECIFICATION

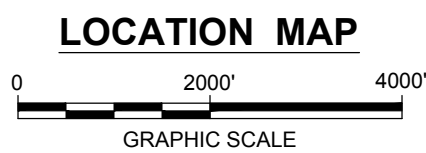
## FORMER UNOCAL BULK FUEL TERMINAL

MARCH 8, 2016

PRELIMINARY



REFERENCE: BASE MAP USGS 7.5 MINUTE QUADRANGLE., (QUADNAME), (ST.), (DATE)



ARCADIS U.S., INC.



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**PROPERTY DATA:**

**PROPERTY ADDRESS:**  
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EDMONDS, WASHINGTON  
**ZONED:**  
MP2

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**1.0 Introduction**

The enclosed drawings and specifications contain information for the construction and installation of a treatment facility. The following drawings depicting the treatment facility are required for construction and installation:

Drawing No.	Revision	Title
G1A	0	Construction Notes and Specifications
G1B	0	Construction Notes and Specifications
G1C	0	Construction Notes and Specifications
G-2	0	Major Equipment and Instrument List
C-1	0	Site Details and Piping Layout
C-2	0	System Building Layout Detail
C-3	0	System Building Layout Detail
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C-5	0	Wellhead Connection Construction Details
C-6	0	Well Construction Details
C-7	0	Manifold Connection Details
C-8	0	System Pad Details
C-9	0	Riprap Design at Detention Basin 1
P-1	0	Process and Instrumentation Diagram

CHEVRON: Chevron Environmental Management Company  
 ENGINEER: **ARCADIS**  
 CONTRACTOR: **ClearCreek Contractors**

**2.0 General Construction Specifications**

- 2.1 The CONTRACTOR shall review the facility design plans, and field verify all dimensions and site conditions before starting work. The ENGINEER shall be notified of any discrepancy.
- 2.2 All materials used for construction of the facility shall be new or documented to be suitable for reuse.
- 2.3 The ENGINEER will request a plan check, if applicable. The ENGINEER shall apply for and obtain all discharge permits for treated water and air, as applicable.
- 2.4 The CONTRACTOR shall obtain and pay for all building permits. The CONTRACTOR shall obtain all necessary inspections, including rough electrical, mechanical, civil, or other applicable inspections, and obtain a final signed off inspection card from the local authority.
- 2.5 The CONTRACTOR shall provide a one year warranty on all CONTRACTOR-provided materials and supplies. The CONTRACTOR shall provide a warranty on workmanship for a period of not less than one year. All defects in CONTRACTOR supplied and installed materials and supplies shall be repaired at CONTRACTOR expense.
- 2.6 In addition to the remediation design plans, the ENGINEER will supply the CONTRACTOR with manufacturer's equipment handling and installation procedures. The CONTRACTOR will install all equipment in accordance with the manufacturers' specifications and instructions.
- 2.7 The ENGINEER will clearly indicate in the remediation design plans the items to be provided by CEMC, the ENGINEER and others. All other items and equipment not clearly indicated as provided by others in the remediation design plans shall be provided by and installed by the CONTRACTOR.
- 2.8 The CONTRACTOR shall be responsible for keeping the site free of excessive debris and waste during construction. The CONTRACTOR is to take the necessary precautions to control dust and stormwater runoff from excavation and construction activities.
- 2.9 The CONTRACTOR shall be responsible for the independent location of all utilities and shall take appropriate measures to protect them from damage. The CONTRACTOR shall formally contact the regional underground utility notification service, such as the Underground Service Alert (USA), One Call, or Blue Stakes, and obtain all necessary Clearances before breaking ground. Should any utilities, including but not limited to, electrical conduits, telephone lines, water lines, sewer, or storm drain lines be damaged during construction, the CONTRACTOR shall be responsible for notifying the affected parties and completing repairs, if applicable. The CONTRACTOR shall be responsible for all repair costs.
- 2.10 CONTRACTOR shall also be responsible for repairing all damage made by the CONTRACTOR to monitoring wells, well seals, manhole boxes, and all above ground structures as the result of accident or neglect.
- 2.11 The CONTRACTOR shall restore all disturbed areas to match the pre-construction conditions and the surrounding area. This includes disturbed lawns, trees, shrubs, plantings, fences, sidewalks, and other structures.
- 2.12 Upon completion of the project, the CONTRACTOR shall assist the ENGINEER in preparing "as-built" drawings. The "as-built" drawings shall show the actual construction details, including final trench and well locations, compound layout, and piping details.
- 2.13 A final inspection will be performed by the ENGINEER and/or a CEMC representative. All items not meeting the specifications and the remediation design plans shall be promptly repaired and/or

replaced by the CONTRACTOR at no expense to CEMC.

- 2.14 The CONTRACTOR shall provide an electrician for a minimum of two days for the startup of the equipment, unless this work can be safely accomplished in less time. The electrician shall be prepared to demonstrate proper motor rotation, proper connections of equipment to circuit breakers, and be available to troubleshoot electrical problems with the system.

**3.0 Trenching and Backfill**

**3.1 General**

- 3.1.1 Trenching and backfill specifications will be developed by the ENGINEER and be presented in the design plans.
- 3.1.2 The trenching and backfill specifications are subject to approval by the local authority during planning and building department permit reviews.
- 3.1.3 All mechanical equipment operation (i.e., backhoe, excavator, or other powered equipment) shall be performed by competent personnel and/or personnel licensed to perform such work. All construction shall be performed by trained personnel operating under a licensed contractor.

**3.2 Pavement Cutting - NA**

- 3.2.1 Existing pavement shall be saw cut to provide a neat vertical face for repaving. When wet cutting, best management practices (BMPs) shall be implemented to prevent cutting water from entering storm drains or migrating from the site.
- 3.2.2 The CONTRACTOR shall make every effort to use existing pavement edges and joints when saw cutting to reduce unnecessary cuts. Pavement removed from trenches or other excavations shall be replaced to match the existing material.
- 3.2.3 Concrete or asphalt trench cuts shall not exceed a nominal width of 36 inches, and shall be not less than 18 inches wide (nominal) unless specified otherwise in the design plans. Trenches shall be cut to the minimum width necessary to accommodate all piping shown in the design plans.

**3.3 Trench Excavation - NA**

- 3.3.1 Trenches shall be excavated to the specified widths and depths specified in the design plans. Any deviation from the trenching plans shall be approved by the ENGINEER before work commences. All deviations shall be documented on the "As-Built drawings.
- 3.3.2 CONTRACTOR shall stop work immediately if product piping or tank field is encountered during excavation. Further excavation shall not be conducted without the approval of CEMC and ENGINEER.
- 3.3.3 All excavation activities shall be in strict accordance with OSHA regulations and all Federal, State, and Local laws and regulations.
- 3.3.4 All excavated soil shall be monitored by the ENGINEER in accordance with local contaminated soil handling regulations and permits. If hydrocarbon impacted soil is detected, the soil shall be stockpiled in an area designated by the ENGINEER. The impacted soil shall be placed on 6 mil plastic sheeting and securely covered using a minimum of 6 mil thick plastic sheeting. Alternatively, impacted soil may be placed in properly labeled DOT-approved 55 gallon steel drums or roll-off bins. The ENGINEER shall be responsible for sampling and chemically analyzing the excavated soil for hydrocarbons for waste profiling. CEMC will be responsible for disposal/treatment of hydrocarbon impacted soil.
- 3.3.5 The CONTRACTOR shall be responsible for loading soil into trucks and off-site disposal or recycling of all hydrocarbon-free soil and construction debris.
- 3.3.6 The CONTRACTOR shall take all necessary precautions to avoid damaging existing underground utilities, piping, and underground structures during excavation activities.
- 3.3.7 The CONTRACTOR shall hand-excavate to expose all existing product, vent, electrical conduit, water, and sewer lines before excavating with mechanical equipment.
- 3.3.8 Once all existing lines have been located, the trenches shall be neatly cut by a backhoe, excavator, bobcat, or other approved method to provide a square cut trench.
- 3.3.9 The CONTRACTOR shall be responsible for the safety and integrity of trenches and trench plates placed over open trenches during working and non-working hours. If trenches must remain open after normal work hours the CONTRACTOR shall implement the following measures:
  - Active traffic areas - open trenches shall be covered by steel trench plates capable of supporting vehicular traffic. Trench plates are to be placed so that there are no gaps between plates. The edges of the plates shall be secured with temporary asphalt patch to minimize displacement by vehicles crossing the plates.
  - Non-traffic areas - open trenches shall be covered by steel trench plates (non-skid plates in frequently used pedestrian areas) or ¾-inch thick plywood.
- 3.3.10 The CONTRACTOR shall take precautions to minimize surface water entering excavations and preventing oversaturation of trenches.

- 3.3.11 When required by local authority, the ENGINEER will implement a Storm Water Pollution Prevention Plan (SWPPP). The CONTRACTOR shall strictly follow the requirements of the SWPPP. If no SWPPP is required, the CONTRACTOR shall implement Best Management Practices to ensure that all storm water runoff from construction debris, excavated soil, or disturbed surfaces will not to enter a storm drain or runoff the site.
- 3.3.12 Excavation shall not interfere with 45-degree zone of influence on any existing foundation or footing. Existing footings or foundations that may be affected by any excavation shall be underpinned adequately or otherwise protected against settlement and shall be protected against lateral movement per applicable building code.

**3.3 Backfill**

- 3.3.1 Trenches shall be backfilled as soon as practical after pressure testing the underground pipe runs, and following any required inspections. Trenches shall not remain open longer than necessary to prevent sidewall caving. If caving is anticipated, the CONTRACTOR shall use a commercial soil sealant/binder or forms to prevent caving. Chemical soil binders/sealants shall be approved by CEMC.  
  
Prior to backfilling, the CONTRACTOR shall confirm that the underground pipe is buried to a minimum depth of 18 inches from the top of the pipe, unless otherwise noted in the design plans and local building codes.  
  
Underground piping shall be bedded in clean sand, or the ENGINEER-approved equivalent, to a minimum depth of 2-inches below the bottom of the piping and 2-inches above the piping. The sand shall be clean, rock-free (100 percent passing No. 4 sieve), and free of silt and clay.

Trench backfill material may consist of Class II aggregate base course, CDF slurry mix, or approved "native" excavated material. Backfill materials shall not contain rubble, vegetation, trash, boulders, or other debris.

- 3.4.5 Native soil may be used as **support material** around above grade pipe with approval of CEMC and the ENGINEER. It is recommended that native soil be tested for geotechnical properties to determine if the material is suitable for backfill.
  - 3.4.6 Backfill material (other than CDF slurry) shall be placed in 8-inch maximum lifts (unless otherwise specified in the design plans), and compacted to 95 percent of the maximum dry density at optimum moisture content (based on Modified Proctor Compaction Test ASTM D1557) or in accordance with the local codes.
  - 3.4.7 Backfill soil shall be compacted to 95 percent of the maximum dry density at optimum moisture content (based on ASTM D1557) or in accordance with the local codes.
  - 3.4.8 Cement sand slurry (controlled density fill [CDF]) may be used as backfill material with the approval of CEMC and the ENGINEER. The CDF shall be 1.5 to 2 sack slurry. No compaction testing is required for CDF.
  - 3.4.9 Class 2 aggregate base shall be placed under new asphalt pavement. The aggregate base thickness should equivalent to the existing aggregate base thickness or six inches whichever is greater.
  - 3.4.10 Prior to paving, the CONTRACTOR shall remove all vegetation, surplus soil, rubble, trash, debris and other materials and provide a flat, unyielding subgrade surface for paving. Saturated, soft or pumping soils shall be removed and replaced with suitable material in accordance these specifications.
  - 3.4.11 The CONTRACTOR shall prepare the sub-grade elevation to match the base of the existing pavement, unless the asphalt restoration design exceeds existing in-place asphalt design.
- 4.0 Piping**
- 4.1 General**
- 4.1.1 The local authority, and building and plumbing codes, along with ASTM specifications, shall be used to design the types of piping and installation methods required for each remediation site.
  - 4.1.2 All piping work shall be installed by trained personnel operating under a state-licensed contractor.
  - 4.1.3 All materials shall be new or documented to be suitable for reuse.
  - 4.1.4 All materials and work shall be in accordance with the pipe manufacturer's specifications, the design plans, and all applicable codes.
  - 4.1.5 All piping and plumbing shall be performed by trained and competent personnel, who meet all of the requirements dictated by the local authorities. In addition, the CONTRACTOR is responsible for ensuring the installation of any equipment or materials which require specific licensing shall be performed under the direction of the individual who holds a current license for such work.
  - 4.1.6 When connecting to existing underground piping, the CONTRACTOR shall first verify the existing piping path. If the existing underground piping is to be used for conveyance, the CONTRACTOR shall also field verify the integrity of the existing pipe prior to connecting to it.
  - 4.1.7 The pipe for vapor lines shall be sloped towards the wellheads at a ratio of 1:100 to avoid accumulation of condensate in the pipes. If a trench depth of greater than 4 feet is needed to achieve a required slope, the CONTRACTOR shall notify the ENGINEER and implement

SCALE(S) AS INDICATED  THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:  USE TO VERIFY FIGURE REPRODUCTION SCALE	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 20%;">No.</td><td style="width: 20%;">Date</td><td style="width: 40%;">Revisions</td><td style="width: 10%;">By</td><td style="width: 10%;">Ckd</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table>	No.	Date	Revisions	By	Ckd						<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td colspan="3">Professional Engineer's Name <b>PETER J. CAMPBELL</b></td></tr> <tr><td colspan="3">Professional Engineer's No. WA 45051</td></tr> <tr><td style="width: 20%;">State WA</td><td style="width: 20%;">Date Signed</td><td style="width: 60%;">Project Mgr.</td></tr> <tr><td>Designed by</td><td>Drawn by</td><td>Checked by</td></tr> </table>	Professional Engineer's Name <b>PETER J. CAMPBELL</b>			Professional Engineer's No. WA 45051			State WA	Date Signed	Project Mgr.	Designed by	Drawn by	Checked by			CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY • FORMER UNOCAL BULK FUEL TERMINAL, EDMONDS, WASHINGTON <b>SYSTEM DESIGN SPECIFICATION</b>  <h2 style="text-align: center;">GENERAL NOTES</h2>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>ARCADIS Project No. B0045362.0006.00012</td></tr> <tr><td>Date MARCH 2016</td></tr> <tr><td>ARCADIS 6723 Towpath Road, Box 66 Syracuse, NY 13214 Tel: 315-446-9120</td></tr> </table>	ARCADIS Project No. B0045362.0006.00012	Date MARCH 2016	ARCADIS 6723 Towpath Road, Box 66 Syracuse, NY 13214 Tel: 315-446-9120	<b>G-1A</b>
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measures to address potential condensate accumulation in the pipe as directed by the ENGINEER.

4.1.8 Where piping is installed above ground, pipe supports and clamps shall be used to support the pipe at appropriate intervals to prevent sag as specified in the piping manufacturer's specifications. When Unistrut supports are used the ends of the supports shall be covered with plastic protective caps.

4.1.5 The CONTRACTOR shall paint all above ground piping as appropriate for UV protection, where required by code and to identify potential hazards (i.e.; overhead piping, potential trip hazard). When painting piping is applicable, the following schedule shall be used: "grey - soil vapor", "blue - treated water", "yellow - gas supply", "air lines - not painted".

4.1.6 The CONTRACTOR shall label all above ground piping with indelible or permanent marking indicating the contents of the pipe (i.e., "groundwater," "vapor," or "treated water", compressed air, gas, electric) and the flow direction.

4.1.7 The CONTRACTOR shall make all wellhead connections as shown in the design plans.

4.1.8 The piping materials shall be specified by the ENGINEER in the design plans. Any conflicts or questions concerning pipe material compatibility, as discovered by the CONTRACTOR, shall be immediately brought to the attention of the ENGINEER.

4.1.9 The use of dissimilar metals and alloys in direct contact with each other is prohibited on all pipe lines containing liquids due to the potential for galvanic corrosion. Where dissimilar metals must be joined, di-electric unions or couplers shall be used.

4.1.10 All underground piping shall be identified using tracer wire and metallic tape placed above the piping at the top of the bedding material above the piping. Tracer wire terminals will be tagged and identified in the equipment compound, at junction boxes, and well boxes.

4.1.11 The CONTRACTOR shall ensure that all foreign materials have been removed from the underground piping following installation and before backfilling.

**4.2 Polyvinyl Chloride (PVC) Pipe Specifications**

4.2.1 All underground PVC process piping shall be Schedule 40 (unless noted otherwise in design drawings). All aboveground PVC process piping shall be Schedule 80 (unless noted otherwise in design drawings or required by applicable codes).

4.2.2 All pipe joints are to be glued using PVC primer and PVC solvent cement. Connections to other type of pipes are to be by flange or male/female adapters specifically designed for a transition from PVC pipe to a specific type of pipe (i.e., galvanized steel, copper).

4.2.3 PVC pipe shall not be used for above ground or underground compressed air service, or for high temperature applications, such as blower discharge piping.

**4.3 Galvanized Pipe Specifications**

4.3.1 Galvanized pipe shall be schedule 40 hot-dip galvanized (HDG) steel per ASTM A53.

4.3.2 Galvanized pipe shall not be used to convey soil vapor. Use of galvanized pipe prior to catalytic oxidizer abatement systems may increase risk of poisoning the catalytic cell material. Oxidizer vendors should be consulted for appropriate piping material use prior to installing the oxidizer.

**4.4 ABS Compressed Air Pipe Specifications - NA**

4.4.1 ABS pipe and fittings shall be Duraplus™ or equivalent and capable of withstanding continuous working pressures greater than 100 psi.

4.4.2 ABS-compressed air fittings shall be the socket type, designed for solvent welding.

- Fittings shall be designed and manufactured to withstand the continuous pressures applicable to the maximum pressure rating of the pipe.
- The solvent cement shall be ABS solvent cement and designed to withstand continuous pressures up to 185 psi at 73° F.

4.4.3 When transitioning from ABS to non-ABS piping material, the CONTRACTOR shall ensure appropriate transition fittings are used.

**4.5 Stainless Steel Pipe Specifications**

4.5.1 Stainless Steel pipe shall consist of Type 304 or 316 for construction unless specified in the design plans or on approval by the ENGINEER.

4.5.2 All connections shall be made using stainless steel flange connections with Buna-N gaskets and NPT threaded connections. Use of stainless steel unions shall not be used.

4.5.3 All threaded connections shall be made using pipe thread sealant tape specifically made for use with stainless steel pipe and should contain nickel.

**4.6 Flexible Hoses/ Tubing**

4.6.1 Flexible hoses and tubing shall be rated for chemical compatibility, and the operating pressures and temperatures at which they will be used.

4.6.2 Connections to fittings and components shall be with hose barbs and clamps, cam-locks with locking clips, or compression fittings. When applicable, the CONTRACTOR shall not use plastic cam-locks.

4.6.3 All air quick connects and safety release valves will be installed per manufacturer specifications and recommendations.

4.6.4 Underground hose shall be placed in PVC conduits and shall have no greater than 360- degrees in total turns between access points or joined in a junction box.

4.6.5 All underground splices and connections shall occur in a junction box or well box. No hose connections are to be located in conduits.

4.6.1 Hose clamps (used in conjunction with hose barb fittings) shall be roll-over, center punch (banded) or T-Bar type clamps. Worm gear hose clamps shall not be used.

**4.7 Pressure Testing**

4.7.1 All process piping shall be pressure tested according to local specifications and witnessed by an ENGINEER or an approved representative. No testing will be conducted through instruments or equipment

4.7.2 All PVC lines used for vacuum will be tested at 5 pounds per square inch (PSI) of pressure and held for an hour. If a pressure drop of more than 1 PSI is observed during the hour, the line will be inspected and repaired as necessary prior to retesting the line.

4.7.3 All PVC lines used for water will be tested at 5 PSI for a period of 60 minutes. If a leak is observed during the testing time or a pressure drop of more than 1 PSI is noted, the line will be inspected and repaired as necessary prior to retesting the line.

4.7.4 All ABS lines used for compressed air will be tested at 100 PSI for a period of 60 minutes. If a pressure drop of more than 1 PSI is observed during the testing time, the line will be inspected and repaired as necessary prior to retesting the line. A curing time (minimum of 24 hours or per the material manufacturer, whichever is the largest), will be followed prior to beginning any testing on the ABS lines. Only threaded fittings to be used on the ABS pipe and transition fittings are to be metal reinforced.

**5.0 Asphalt Pavement NA**

**5.1 General**

5.1.1 Hot mix Asphalt Concrete shall not be used to restore asphalt surfaces affected by construction activities. EXCEPTION: Asphalt cold patch may be used as a temporary surface for small pavement patches (not to exceed 3 feet by 3 feet) during site construction activities. Temporary asphalt patch must be removed prior to or during final site restoration activities.

5.1.2 Asphalt driveways, parking strips, or other areas designed for vehicular and pedestrian traffic shall be restored to match existing grades.

5.1.3 The CONTRACTOR shall assure that the sub-grade has been properly prepared. No asphalt shall be installed on saturated, soft or pumping soil, frozen soil, ice, snow, or standing water.

5.1.4 Finished surfaces shall be smooth with uniform texture and be free of voids, mounds, ridges, depressions, cracks, roller marks, pits, or other irregularities (1/4 inch maximum over 10 feet straight edge). Edges shall be capped over and straight. Restored pavement surfaces not meeting these requirements will be replaced at the CONTRACTOR's expense.

**5.2 Asphalt Concrete Materials**

5.2.1 Asphalt Concrete shall be a high-quality, controlled hot mixture of asphalt and well-graded quality aggregate, and compacted into a uniformly dense mass. The paving materials shall conform to ASTM specification D3515.

5.2.2 A tack coat bonding agent shall be applied between asphalt layers, between layers of concrete or slurry and the asphalt, and between cut edges of existing asphalt to bond to the new asphalt to the old surface. The tack coat material shall meet the specifications in ASTM D977 or D2397 and be grades SS-1, SS-1h, CSS-1, or CSS-1h. The asphalt tack coat shall be a diluted emulsified asphalt mixture of equal parts emulsion and clean water.

5.2.3 The aggregate used for the base course and surface mixture shall be crushed stone, gravel, stone or slag screenings, sand, mineral filler, or a combination of these materials. Uncrushed coarse aggregate may be used in base course mixtures only.

- Coarse and fine aggregate shall conform to ASTM D692 and ASTM D1073.
- Mineral filler shall conform to ASTM D242.
- If approved for use by Chevron, slag shall be blast furnace, air cooled slag that is not less than 70 pounds per cubic foot in mass.

5.2.4 The liquid asphalt used shall conform to ASTM D3381 and D946, and shall be the appropriate grade for the ambient mean annual temperature conditions.

5.3 **Asphalt Concrete Pavement Construction**

5.3.1 Prior to placing new asphalt adjacent to existing pavement, the CONTRACTOR shall saw- cut a clean, straight edge along the existing pavement, and apply tack coat to the vertical cut surface. All saw cut debris shall be removed from the trench prior to laying the new pavement.

5.3.2 The temperature of the asphalt mixture shall not exceed 325oF when discharged from the spreader. Initial compaction shall be performed when the temperature of the mixture is estimated to be less than 250oF. Final compaction shall begin with the asphalt as hot as possible, but not less than 150oF.

5.3.3 The asphalt mixture shall be placed in lifts and compacted to a maximum nominal thickness of 2 inches until the new asphalt surface match the existing surface. The asphalt shall be compacted to a minimum of 96 percent of the reference density.

5.3.4 A tack coat of 0.15 gallon per square yard of diluted emulsified asphalt shall be applied between the base coarse surface and asphalt pavement. All vertical surfaces, which will contact the new asphalt paving, shall be tack coated. The tack coat shall be allowed to cure before asphalt placement, and shall be applied on surfaces that can be covered with an asphalt mixture during the same day.

5.2.1 The asphalt mix shall be compacted immediately after placement. Initial compaction shall be accomplished using a steel wheel tandem roller, steel three-wheeled roller, or vibratory roller. As needed, intermediate rolling with a pneumatic tire roller shall be done immediately behind the initial rolling. In areas too small for the roller compactor, a vibrating plate compactor or hand tamper shall be used to achieve the required compaction. NOTE: The CONTRACTOR shall be responsible for preventing traffic loads on newly asphalted surfaces until it has sufficiently cooled to support traffic.

5.2.2 The CONTRACTOR shall return to the site after one week and apply asphalt joint sealer to all asphalt joints.

**6.0 Portland Cement Concrete Pavement**

**6.1 General**

6.1.1 Finished concrete surfaces shall be true and even with the existing grade (1/4 inch maximum over 10 feet straight edge). The surface grade and finish must match the surrounding area. The finished concrete shall be free of voids, mounds, ridges, depressions, cracks, or other irregularities. Any concrete determined to be substandard shall be removed and replaced at no cost to CEMC or the ENGINEER.

6.1.2 Concrete restoration shall only occur along vertical forms or saw cut walls. When possible, saw cuts shall follow existing joints and the layout existing concrete surface patterns. Newly placed concrete pavement shall be protected from vehicular and pedestrian traffic until it is suitably cured. The CONTRACTOR shall be responsible for replacement of the concrete pavement not meeting design documents and/or specifications.

6.1.3 Concrete shall be thoroughly mixed to assure uniform mixture of components within the mass.

**6.2 Concrete Materials**

6.2.1 Portland Cement shall conform to ASTM C-150 Type II.

6.2.2 Fine and Coarse Aggregates for normal weight concrete shall conform to ASTM C-33 and shall conform to the appropriate ASTM grading requirement. Aggregates shall be clean, hard and uniformly graded sand, crushed rock or gravel, free from loam, clay or organic matter. Sound aggregate shall be used and shall have a maximum diameter of 1.5-inches.

6.2.3 Water shall be potable and free of acids, alkalis, and organic materials.

6.2.4 The concrete mix shall pass a compressive strength test of 2,500 psi after 28 days. In certain localities, 3,000 psi compressive strength concrete is required by seismic code.

6.2.5 The concrete mix shall have a minimum slump of 3-inches and a maximum slump of 4- inches.

6.2.6 The CONTRACTOR shall specify the concrete mix, and provide a copy of the concrete specifications for approval from CEMC and the ENGINEER prior to placement, if requested. The number of bags of cement per yard, compressive strength, volume of water, slump, type and weight of fine and coarse aggregates, and type and amount of admixtures shall be addressed in the specification.

**6.3 Reinforcing Steel**

6.3.1 Transverse reinforcing steel dowels shall be a Number 4 (#4, 1/2 inch diameter) Grade 60 rebar (minimum), spaced no more than 18-inches on center along the entire length the trench. The reinforcing steel dowels shall be embedded at least 4-inches into the existing concrete at mid-height and secured in place using non-shrink epoxy to anchor the steel rebar in place

All concrete reinforcement shall be as follows:

- No. 4 bars and larger
- Welded Wire Fabric (Unless required by local authority or with the approval of the CEMC project manager, welded wire fabric (WWF) or mesh shall not be used to reinforce trenches in traffic areas.

6.3.2 All bars should be clean of rust, grease or other materials likely to impair bond.

SCALE(S) AS INDICATED  THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:	USE TO VERIFY FIGURE REPRODUCTION SCALE	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>No.</th> <th>Date</th> <th>Revisions</th> <th>By</th> <th>Ckd</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>	No.	Date	Revisions	By	Ckd						<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="3">Professional Engineer's Name <b>PETER J. CAMPBELL</b></td> </tr> <tr> <td colspan="3">Professional Engineer's No. WA 45051</td> </tr> <tr> <td>State WA</td> <td>Date Signed</td> <td>Project Mgr.</td> </tr> <tr> <td>Designed by</td> <td>Drawn by</td> <td>Checked by</td> </tr> </table>	Professional Engineer's Name <b>PETER J. CAMPBELL</b>			Professional Engineer's No. WA 45051			State WA	Date Signed	Project Mgr.	Designed by	Drawn by	Checked by			CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY • FORMER UNOCAL BULK FUEL TERMINAL, EDMONDS, WASHINGTON <b>SYSTEM DESIGN SPECIFICATION</b>  <h2 style="margin: 0;">GENERAL NOTES</h2>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>ARCADIS Project No. B0045362.0006.00012</td> </tr> <tr> <td>Date MARCH 2016</td> </tr> <tr> <td>ARCADIS 6723 Towpath Road, Box 66 Syracuse, NY 13214 Tel: 315-446-9120</td> </tr> </table>	ARCADIS Project No. B0045362.0006.00012	Date MARCH 2016	ARCADIS 6723 Towpath Road, Box 66 Syracuse, NY 13214 Tel: 315-446-9120	<b>G-1B</b>
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- 6.3.3 All bends shall be made cold.
- 6.3.4 Splicing of bars shall have a minimum 1'6" lap of 1'-6" in all concrete cases unless dimensioned otherwise on details.
- 6.3.5 All reinforcing bars shall be accurately and securely placed before pouring concrete or applying grout and supported off the ground using steel or plastic cradles.
- 6.3.6 Spacing of bars shall be considered as maximum spacing.
- 6.3.7 Non-shrink epoxy materials shall be a 100 percent solids, high-modulus, non-slag gel.
- 6.3.8 Longitudinal reinforcing steel shall be #4 rebar (unless otherwise specified in the design plans) and securely attached to all transverse reinforcing steel dowels using wire-ties or approved equivalent.
- 6.4 Concrete Joints**
- 6.4.1 Joints shall be provided in paving where they previously existed and shall blend smoothly with those existing joints. As a general rule, joint spacing shall not exceed 15 feet.
- 6.4.2 The CONTRACTOR shall install the same type of joint as those in existing slab.
- 6.4.3 Joints shall be provided along property lines, where entry ramps cross and at changes in grade or slope
- 6.4.4 Saw cut control joints shall be cut 4 to 12 hours after concrete is poured, otherwise use tooled or preformed joint inserts.
- 6.4.5 The CONTRACTOR shall use Aqua Crete® or equivalent sealant to seal the concrete joints. Joint surfaces shall be thoroughly cleaned prior to applying joint compound.
- 6.5 Concrete Placement**
- 6.5.1 The CONTRACTOR shall assure that the sub-grade has been properly prepared. No concrete shall be poured on soft, saturated or pumping soil, frozen soil, ice, snow, or standing water.
- 6.5.2 Concrete shall be poured in accordance with commonly accepted industry practices.
- The CONTRACTOR shall prevent overworking and aggregate segregation.
  - The concrete shall be adequately tamped or vibrated to prevent voids or honeycombing.
  - Area between joints shall be cast as one continuous pour.
  - Concrete curbs shall be monolithically poured with the adjacent concrete paving, unless prior approval from the ENGINEER is obtained.
  - The maximum allowable travel time to the site in hot weather will be 1 hour and 15 minutes and cold weather will be 2 hours.
- 6.6 Concrete Finishing**
- 6.6.1 The CONTRACTOR shall finish the concrete in accordance with standard industry practices.
- After all the bleed water has disappeared; the CONTRACTOR shall float the flat surface by hand using a trowel.
  - After floating, a soft concrete finish broom shall be used to finish the surface to match the existing concrete finish.
- 6.6.2 Dry cement shall not be used to remove excess water from the surface. Finish work must be delayed until the water sheen has disappeared.
- 6.6.3 Water shall not be added to ease the finishing.
- 6.6.4 Care shall be used to not overwork the surface.
- 6.6.5 Construction/control joints and edges shall be hand-tooled to a ¼-inch radius.
- 7.0 Electrical**
- 7.1 General**
- 7.1.1 The local authority and building codes, including the national electric code (NEC), are used to dictate the specific type of electrical enclosures and raceways that are required for use in specific hazardous and non-hazardous locations.
- 7.1.2 All work will be performed in accordance with the NEC. Local codes will govern, but any differences should be pointed out to the local authority. All work shall conform to the regulations and specifications of the local power company providing the service.
- 7.1.3 Electrical work shall only be conducted by an electrical CONTRACTOR who is licensed in the state where the work is to be performed.

- 7.2 Electrical Service**
- 7.2.1 The CONTRACTOR shall install a weather-tight main electrical breaker/disconnect panel located outside the equipment enclosure as shown on the site plans. The main panel shall have a lockable disconnect/shut-off switch. The CONTRACTOR shall install the power as required by the ENGINEER.
- 7.2.2 All service equipment shall be enclosed in a water-tight National Electrical Manufacturers Association [NEMA] enclosure, if exposed to the elements.
- 7.2.3 The power meter is typically supplied and installed by the local power utility company.
- 7.2.4 If three-phase power is required and only single-phase power is available, a phase converter shall be used for those components requiring such service. The equipment vendor shall ensure that all electrical motors and controls are rated for converter use, and can withstand the additional heat buildup caused by phase converter use.
- 7.3 Electrical Service Disconnects**
- 7.3.1 The CONTRACTOR shall install all service disconnect switches necessary to safely shutdown and lockout the equipment.
- 7.3.2 At a minimum, the switches shall be contained in a water-tight NEMA 4 panel.
- 7.3.3 The CONTRACTOR shall install an emergency stop switch on the exterior of the compound.
- 7.4 Electrical Above Ground Conduits and Enclosures**
- 7.4.1 The CONTRACTOR shall install threaded rigid galvanized metal conduit in all aboveground installations, unless otherwise specified by the ENGINEER.
- 7.4.2 Threaded joints shall be installed per local code with at least five threads fully engaged.
- 7.4.3 All couplings, unions, junction boxes, device boxes, and conduit bodies shall have tight joints.
- 7.4.4 In unclassified areas, liquid-tight flexible nonmetallic tubing may be used to make connections to motors and other electrical equipment. The maximum length shall not exceed 18 inches.
- 7.5.5 Wire nuts or twist-lock terminations shall not be used for ground, motor, or power connections.
- 7.7 Electrical Grounding**
- 7.7.1 The conduit system and neutral conductors shall be grounded in accordance with local code. Ground testing shall be documented and submitted to the ENGINEER.
- 8.0 Construction Details**
- 8.1 Equipment Enclosure**
- 8.1.1 Install fencing and equipment enclosure as shown on the design plans
- 8.1.2 Slats for chain link fence shall match existing building color scheme or colored as determined by the local building department.
- 8.1.3 Fence post footings shall be concrete, minimum 1-foot diameter and 3-feet deep unless otherwise specified in the applicable permit conditions or design plans.
- 8.1.4 CONTRACTOR shall install the following signage on all sides of the remediation equipment room and the inside door of the remediation equipment room:
- Danger High Voltage
  - No Smoking
  - 24-hour contact numbers
  - Others as per local code
- 9.0 Construction Schedule**
- 9.1 The CONTRACTOR shall confirm a construction schedule with the ENGINEER least one week (5 business days) prior to any work at the site.
- 9.2 The proposed construction schedule shall be presented in a time line format showing estimated start date, duration and completion times for each activity. Any deviation from the originally proposed schedule must be communicated to the ENGINEER within 24- hours.
- 9.3 The CONTRACTOR shall make proper and timely notification of all work and inspections to regulatory or governing agencies as required by building and other construction permits.
- 10.0 CONTRACTOR Safety Requirements**
- 10.1 The CONTRACTOR is responsible for the safety of his personnel and subcontractor personnel. The CONTRACTOR shall conform with the ENGINEER's and CEMC's Behavior Based Safety Program requirements. At a minimum the CONTRACTOR shall:

- Develop and have available site specific Health and Safety Plan (HASP) and Journey Management Plan (JMP) which conforms to the ENGINEER's and CEMC standards.
  - Develop and have available on site Job Loss Analysis (JLA) forms outlining the tasks to be performed, the job steps, the hazards, and the mitigating procedures to minimize risk and maximize safety.
  - Complete the CEMC Permit-to-Work processes and procedures.
  - Conduct and document a tailgate safety meeting each morning and afternoon when site work is to be performed.
  - Ensure compliance with all Federal and State Occupational Safety and Health Administration (OSHA) and local safety regulations.
  - Meet requirements of CEMC's Short Service Employee (SSE) Process.
  - Ensure the appropriate personnel have received Defensive Driving training.
- 10.2 Work hours shall be during daylight hours only, unless approved by the CEMC and ENGINEER prior to the work being performed. Weekend work will not be allowed, unless approved by CEMC and ENGINEER prior to the work being performed. Work hours may be dictated by the local planning department or the building permit.
- 10.1 The CONTRACTOR shall have sufficient quantities and quality of hard hats, goggles, safety glasses, reflective vests, and gloves on site to outfit all CONTRACTOR workers, and provide for a secure work area.
- 10.2 The CONTRACTOR shall secure all work areas with barricades, snow fence, or temporary chain link fence to protect the work area from intrusion by unauthorized vehicles or pedestrians. When conditions warrant, the CONTRACTOR shall provide traffic flaggers in addition to barricades to control ingress and egress from the work area. A traffic control plan shall be included in the CONTRACTOR HASP.
- 10.3 A pre-construction safety meeting shall be held at the site within two weeks prior to the anticipated start of construction. The pre-construction safety meeting shall be attended by CEMC, the ENGINEER, the CONTRACTOR, and other interested parties.
- If the site is an active business, the site owner/manager must be present to discuss impacts to the facility activities.
  - The basis for the JMP is to be discussed during the meeting. Ingress and egress for equipment and deliveries, exclusion zones, impacts on vehicle and pedestrian traffic, and emergency response are to be discussed and documented during the meeting.
- 10.4 The CONTRACTOR shall have access to at least one 20-pound dry chemical type-ABC fire extinguisher at the site, with current inspection tags, during all construction activities.
- 10.5 The CONTRACTOR shall contain loose debris and store construction materials on a daily basis make sure that the work area is clean and orderly prior to departure from the site.
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**Soil Vapor Extraction**

Item	Equipment Description	Quantity	Detail No.	Drawing	Equipment ID
1	140 gallons Vapor Liquid Separator Newterra model VLW-140	1		P-1	A-1
2	Moyno model 34401 progressive cavity transfer pump with a 1 HP 208-230/460V/3P motor (12 gpm @ 25 psi)	1		P-1	
3	Busch model MM 1502 AV rotary claw vacuum pumps, each with a 20 HP 208-230/460V/3P	3		P-1	B-1
4	Integral discharge silencer	3		P-1	
5	Integral vacuum relief valve	3		P-1	
6	Solberg inlet filter/silencer	2		P-1	
7	4" Oxidizer dilution assembly (controlled by oxidizer) includes vacuum transmitter and Solberg filter/silencer	1			
8	Rosemount model 3051SMV mass flow transmitter with Rosemount 485 Annubar primary flow element includes high vacuum alarm setpoint	1			
9	Intellishare Model ECO300 Flameless Electric Catalytic Oxidizer	1		P-1	S-1

**Groundwater Extraction Pumps**

Item	Equipment Description	Quantity	Detail No.	Drawing	Equipment ID
10	Grundfos model SPE electric submersible well pumps, each with 1/2 HP 230V/1P motor, 12 gpm at depth of 50 feet	12		C-1, P-1	P-1 through P-10
11	Grundfos VFD	12	1	C-5	
12	High level alarm switch	12		C-5	

**Groundwater Treatment**

Item	Equipment Description	Quantity	Detail No.	Drawing	Equipment ID
13	110 GPM oil water separator, newterra model OWS-18 with 70 gallon effluent water chamber	1		P-1	T-1
14	Goulds NPE model 2ST centrifugal transfer pump with a 3 HP 208-230/460V/3P motor, 110 GPM at 60' TDH	1		P-1	TP-1
15	Pentair model L88302NAC10 number two size bag filter housings in parallel	2		P-1	
16	QED model EZ Tray 12.4SS stainless steel air stripper	1		P-1	AS-1
17	New York Blower with a 5 HP 208-230/460/3P motor	1		P-1	B-2
18	Goulds NPE model 2ST centrifugal transfer pump with a 3 HP 208-230/460V/3P motor:	1		P-1	TP-3
19	Liquid Phase Carbon Filtration Units, newterra model HPLPC3000 contactor vessels	2		P-1	G-1, G-2

**System Enclosure**

Item	Equipment Description	Quantity	Detail No.	Drawing	Equipment ID
20	8' x 40' used high cube modified shipping container that will serve as process room, with double access doors to connect to additional shipping container	1		C-2	
21	8' x 40' used high cube modified shipping container divided into two rooms - control room and process room, with double access doors to connect to additional shipping container	1		C-2	
22	Ventilation fan with thermostat and sound attenuating hood				
23	Heater with thermostat				
24	Passive vent louvers with sound attenuating hood				
25	Sump with high level alarm switch				
26	Emergency stop switch				
27	LEL transmitter (with calibration kit)				
28	Fire extinguisher				
29	First aid kit				
30	Eye wash bottles				

**Control System**

Item	Equipment Description	Quantity	Detail No.	Drawing	Equipment ID
31	NEMA 1 lockable panel enclosure	1		C-2	
32	NEMA 3R Fused main disconnect	1			
33	Allan Bradley MicroLogix 1400	1			
34	Programmable 6" user display/touch screen	1			
35	Duplex 15 Amp GFI receptacle	1			
36	HOA switches (contained within touchscreen)				
37	Red alarm indicator light	1			
38	newterra Site Link Basic Wireless Service	1			

Status	Well	Total Depth (ft bgs)	Casing Diameter (inches)	Screen Interval (ft bgs)	Sump (ft bgs)
Installed	DPE-1	30	4	5 - 25	25 - 30
Installed	DPE-2	30	4	5 - 25	25 - 30
Installed	DPE-3	22	4	5 - 18	18 - 22
Installed	DPE-4	23	4	4 - 18	18 - 23
Proposed	DPE-5	24	4	4 - 19	19 - 24
Proposed	DPE-6	24	4	4 - 19	19 - 24
Proposed	DPE-7	24	4	4 - 19	19 - 24
Proposed	DPE-8	24	4	4 - 19	19 - 24
Proposed	DPE-9	24	4	4 - 19	19 - 24
Proposed	DPE-10	24	4	4 - 19	19 - 24
Proposed	DPE-11	24	4	4 - 19	19 - 24
Proposed	DPE-12	24	4	4 - 19	19 - 24
Proposed	DPE-13	24	4	4 - 19	19 - 24
Proposed	DPE-14	24	4	4 - 19	19 - 24

**NOTES:**

FT BGS = feet below ground surface

THE CONSTRUCTION OF PROPOSED WELLS MAY VARY BASED ON SITE CONDITIONS.

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Professional Engineer's Name  
**PETER J. CAMPBELL**

Professional Engineer's No.  
WA 45051

State: WA Date Signed: Project Mgr:

Designed by: Drawn by: Checked by:



CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY • FORMER UNOCAL BULK FUEL TERMINAL, EDMONDS, WASHINGTON

SYSTEM DESIGN SPECIFICATION

**MAJOR EQUIPMENT AND INSTRUMENTATION LIST**

ARCADIS Project No.  
B0045362.0006.00012

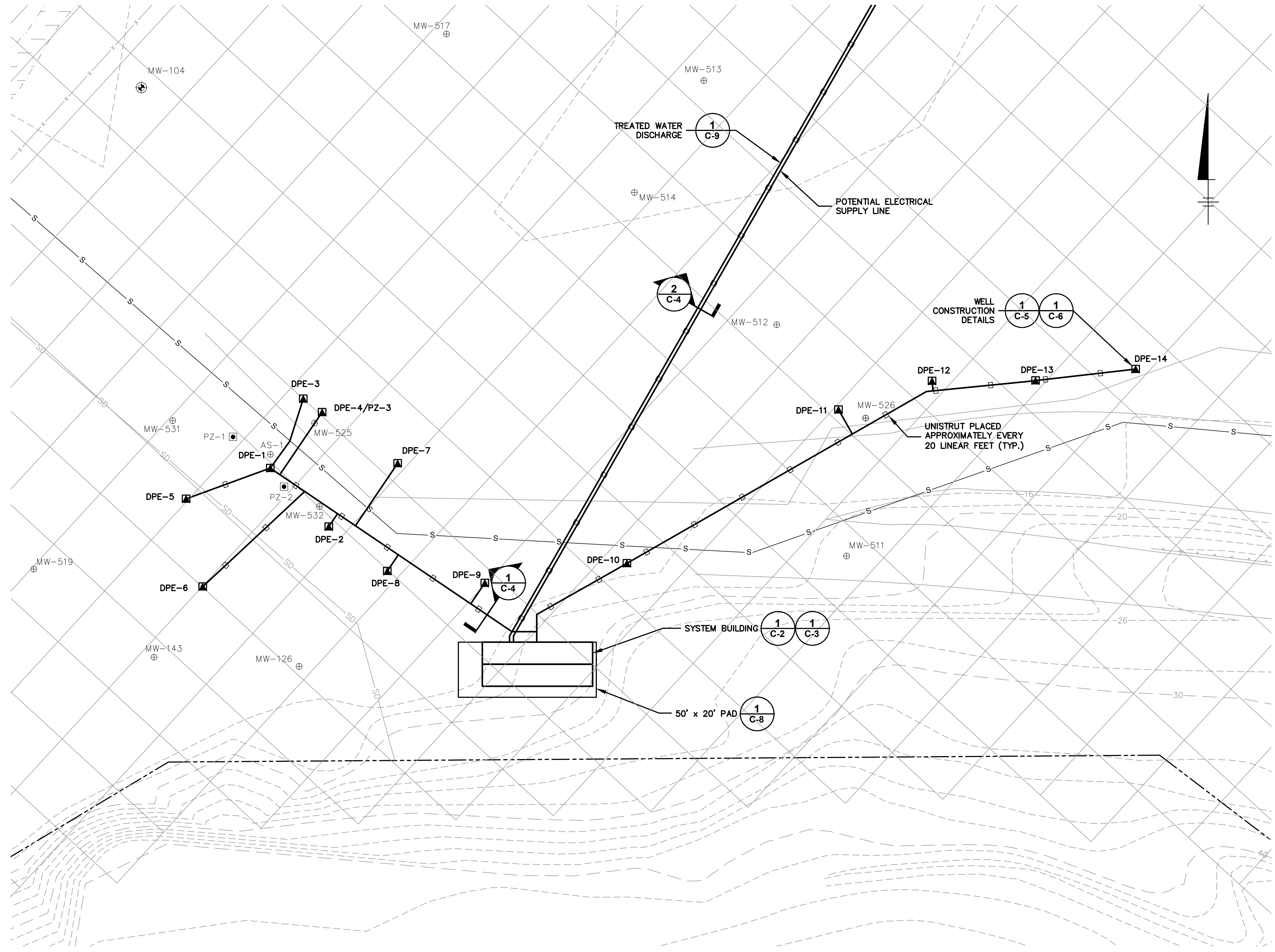
Date  
MARCH 2016

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6723 Towpath Road, Box 66  
Syracuse, NY 13214  
Tel: 315-446-9120

**G-2**

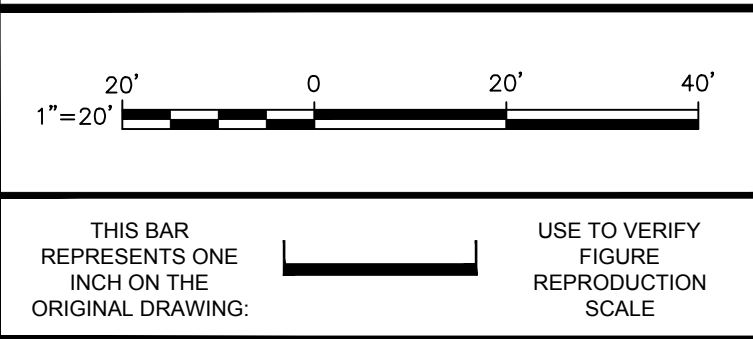
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- LEGEND:**
- PROPOSED ABOVE GRADE PIPE OR CONDUIT
  - PROPOSED UNISTRUT LOCATIONS
  - DPE-10 ■ PROPOSED DUAL PHASE EXTRACTION (DPE) WELL LOCATION
  - MW-203 ⊕ INTERIOR MONITORING WELL LOCATION AND DESIGNATION
  - MW-108 ⊕ PERIMETER MONITORING WELL LOCATION
  - - - - - PROPERTY BOUNDARY
  - S WSDOT STORMWATER LINE
  - SD POINT EDWARDS STORM DRAIN LINE

- NOTES:**
1. BUILDING AND ROAD INFORMATION DIGITIZED FROM GOOGLE EARTH AERIAL PHOTO. TOPOGRAPHIC CONTOURS WERE OBTAINED FROM AN UNKNOWN SOURCE. ALL LOCATIONS ARE APPROXIMATE AND SHALL BE VERIFIED IN THE FIELD BY CONTRACTOR PRIOR TO CONSTRUCTION.
  2. HORIZONTAL DATUM: WASHINGTON STATE COORDINATE SYSTEM NORTH ZONE (NAD 83/98). VERTICAL DATUM: N.A.V.D. 88. UNITS: U.S. SURVEY FEET. HORIZONTAL AND VERTICAL CONTROL ESTABLISHED BY GPS VIA VERTICAL REFERENCE STATION NETWORK (VRSN).
  3. SOUTHEAST PORTION OF WSDOT STORMWATER LINE HAS NOT BEEN SURVEYED.
  4. LOCATION OF EXISTING POWER SUPPLY PANEL HAS NOT BEEN SURVEYED.



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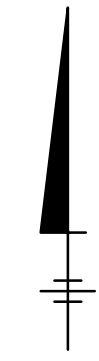
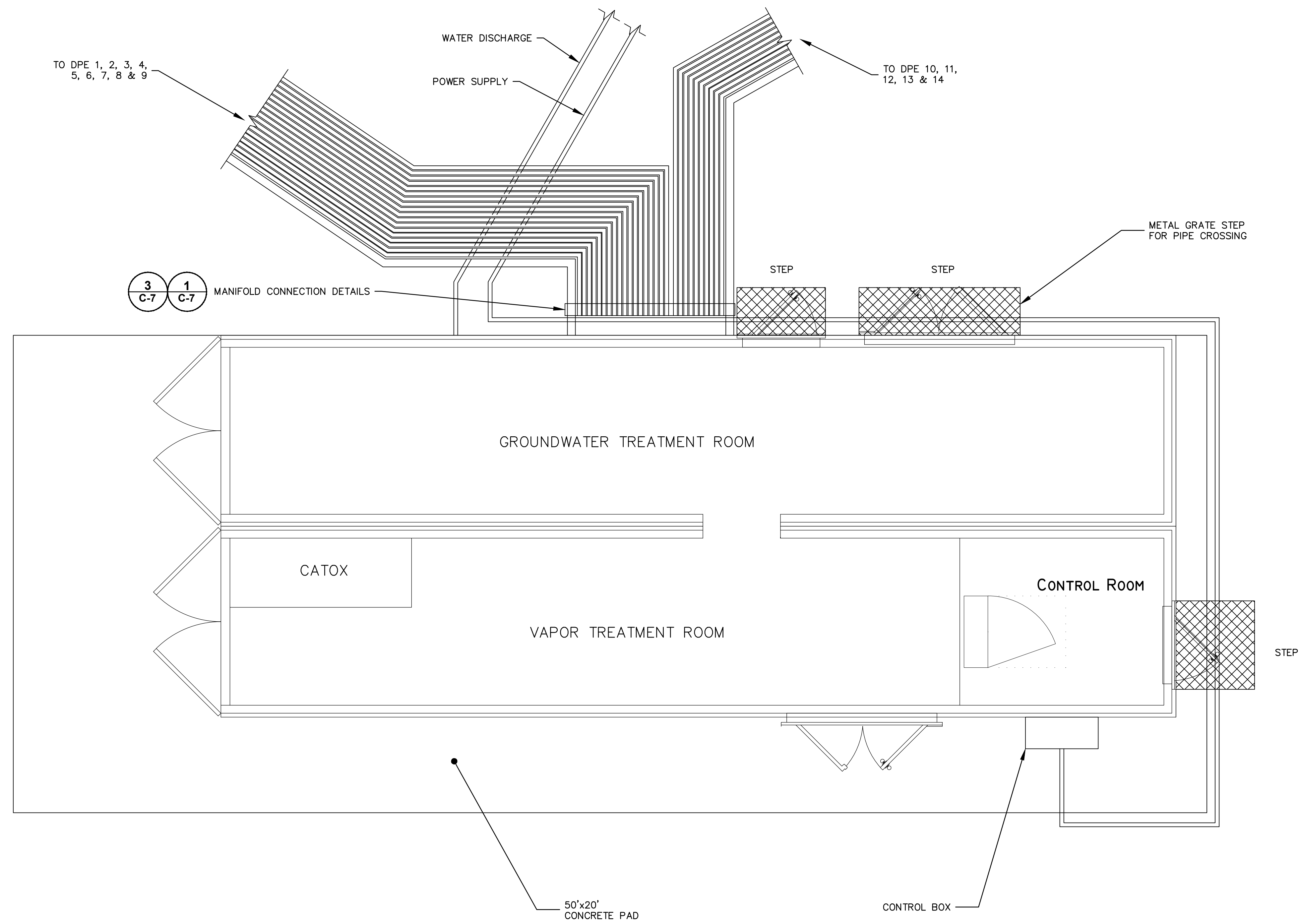


CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY • FORMER UNOCAL BULK FUEL TERMINAL, EDMONDS, WASHINGTON  
 SYSTEM DESIGN SPECIFICATION  
**DPE SYSTEM PIPING LAYOUT**

ARCADIS Project No.  
 B0045362.0006.00012  
 Date  
 MARCH 2016  
 ARCADIS  
 6723 Towpath Road, Box 66  
 Syracuse, NY 13214  
 Tel: 315-446-9120

**C-1**

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**SYSTEM LAYOUT** ①

0 2' 5'

SCALE: 3/8"=1'-0"

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 WA . . . . .  
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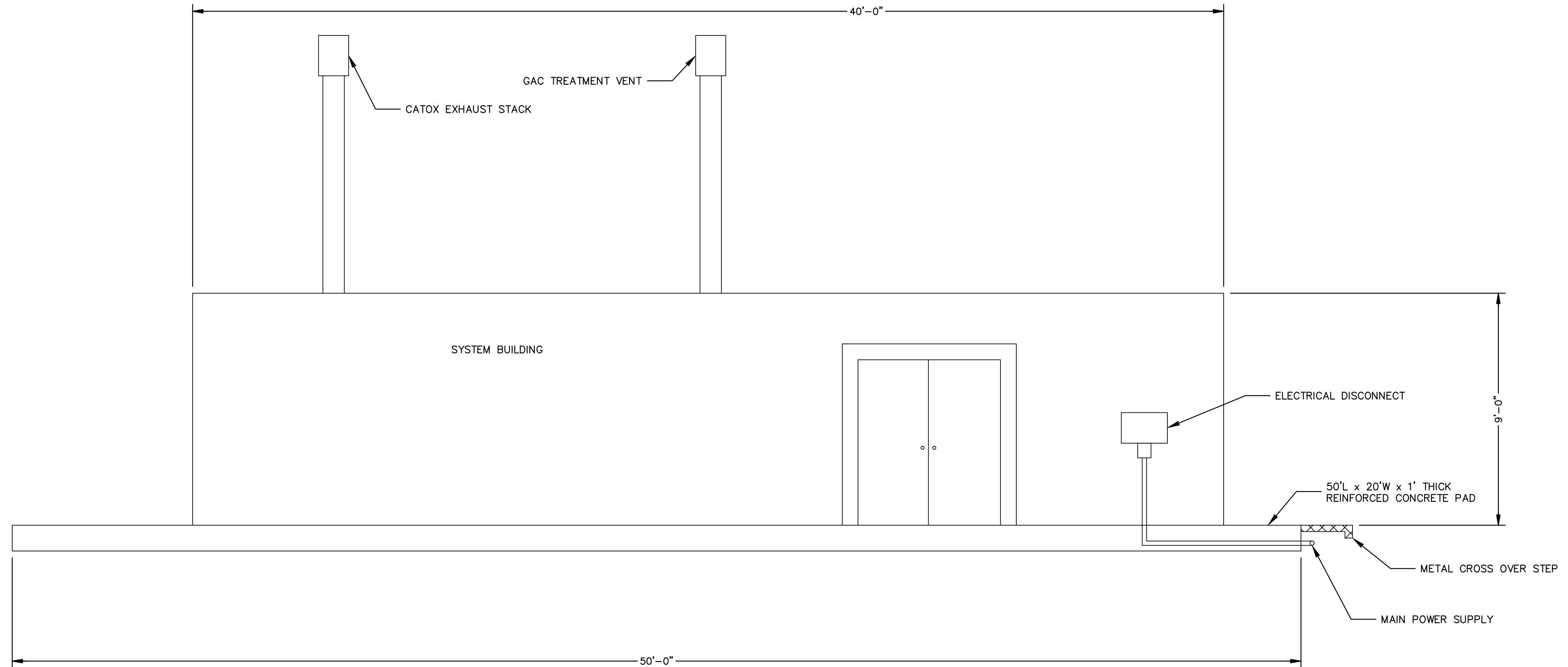
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY • FORMER UNOCAL BULK FUEL TERMINAL, EDMONDS, WASHINGTON

SYSTEM DESIGN SPECIFICATION

**SYSTEM BUILDING LAYOUT DETAIL**

ARCADIS Project No.  
 B0045362.0006.00012  
 Date  
 MARCH 2016  
 ARCADIS  
 6723 Towpath Road, Box 66  
 Syracuse, NY 13214  
 Tel: 315-446-9120

CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DB: R. OBERLANDER LD: R. OBERLANDER PIC: P. CAMPBELL PW: TM: A. PATEL LYN: ON=OFF=REF\*  
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 XREFS: 45362X00 IMAGES: PETER\_CAMPBELL.dwg PROJECTNAME: PRELIMINARY TREATMENT FACILITY LAYOUT C-3 PLOTTED: 3/8/2016 8:24 AM BY: OBERLANDER, ROSEANNE



ELEVATION  
**TREATMENT FACILITY LAYOUT 1**  
 SCALE: 3/8"=1'-0"

SCALE(S) AS INDICATED

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Professional Engineer's Name <b>PETER J. CAMPBELL</b>		
Professional Engineer's No. WA 45051		
State WA	Date Signed	Project Mgr.
Designed by	Drawn by	Checked by



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SYSTEM DESIGN SPECIFICATION

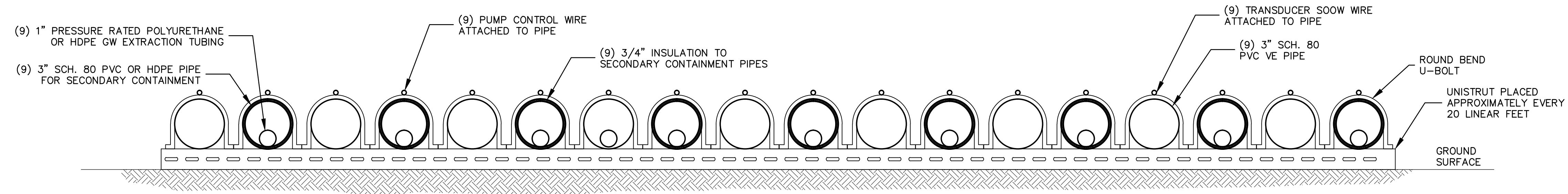
**SYSTEM BUILDING LAYOUT DETAIL**

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Date MARCH 2016
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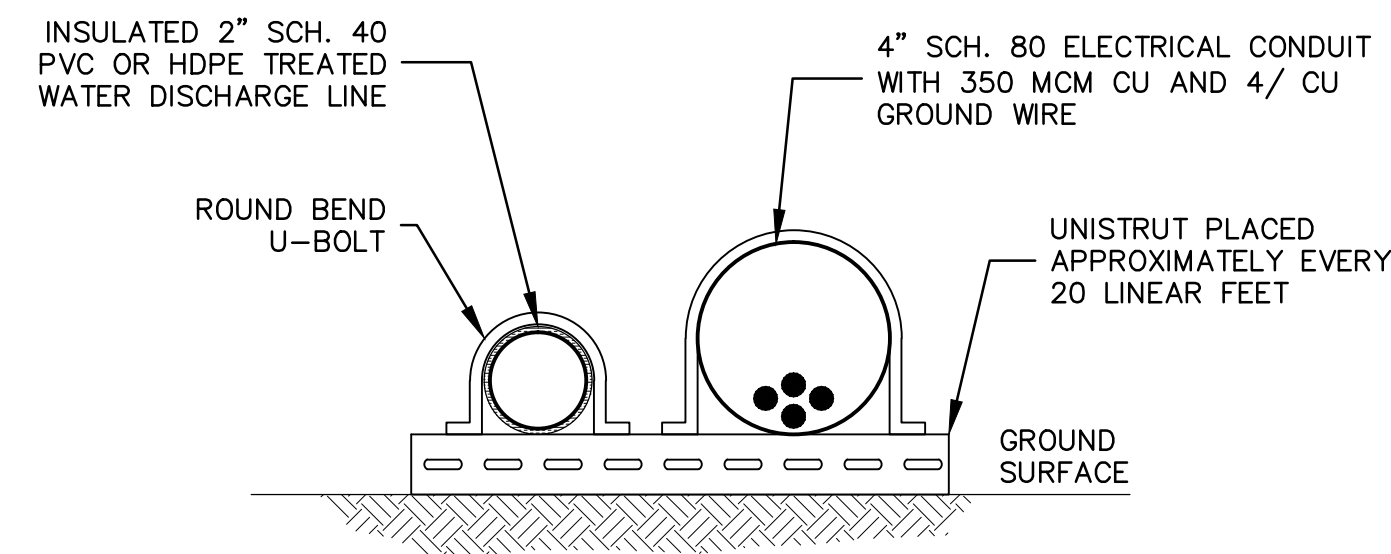
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 45362X00



**PIPING CROSS-SECTION 1**  
 SCALE: 3"=1'-0"



**PIPING CROSS-SECTION 2**  
 SCALE: 3"=1'-0"

NOTES:

- GROUNDWATER CONVEYANCE SECONDARY CONTAINMENT LINE INSULATED WITH 3/4 INCH CLOSED CELL FOAM JACKETED INSULATION.
- PIPE WILL BE EITHER SCH. 80 PVC OR SDR 11 HDPE DEPENDING ON PRODUCT AVAILABILITY.

DEFINITIONS:

- PVC POLYVINYL CHLORIDE
- SCH SCHEDULE
- inHg INCHES OF MERCURY
- SOOW WIRE SERVICE COLD, OIL RESISTANT JACKET, OIL RESISTANT INSULATION AND WEATHER/WATER RESISTANT

SCALE(S) AS INDICATED	
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Professional Engineer's Name <b>PETER J. CAMPBELL</b>			
Professional Engineer's No. WA 45051			
State	Date Signed	Project Mgr.	
WA			
Designed by	Drawn by	Checked by	



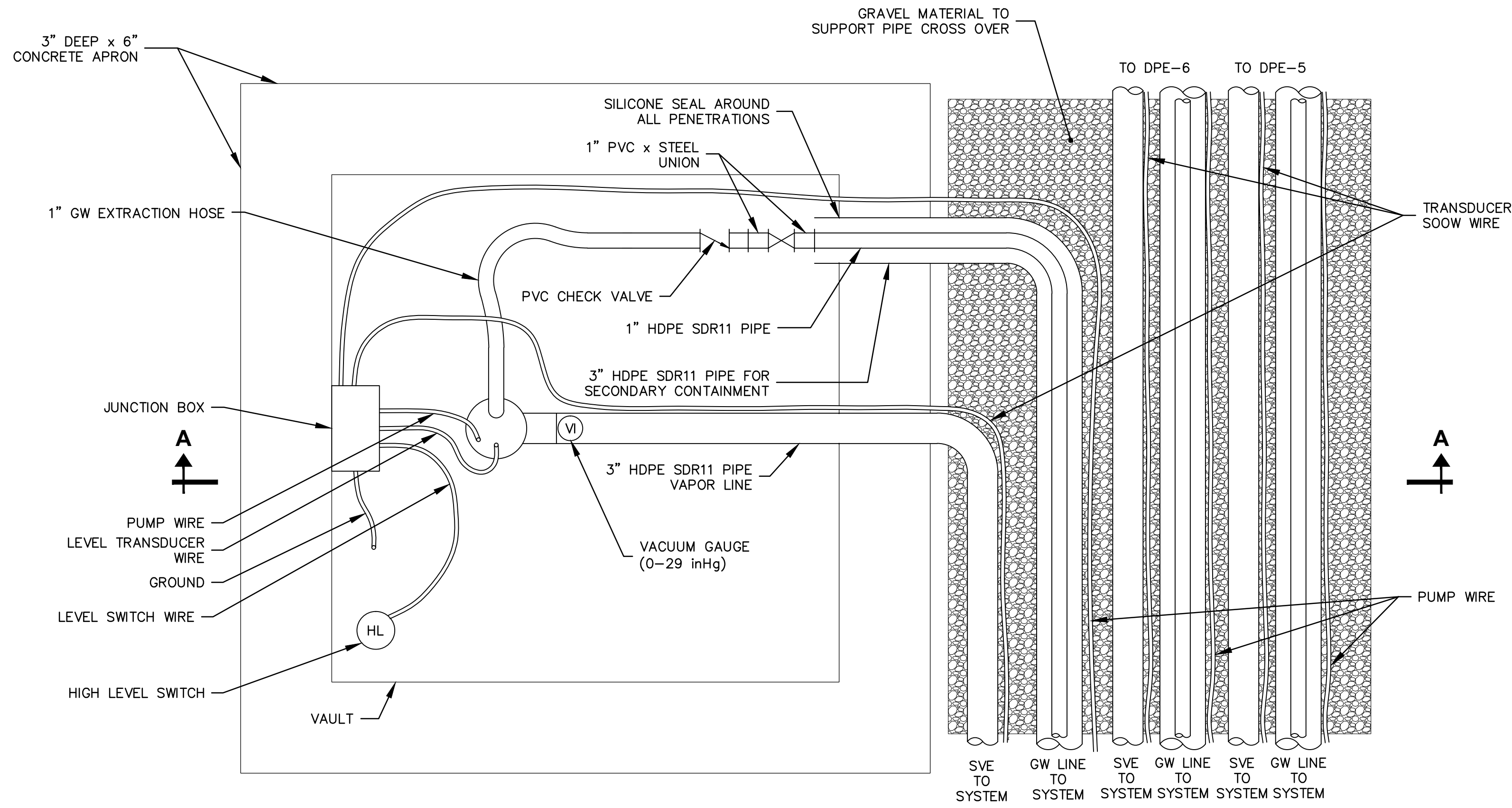
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**SYSTEM DESIGN SPECIFICATION**

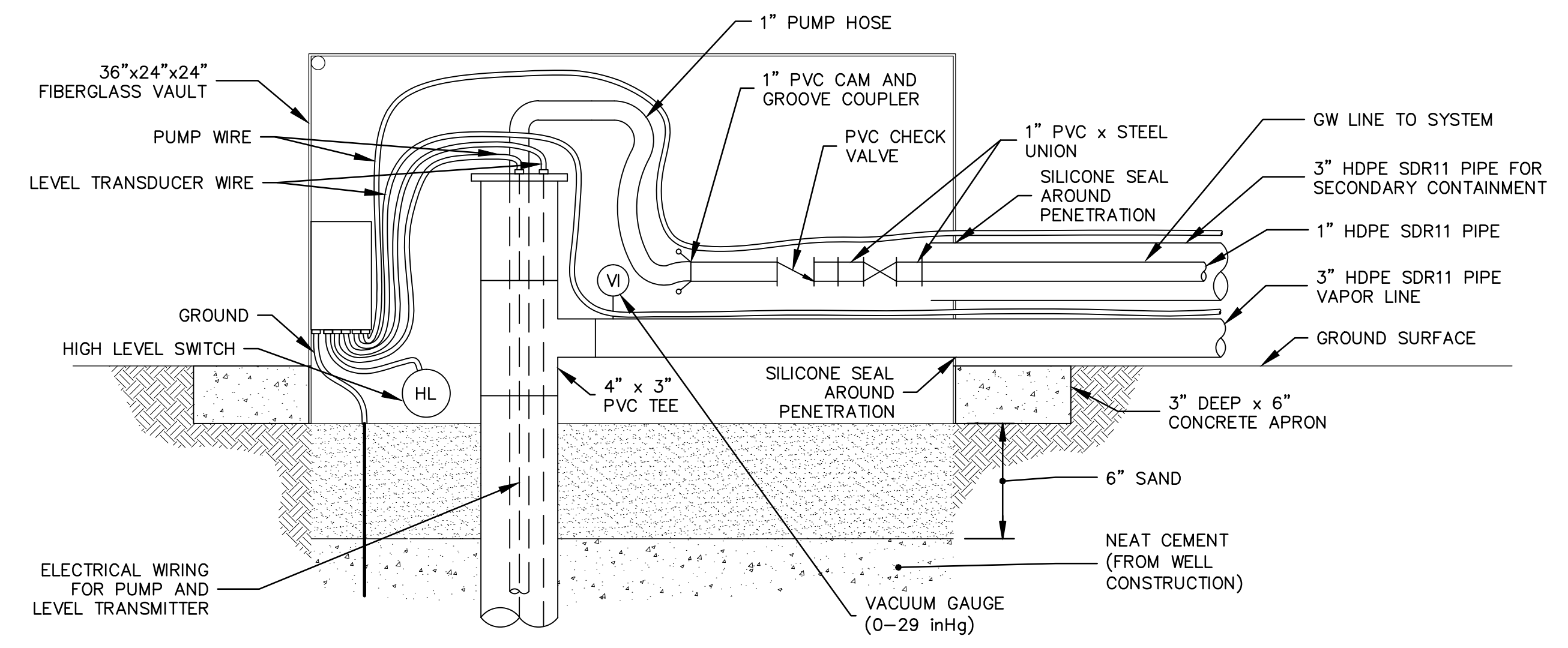
**PIPING CROSS-SECTIONS**

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Date MARCH 2016
ARCADIS 6723 Towpath Road, Box 66 Syracuse, NY 13214 Tel: 315-446-9120

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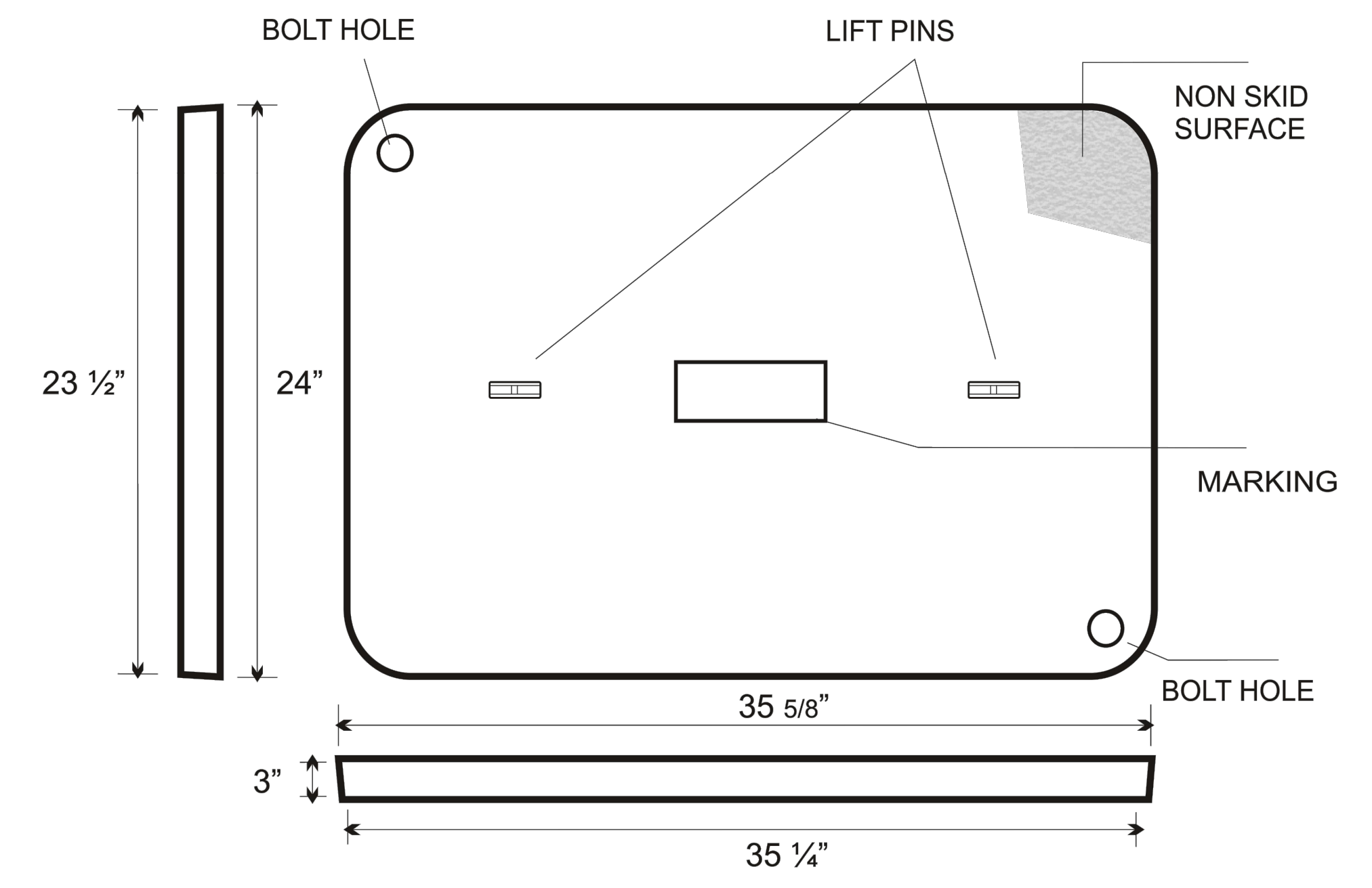


**PLAN**



**SECTION A-A**

**DPE WELLHEAD DETAIL 1**  
NOT TO SCALE



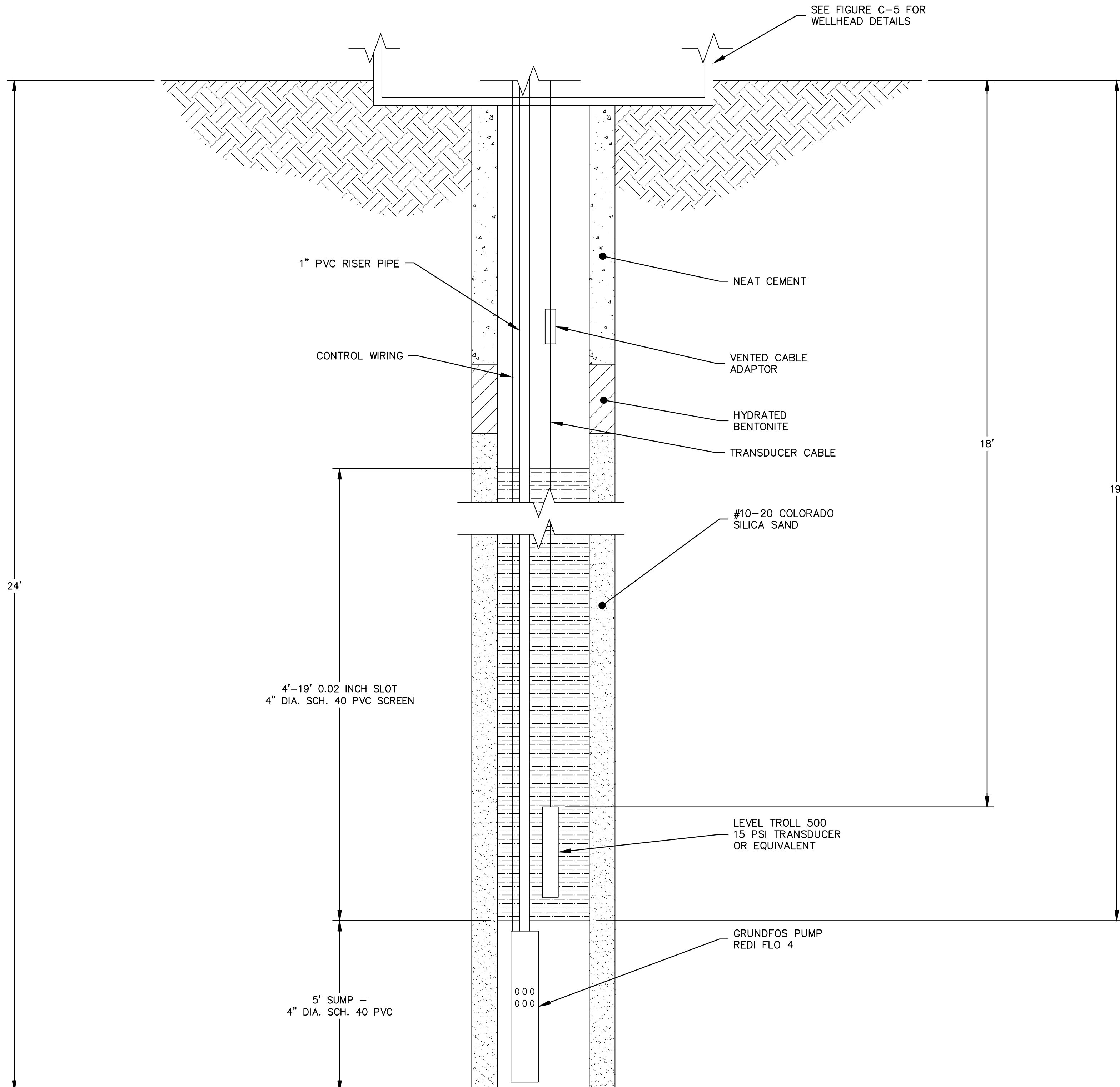
**WELL VAULT DETAIL**

- LEGEND**
- CHECK VALVE
  - VACUUM GAUGE 0-29 inHg
  - 1" STEEL GATE VALVE
  - HIGH LEVEL SWITCH

- DEFINITIONS:**
- PVC POLYVINYL CHLORIDE
  - DPE DUAL PHASE EXTRACTION
  - GW GROUNDWATER CONVEYANCE LINE
  - SVE SOIL VAPOR EXTRACTION LINE
  - inHg INCHES OF MERCURY
  - SOOW WIRE SERVICE COLD, OIL RESISTANT JACKET, OIL RESISTANT INSULATION AND WEATHER/WATER RESISTANT
  - HDPE HIGH DENSITY POLYETHYLENE
  - SDR STANDARD DESIGN RATIO

SCALE(S) AS INDICATED  THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:  USE TO VERIFY FIGURE REPRODUCTION SCALE	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>No.</th> <th>Date</th> <th>Revisions</th> <th>By</th> <th>Ckd</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	No.	Date	Revisions	By	Ckd						Professional Engineer's Name <b>PETER J. CAMPBELL</b> Professional Engineer's No. WA 45051 State WA Date Signed Project Mgr. Designed by Drawn by Checked by		 ARCADIS U.S., INC.	CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY • FORMER UNOCAL BULK FUEL TERMINAL, EDMONDS, WASHINGTON SYSTEM DESIGN SPECIFICATION <b>WELLHEAD CONNECTION CONSTRUCTION DETAILS</b>	ARCADIS Project No. B0045362.0006.00012 Date MARCH 2016 ARCADIS 6723 Towpath Road, Box 66 Syracuse, NY 13214 Tel: 315-446-9120	<b>C-5</b>
		No.	Date	Revisions	By	Ckd											
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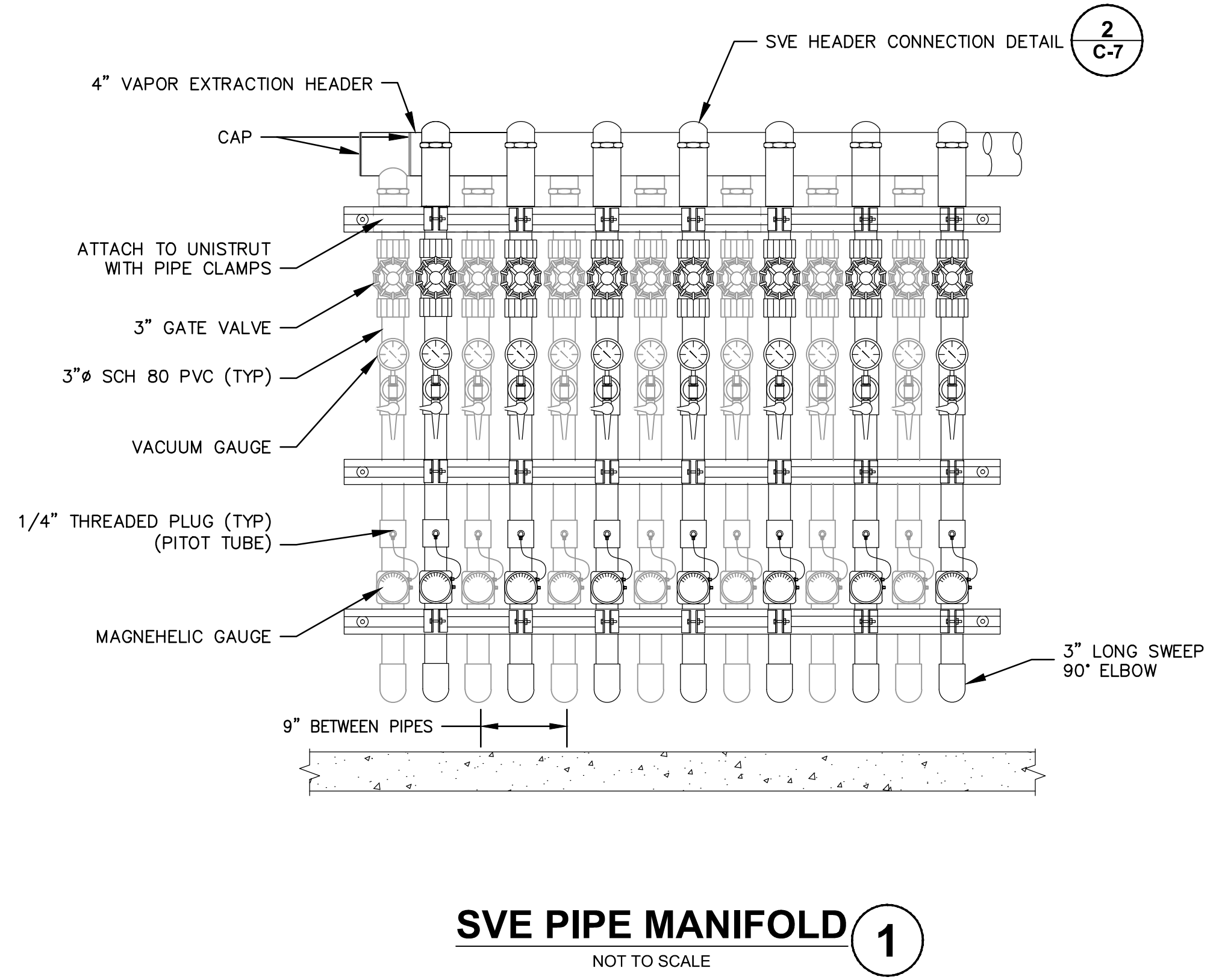


**WELL CONSTRUCTION DETAIL 1**  
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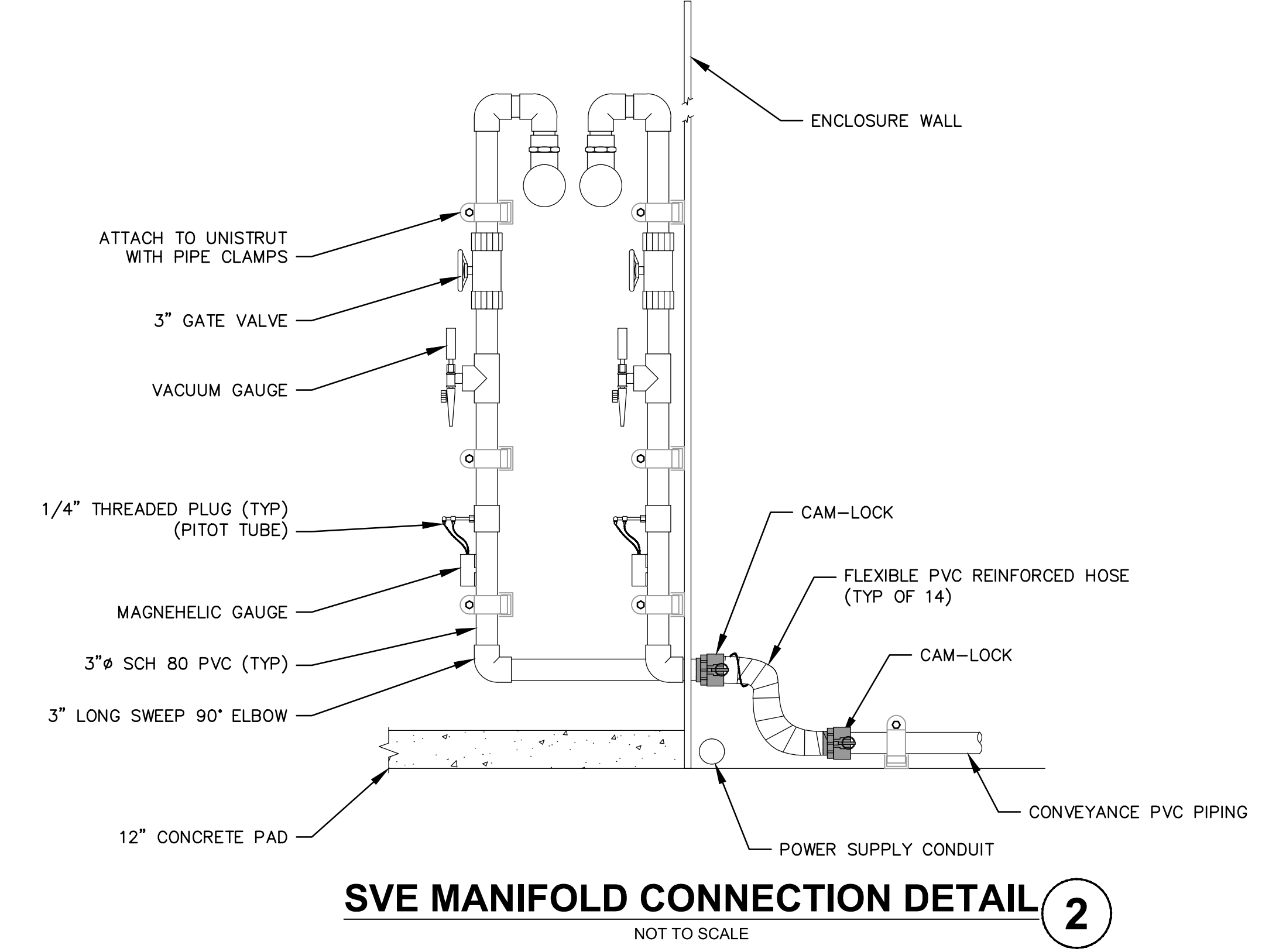
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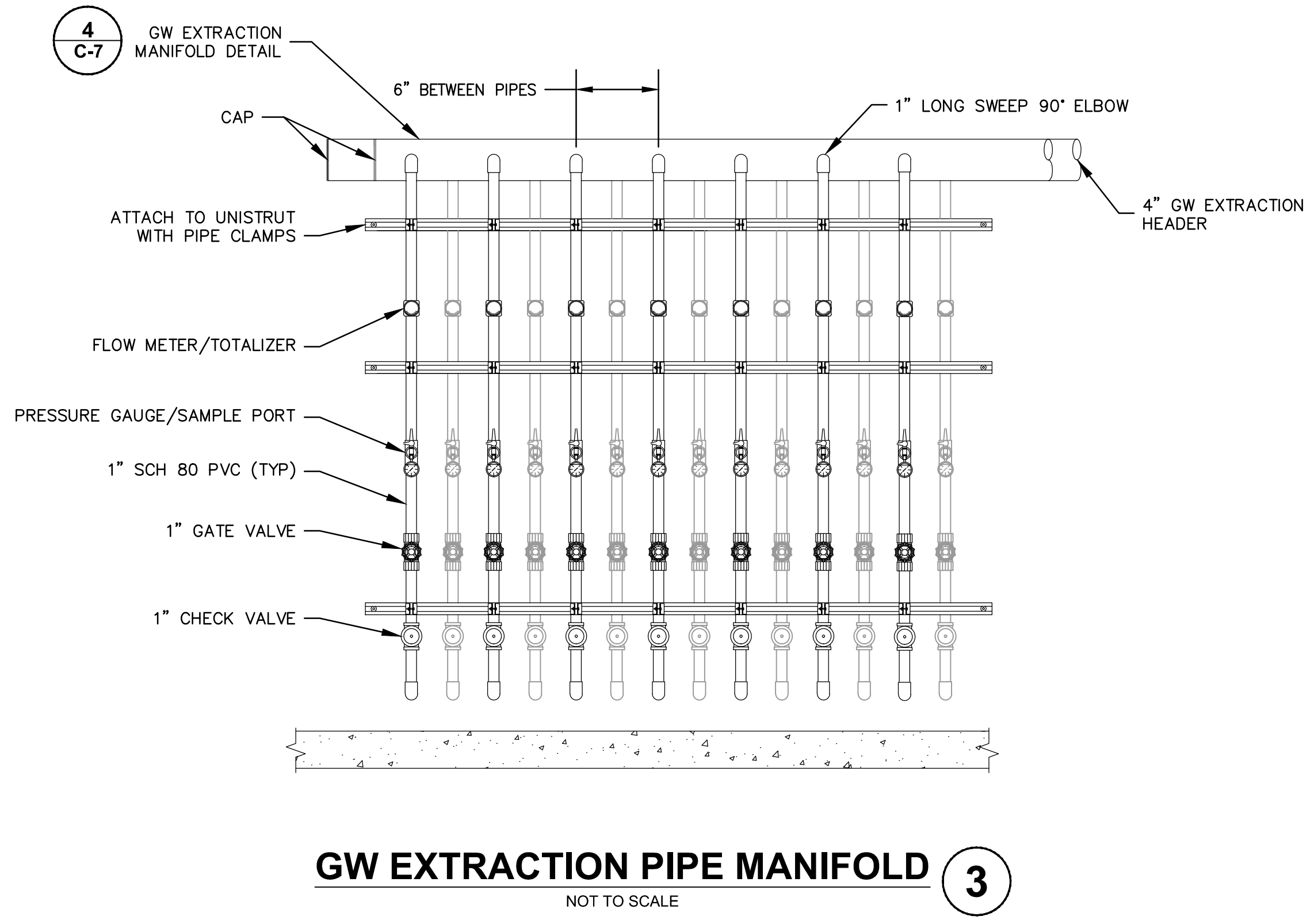
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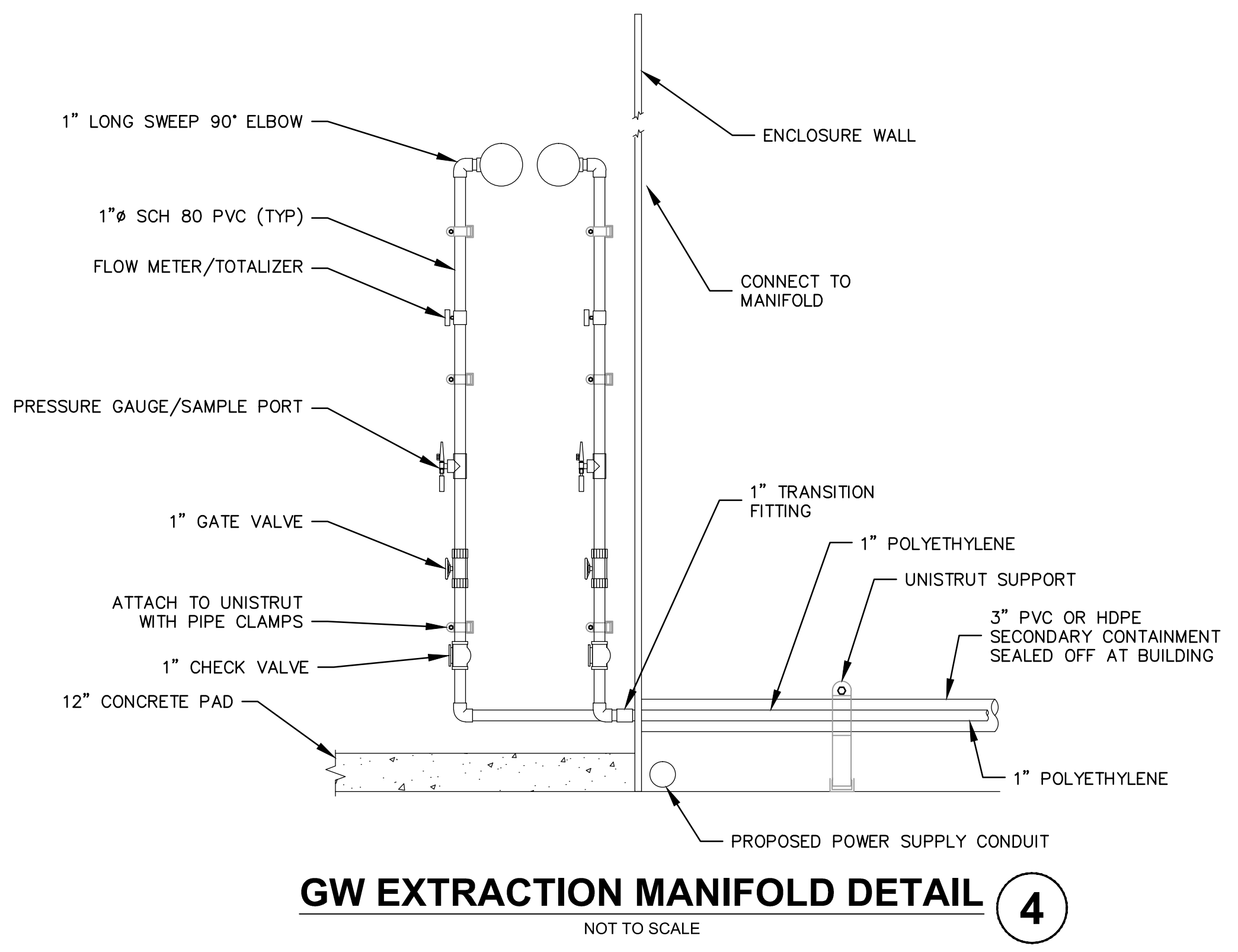
**SVE PIPE MANIFOLD 1**  
NOT TO SCALE



**SVE MANIFOLD CONNECTION DETAIL 2**  
NOT TO SCALE



**GW EXTRACTION PIPE MANIFOLD 3**  
NOT TO SCALE



**GW EXTRACTION MANIFOLD DETAIL 4**  
NOT TO SCALE

**NOTES:**

- GW AND SVE PIPE MANIFOLDS WILL BE CONSTRUCTED AT THE EQUIPMENT VENDORS FACILITY PRIOR TO SHIPMENT OF EQUIPMENT TO THE SITE.
- POWER SUPPLY CONDUIT LOCATION MAY CHANGE BASED ON PUBLIC UTILITY SUPPLY LOCATION.

**DEFINITIONS:**

PVC POLYVINYL CHLORIDE  
 SCH SCHEDULE  
 GW GROUNDWATER CONVEYANCE LINE  
 SVE SOIL VAPOR EXTRACTION LINE

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Professional Engineer's Name  
**PETER J. CAMPBELL**

Professional Engineer's No.  
WA 45051

State  
WA

Date Signed

Project Mgr.

Designed by

Drawn by

Checked by



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SYSTEM DESIGN SPECIFICATION

**MANIFOLD CONNECTION DETAILS**

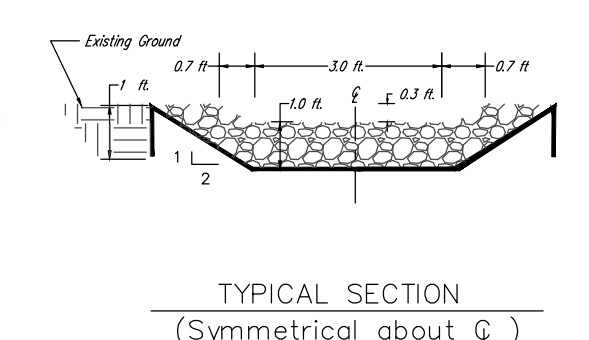
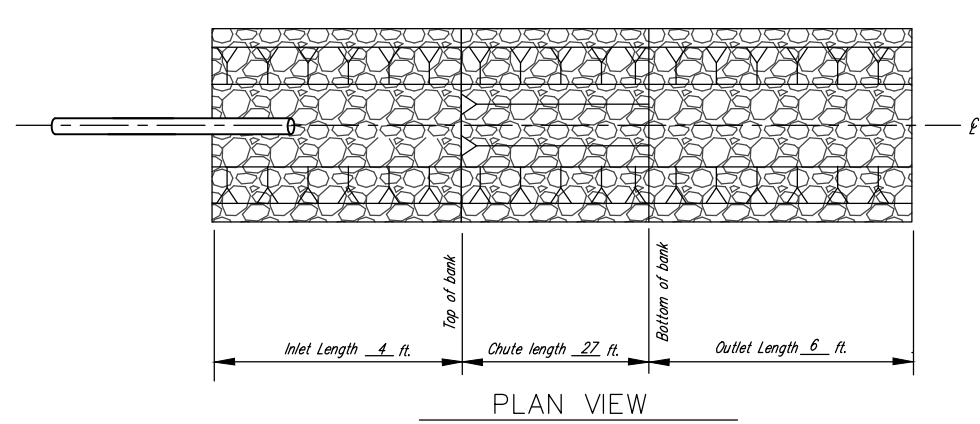
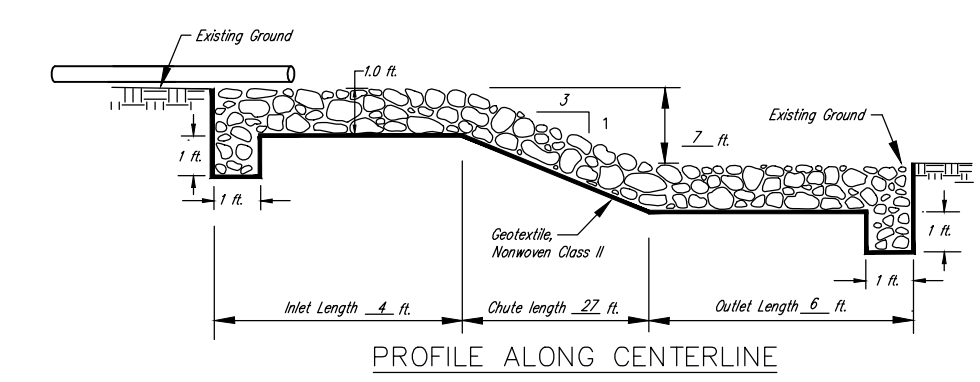
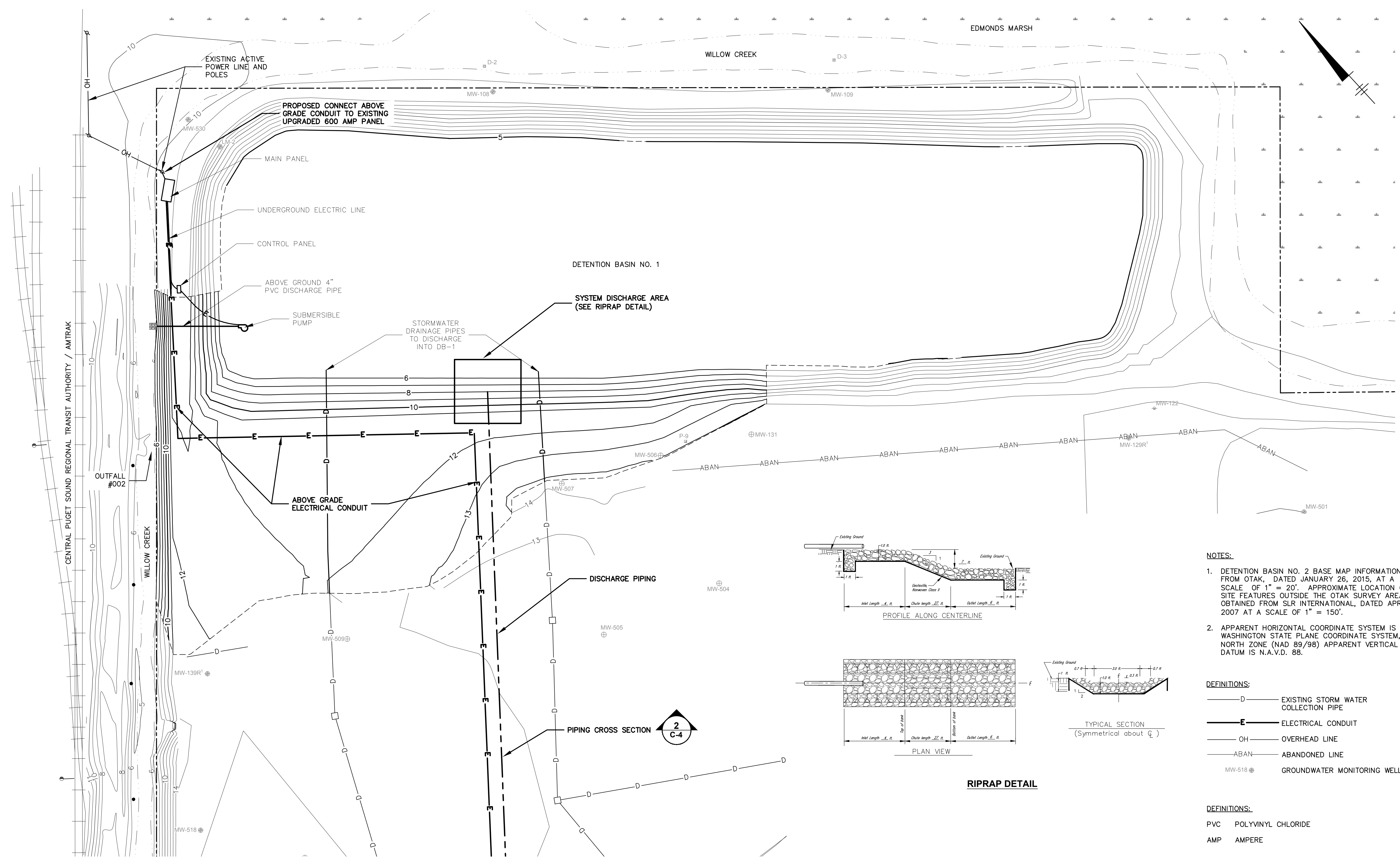
ARCADIS Project No.  
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Date  
MARCH 2016

ARCADIS  
6723 Towpath Road, Box 66  
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Tel: 315-446-9120

**C-7**

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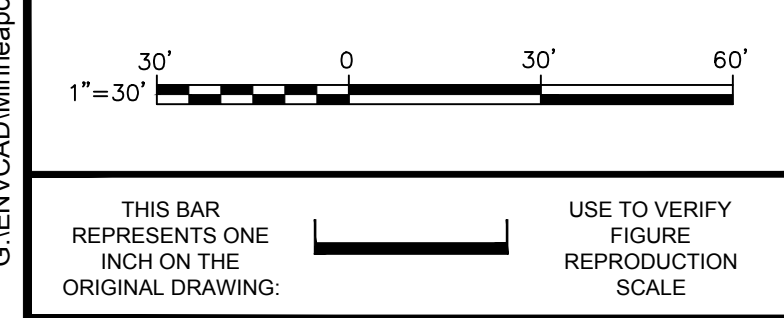


**RIPRAP DETAIL**

- NOTES:**
1. DETENTION BASIN NO. 2 BASE MAP INFORMATION FROM OTAK, DATED JANUARY 26, 2015, AT A SCALE OF 1" = 20'. APPROXIMATE LOCATION OF SITE FEATURES OUTSIDE THE OTAK SURVEY AREA OBTAINED FROM SLR INTERNATIONAL, DATED APRIL 2007 AT A SCALE OF 1" = 150'.
  2. APPARENT HORIZONTAL COORDINATE SYSTEM IS WASHINGTON STATE PLANE COORDINATE SYSTEM, NORTH ZONE (NAD 89/98) APPARENT VERTICAL DATUM IS N.A.V.D. 88.

- DEFINITIONS:**
- D — EXISTING STORM WATER COLLECTION PIPE
  - E — ELECTRICAL CONDUIT
  - OH — OVERHEAD LINE
  - ABAN — ABANDONED LINE
  - MW-518 — GROUNDWATER MONITORING WELL

- DEFINITIONS:**
- PVC — POLYVINYL CHLORIDE
  - AMP — AMPERE



No.	Date	Revisions	By	Ckd

Professional Engineer's Name  
**PETER J. CAMPBELL**  
 Professional Engineer's No.  
 WA 45051  
 State Date Signed Project Mgr.  
 WA  
 Designed by Drawn by Checked by

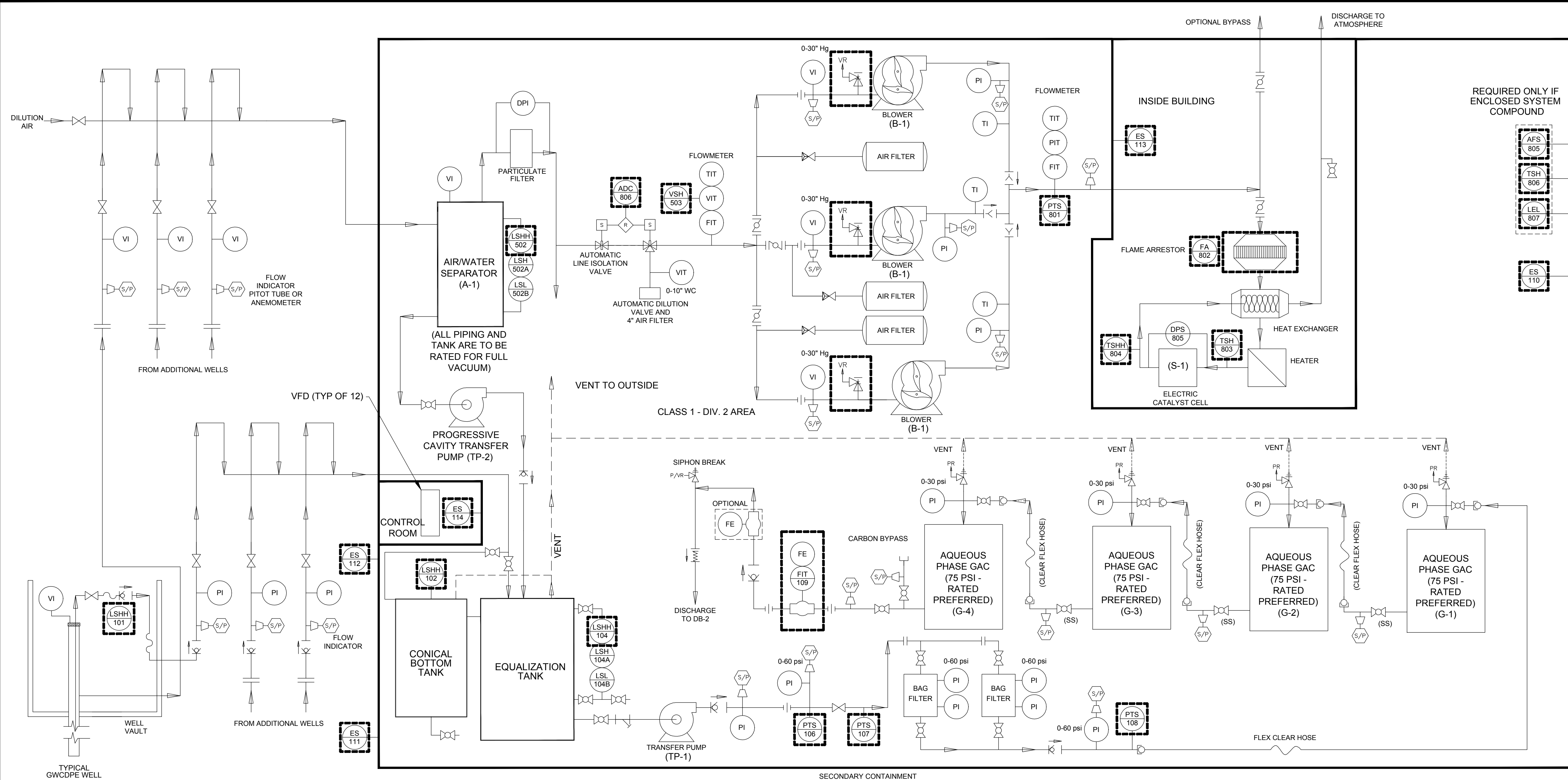


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 SYSTEM DESIGN SPECIFICATION  
**RIPRAP DESIGN AT DETENTION BASIN 1**

ARCADIS Project No.  
 B0045362.0006.00012  
 Date  
 MARCH 2016  
 ARCADIS  
 6723 Towpath Road, Box 66  
 Syracuse, NY 13214  
 Tel: 315-446-9120

**C-9**

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 IMAGES: PETER\_CAMPBELL



- PRIMARY EQUIPMENT SYMBOLS**
- VACUUM BLOWER
  - LIQUID-RING BLOWER
  - OIL-LESS COMPRESSOR
  - METERING PUMP
  - COALESCING FILTER
  - DISCHARGE SILENCER
- FITTINGS SYMBOLS**
- CAP (THREADED)
  - PLUG (THREADED)
  - REDUCER
  - RAIN CAP
  - WYE STRAINER
  - SPRAY NOZZLE
  - UNION
  - FLANGED JOINT
  - ORIFICE-PLATE FLOWMETER
  - CAM LOCK
  - FLEXIBLE HOSE OR CONNECTOR
  - P-TRAP
- VALVE SYMBOLS**
- GATE (NORMALLY OPEN)
  - GATE (NORMALLY CLOSED)
  - BALL (NORMALLY OPEN)
  - BALL (NORMALLY CLOSED)
  - BUTTERFLY (NORM. OPEN)
  - BUTTERFLY (NORM. CLOSED)
  - BALL CHECK
  - SPRING CHECK
  - SEATLESS CHECK
  - AUTOMATIC DRAIN
  - NEEDLE VALVE
  - SOLENOID (NORMALLY CLOSED; FAIL CLOSED)
  - PRESSURE REGULATOR
  - VACUUM RELIEF
  - PRESSURE RELIEF
  - PRESSURE/VACUUM RELIEF
  - QUICK DISCONNECT
  - QUICK DISCONNECT
  - BOSS POSITIVE METAL-TO-POLYMER COUPLER
- REQUIRED ONLY IF ENCLOSED SYSTEM COMPOUND**
- AFS 805
  - TSH 806
  - LEL 807
  - ES 110
- ABBREVIATIONS:**
- DPI DIFFERENTIAL PRESSURE INDICATOR
  - ES EMERGENCY STOP
  - FA FLAME ARRESTOR
  - FE FLOW INDICATOR
  - FIT FLOW INDICATOR AND TOTALIZER
  - LEL LOWER EXPOSURE LIMIT
  - LSL LEVEL SWITCH LOW
  - LSH LEVEL SWITCH HIGH
  - LSHH LEVEL SWITCH HIGH HIGH
  - PI PRESSURE INDICATOR
  - PIT PRESSURE INDICATOR TRANSMITTER
  - PSI POUNDS PER SQUARE INCH
  - PTS PRESSURE TRANSMITTING SWITCH
  - SS STAINLESS STEEL
  - TI TEMPERATURE INDICATOR
  - TIT TEMPERATURE INDICATOR TRANSMITTER
  - TS TEMPERATURE SWITCH
  - VFD VARIABLE FREQUENCY DRIVE
  - VI VACUUM INDICATOR
  - VIT VACUUM INDICATOR TRANSMITTER

CONTROL UNIT	FUNCTION	CONTROL UNIT	FUNCTION	CONTROL UNIT	FUNCTION	CONTROL UNIT	FUNCTION	CONTROL UNIT	FUNCTION	CONTROL UNIT	FUNCTION
LSHH 101	LEVEL SWITCH/ALARM HIGH HIGH: TURNS OFF ALL SYSTEMS	PTS 106	PRESSURE TRANSMITER SWITCH/ALARM HIGH: TURNS OFF ALL SYSTEMS	ES 110	EMERGENCY STOP SWITCH (INTERNAL #1): TURNS OFF ALL SYSTEMS	LSHH 502	LEVEL SWITCH/ALARM HIGH HIGH: TURNS OFF ALL SYSTEMS	TSH 803	TEMPERATURE SWITCH/ALARM LOW: CLOSES AUTOMATIC DILUTION VALVE (ADC) WHEN SYSTEM REACHES OPERATING TEMPERATURE RANGE	ES 112	EMERGENCY STOP SWITCH INTERNAL #2 TURNS OFF ALL SYSTEMS
LSHH 102	LEVEL SWITCH/ALARM HIGH HIGH: TURNS OFF ALL SYSTEMS	PTS 107	PRESSURE TRANSMITER SWITCH/ALARM HIGH: TURNS OFF ALL SYSTEMS	ES 111	EMERGENCY STOP SWITCH (EXTERNAL #1): TURNS OFF ALL SYSTEMS	LSH 502A	LEVEL SWITCH HIGH: TURNS ON AS TRANSFER PUMP (TP-2)	TSHH 804	TEMPERATURE SWITCH/ALARM HIGH HIGH: TURNS OFF ALL SYSTEMS	ES 113	EMERGENCY STOP SWITCH EXTERNAL #2 TURNS OFF ALL SYSTEMS
LSHH 104	LEVEL SWITCH/ALARM HIGH HIGH: TURNS OFF ALL SYSTEMS	PTS 108	PRESSURE TRANSMITER SWITCH/ALARM HIGH: TURNS OFF ALL SYSTEMS	FIT 109	FLOW INDICATOR AND TOTALIZER	LSL 502B	LEVEL SWITCH LOW: TURNS ON AS TRANSFER PUMP (TP-2)	DPS 805	DIFFERENTIAL PRESSURE SWITCH/ALARM HIGH HIGH: TURNS OFF ALL SYSTEMS	ES 114	EMERGENCY STOP SWITCH CONTROL ROOM TURNS OFF ALL SYSTEMS
LSH 104A	LEVEL SWITCH HIGH: TURNS ON AS TRANSFER PUMP (TP-1)					VSH 503	VACUUM SWITCH/ALARM HIGH HIGH: TURNS OFF ALL SYSTEMS	AFS 805	AIR-FLOW SENSOR/ALARM HIGH HIGH: TURNS OFF ALL SYSTEMS		
LSL 104B	LEVEL SWITCH LOW: TURNS OFF TRANSFER PUMP (TP-1)					PTS 801	AIR PROVING SWITCH (PRESSURE SWITCH/ALARM LOW): TURNS OFF ALL SYSTEMS	TSH 806	TEMPERATURE SWITCH/ALARM HIGH HIGH: TURNS OFF ALL SYSTEMS		
ALL HIGH HIGH OR LEL LEVEL SWITCHES ARE MANUAL RESET											
						FA 802	FLAME ARRESTOR: PREVENTS FLAMES FROM PROPAGATING UPSTREAM IN EVENT OF EXPLOSION	LEL 807	LOWER EXPOSURE LIMIT /ALARM HIGH HIGH: TURNS OFF ALL SYSTEMS		
								ADC 806	AIR DILUTION CONTROL VALVE: OPENS AT HIGH TEMP TO COOL OXIDIZER CLOSES AT OPERATING TEMP		

SCALE(S) AS INDICATED																
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