Atlantic Richfield Company

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March 27, 2009

Mr. Michael J. Negrelli
Remedial Project Manager
U.S. Environmental Protection Agency
Region 2
290 Broadway Avenue
NYC SB2 – 20th Floor
New York, New York 10007-1866

RE: Work Plan for Improvements to Wetland Treatment System/
Conveyance System
Former Sinclair Refinery Site: Operable Unit 2
Wellsville, New York
USEPA ID NYD9807773170 / NY Site 902003

Dear Mr. Negrelli:

Pursuant to our telephone conversation of March 18, 2009 regarding the status of operations of the Wetland Treatment System at the Former Sinclair Refinery site, Atlantic Richfield Company (ARC) is submitting the attached Work Plan describing improvements and modifications that will be made to the Wetland Treatment System and the Water Conveyance System. As described in this Work Plan, during initial startup activities completed in December 2008 through March 2009, several operational issues have been encountered and include the following:

- Excessive silt and debris buildup in sumps;
- Flow restrictions in discharge lines at turbine flow meters;
- Flow rate reductions when multiple pumps are operating;
- Air leaks in aeration lines in surface flow wetlands;
- Volatile and semi-volatile organic compounds detected in effluent samples above proposed SPDES limits; and
- Partially established of wetland plantings in surface flow and vertical flow wetlands.

The Work Plan provided herein describes the Scope of Work for the improvements, modifications and upgrades that ARC plans to implement this Spring. As described in this Work Plan and as we discussed during our telephone call, ARC will temporarily shutdown operation of

the Wetland Treatment System, in order to have access to the conveyance lines and wetland cells to implement these plans. At this time, ARC is planning an approximate 4-week temporary shutdown period, which will likely begin the week of March 30, 2009. ARC will notify EPA, when the system is shutdown, when the repairs are completed and before the system is reactivated.

If you have any questions or comments on this submittal, please feel free to contact me at (630) 836-6955.

Sincerely,

Joseph P. Sontchi, CPG
Environmental Business Manager
Atlantic Richfield Company, a BP affiliated company

cc: (w/attachments)
Maurice Moore, NYSDEC
Eric Larson, Atlantic Richfield
Martin Schmidt, URS
Jerry Palmer, On-Site
File

WORK PLAN

IMPROVEMENTS TO WETLAND TREATMENT SYSTEM / CONVEYANCE SYSTEM

FORMER SINCLAIR REFINERY
WELLSVILLE, NEW YORK

Prepared for
Atlantic Richfield Company
(a BP Affiliated Company)

March 2009

URS

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This Work Plan has been prepared by Atlantic Richfield Company (ARC) to describe the improvements and modifications that are planned for the Wetland Treatment System and Water Conveyance System that has been installed at the former Sinclair Refinery site. During the summer of 2008, construction of the treatment wetlands system and water conveyance system was completed. Repairs to the sedimentation pond were made in September and the wetlands were planted in October 2008. In early December 2008, the sump pumps in manholes A through H were evaluated for operational performance and tested in order to initiate groundwater extraction and the Performance-Based Groundwater Monitoring (PBGM) Program. The location of conveyance system sumps and treatment wetlands system is provided on Figure 1.

1.1 CONVEYANCE SYSTEM ISSUES

During this initial start up period, several challenges were encountered that limited the rate at which groundwater was extracted from each manhole. The as-built challenges include:

- Excessive silt and debris build up in sumps;
- Flow restrictions at the turbine flow meters related to debris in discharge lines and meter design; and
- Flow rate reductions when multiple pumps were in operation.

ARC has made several interim modifications to the system in response to these conditions. These modifications include:

- Removal of turbine flow meters in manholes and meter box locations;
- Placement of pumps within stilling wells in all sumps; and
- Removal of sections of discharge lines and replacement with larger diameter lines.

On December 30, 2008, manhole sumps B, D, and F became operational and began discharging water at approximately 90 gpm (approx. 30 gpm/sump). At the time of start up, the remaining manhole sumps A, C, E, G, and H were not started. In February 2009, an attempt was made to operate manhole sumps A, C, and E in conjunction with B, D, and F. At this time, it was observed that the combined flow rate of the six sumps was reduced to approximately 30 gpm. In order to prevent the surface flow and vertical flow wetlands from freezing, it was necessary to begin operation of manhole sumps G and H to supplement discharge water. When these five (5) sumps were operational, the flow rate was approximately 90 gpm.

In order to evaluate the cause of the flow rate reduction, the conveyance lines were flushed and checked for leaks. Results of the flushing process indicated a small leak in one of the lines within the meter box. Upon completion of the flushing operation, manhole sumps A, B, C, D, E, and F became operational and discharged water at approximately 90-100 gpm. Since March 13, 2009, manhole sumps A through F have operated at a combined flow rate of

approximately 90 gpm. However, since the flow meters have been removed from individual sumps and the meter box, it is not possible to determine individual manhole flow rates.

In order to alleviate the difficulties in maintaining consistent groundwater discharge rates from manholes A through F, ARC has developed a Work Plan to improve various components of the conveyance system. These improvements are necessary to maintain and measure the required pumping rates from these manholes for capture of groundwater as predicted by the revised groundwater model. Details of the monitoring program are described in the PBGM. See Appendix 13 of the 100% Design Report (Revision 2) for details. The improvements, modifications, and repairs that are planned for the conveyance system at this time are described below in Section 2.

1.2 WETLANT TREATMENT SYSTEM - ISSUES

ARC has identified three issues in the treatment wetlands system during the first three months of their operation. These issues are:

- *Leaks in Aeration Lines*: Aeration lines were installed in the three surface flow wetland cells during their construction in 2008. The aeration lines were placed beneath gravel bedding in the western-most cells in each surface flow wetland. Blowers were installed in March 2009 and connected to the aeration lines in each surface flow wetland cell. When the blowers were started, signs of air leaks were observed in several areas where the aeration lines are covered by gravel.

- *Organics in Treatment Wetlands System Effluent*: During operation of the Wetland Treatment System in December 2008 through March 2009, monitoring has indicated detections of volatile organic and semi-volatile organic compounds above the proposed SPDES limits.

- *Wetland Vegetation*: Wetland species were planted in the Fall of 2008 and have not been fully established.

The maintenance and modifications that ARC plans to undertake to address these Wetland Treatment System issues are described below in Section 3.

Additionally, ARC will take the opportunity during the maintenance shutdown install a biofilter at the cascade aerator to enhance system capability for the control of potential odors. Biofilter system is also described in Section 3.

The following improvements and modifications are based on a review of Drawing C-12A prepared by Secor Engineering as described in the OU2-1 100% Design Report. As a result of operational difficulties, a review of the design was completed by URS and ARC. The following improvements will be made to the conveyance system.

2.1 CHANGE TEE FITTINGS TO WYE TYPE FITTINGS

Description of Change

The manhole and pumps currently connect to the 6-inch HDPE conveyance line via 6"x2"x6" tees. The existing tees shall be removed and replaced with a 6"x6"x6" wye fittings with a 2"x6" reducer on the branch. Specification 15060 (Attachment A) provides additional information on the HDPE piping that will be used for these changes. Manholes A, B, C, D, E, and F are currently connected to one line and G and H are connected to a second line. A spare force main line exists but is not in use.

This work shall be done where manholes A through G connect to the conveyance line for a total of seven existing locations (see Figure 2).

Scope of Work

a. Excavate the existing connections to the conveyance line. Excavated material shall be kept neatly for reuse as appropriate. Pipe bedding material shall be segregated and staged in a manner that is suitable for reuse. Hand excavation shall be required near the existing force mains and other utility lines. Discharge from any construction dewatering within the excavation shall be directed to the adjacent manhole. Note that electrical conduits are above the conveyance lines. Contractor shall take all necessary precautions to avoid damaging these conduits. Contractor shall be responsible for repairing any damage to the conduits.

b. Remove the existing tee connections from the conveyance line. All cuts shall be made neatly and professionally.

c. Install a 6"x6"x6" wye connection with appropriate reducers on the branch. The wye shall be installed to direct the flow in the same direction as the flow in the conveyance line. The coupling should be connected via permanent fusion type couplings. All work, including pipe preparation, shall be done in accordance with the manufacturer's recommendations.

d. Pipe bedding and support shall be replaced and compacted consistent with the existing construction in the surrounding area. Contractor shall provide additional pipe bedding material if excavated material is not suitable for reuse.

e. The pipe shall be pressure tested in accordance with the pressure test procedure included as Attachment B, which is based on the existing specifications and the manufacturer's recommendations. The entire conveyance line from the first manhole through the meter box shall be tested as one entity. The connections shall not be backfilled until the line has been tested and has been approved for backfill by the Engineer.

f. Backfill and restore the excavation to the existing conditions.

2.2 CONNECT MANHOLES TO THE SPARE CONVEYANCE LINE

Description of Change

As currently constructed, six manholes (A through F) connect to one conveyance force main (A). Manholes G and H connect to a second, shorter, conveyance force main (B). A third force main (spare) is identical to A, and presently is not used.

Manholes A through F shall be connected to the spare force main in addition to their primary connection (Line A). The existing connections shall remain unchanged. The new connections to the force main shall be a complete and separate connection from the manhole to the spare conveyance line. The attached specification 15060 provides additional information on the HDPE piping that will be used for these additions.

It is assumed that this work will be done in conjunction with the change in line connections outlined under Item 1 above (see Figure 2).

Scope of Work

a. Excavate the existing connections to the conveyance line and to the spare conveyance line where the connection will be made. The entire existing 2-inch connection line outside the manhole shall be exposed.

b. Excavated material shall be kept neatly for reuse as appropriate. Hand excavation shall be required near the existing force mains and other utility lines. Pipe bedding material shall be segregated and staged in a manner that is suitable for reuse. Discharge from any construction dewatering within the excavation shall be directed to the adjacent manhole. Note that electrical conduits are above the conveyance lines. Contractor shall take all necessary precautions to avoid damaging these conduits. Contractor shall be responsible for repairing any damage to the conduits.

c. Core through the sidewall of the existing manhole as required to provide penetration for the new spare discharge line. The new line shall be offset laterally from the existing line by a minimum of 12 inches. The elevation of the penetration may be up to six inches higher on the sidewall as required so that the piping within the manhole, and at the conveyance lines, will not interfere.

d. Cut and remove a section of the existing spare conveyance line as required. All cuts shall be in a neat and professional manner.

e. Install a 6”x6”x6” inch wye connection with appropriate reducers on the branch. The coupling should be connected via permanent fusion type couplings. All work, including pipe preparation, shall be done in accordance with the manufacturer’s recommendations.

f. Install a 2-inch diameter pipe from the wye at the spare conveyance line, over the existing conveyance line(s), to the manhole. The pipe shall extend a minimum of 6 inches inside the manhole. All fittings between the conveyance line and the manhole should be 45° elbows if possible to provide a smooth flow transition into the conveyance line.

g. Terminate the new line inside the manhole with a 2-inch diameter bronze gate valve with threaded end connections.

h. All proposed work shall be approved by the Engineer. All pipe crossings shall maintain a minimum 6 inch separation, or include provisions to prevent damage from movement between lines in close proximity.

i. The new manhole penetration shall be sealed consistent with the existing construction. The penetration shall be designed to accommodate any movement or expansion of the pipe.

j. Pipe bedding and support shall be replaced and compacted consistent with the existing construction in the surrounding area. Contractor shall provide additional pipe bedding material if excavated material is not suitable for reuse.

k. The pipe shall be pressure tested in accordance with the pressure test procedure included as Attachment B, which is based on the existing specifications and the manufacturer's recommendations. The entire spare conveyance line from the first manhole through the meter box shall be tested as one entity. The connections shall not be backfilled until the line has been tested and has been approved for backfill by the Engineer.

l. Backfill and restore the excavation to the existing conditions.

m. Additional modifications within the manhole to accommodate flow to the spare conveyance line are not included in this scope of work.

2.3 INSTALL CLEANOUTS AT EXISTING METER BOX

Description of Change

The three meters originally installed in the meter box have been removed and replaced with 2-inch diameter sections of pipe. These 2-inch diameter sections shall be removed and replaced with 4-inch diameter pipe; the pipe shall have cleanout wyes installed in both directions on all three of the lines. The new sections of pipe will be flanged connections to accommodate future removal if required. This work will be conducted on all three of the existing conveyance lines in the meter box (see Figure 3).

Scope of Work

a. Remove all existing 2-inch diameter pipe and other components from the conveyance lines inside the meter pit. All cuts shall be in a neat and professional manner.

b. All proposed work shall be approved by the Engineer.

c. Install 4-inch diameter pipe at each of the three conveyance lines. The new 4-inch pipe shall be installed via flanged connections or other connections that are removable. The 4-inch pipe shall not be permanently fused, although the fittings to transition to the flanges (or other couplings) shall be permanently installed.

d. Each of the three new sections of pipe shall include two 4"x4"x4" wye cleanout fittings. The wye fittings shall be installed in opposite directions to allow for cleaning of the pipe in both directions from the meter pit. The wyes shall be installed with adequate separation between

the fittings and between the fittings and the sidewalls of the meter pit to allow for access to the wye without interference. The wyes shall include threaded end caps on the branch.

e. The pipe sections within the manhole shall be adequately supported to prevent sagging and excessive movement of the pipes, especially during cleaning activities.

f. The pipe shall be pressure tested in accordance with the existing specifications and the manufacturer's recommendations.

g. The existing flow analyzers and mounting kits at the meter pit shall be removed and stored as directed by the Engineer.

2.4 INSTALL ULTRASONIC FLOW METERS IN MANHOLES

Description of Change

Ultrasonic flow meters will be installed in manholes A through F. These flow meters have no moving parts in contact with the liquid stream and are not expected to restrict flow. Compatible flow analyzers will also be installed adjacent to the control panel for the pumps in each of the manholes.

During operation of the Wetland Treatment System in January through March 2009, several operational features were evaluated and are required to be repaired for efficient operations. The following maintenance items and repairs are to be performed in the Wetland Treatment System.

3.1 SURFACE FLOW WETLANDS AERATION LINES

Description of Repair

The water will be drained from the surface flow wetland cells to facilitate safe access to the aeration lines. This water will be routed through the vertical flow wetlands. The blowers will be restarted to locate the leaks in the aeration lines. The aeration lines will be exposed at each leaking location, visually inspected, and repaired, as necessary. In addition, the aeration lines in the other cells will be inspected and repaired as needed.

3.2 AIR EMISSION CONTROL OF CASCADE AERATOR

Description of Upgrade

In order to provide enhanced capacity to control potential hydrocarbon odors from the four cascade aerators, ARC has requested NAWE (Stantec) to prepare a design concept for installation of a biofilter to reduce potential hydrocarbon air emission odors. At this time NAWE is completing the design for a biofilter. The design is expected to be complete by early April 2009 and installed prior to system startup.

3.3 GRANULAR ACTIVATED CARBON TREATMENT OF WETLAND TREATMENT SYSTEM EFFLUENT

Description of Maintenance Item

In order to provide control of volatile organic compounds identified in the effluent from the WTS, ARC will install a temporary granular activated carbon (GAC) treatment system for polishing the effluent. The system will be either an active or passive temporary system installed between the vertical flow wetlands and the discharge manhole. At this time, it is expected that the temporary GAC treatment system will operate until the vegetation in the Wetland Treatment System is sufficiently established in order to meet the designed effluent concentrations and final SPDES discharge limits approved by NYSDEC.

3.4 WETLAND PLANTING ASSESSMENT

Description of Maintenance Item

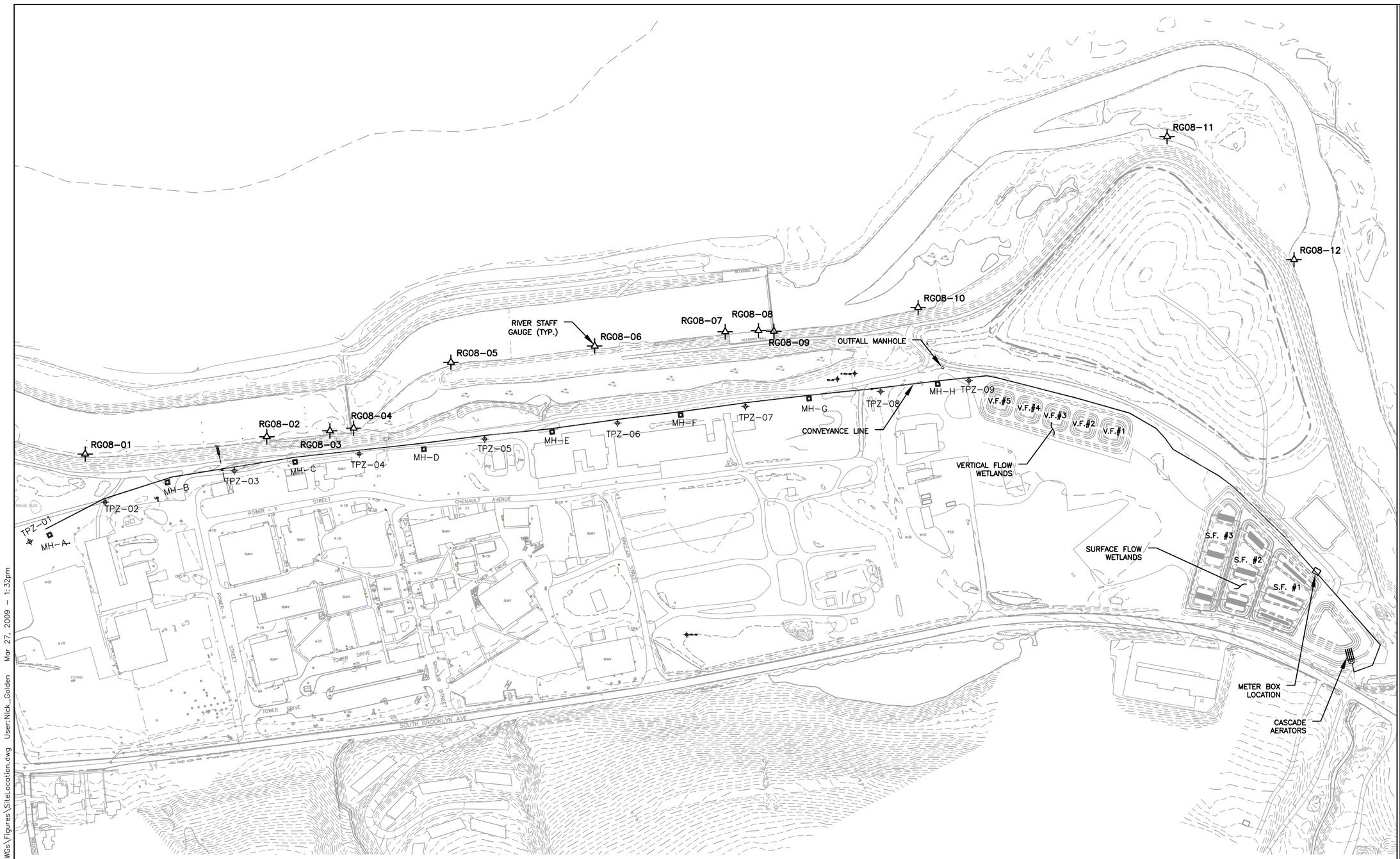
The surface flow and vertical flow wetlands were planted in October 2008. During operation of the Wetland Treatment System, the water level in the surface flow wetlands was raised to prevent freezing in the bench area.

When the water level in the system is lowered for aeration line repairs, an assessment of plant survival will be performed. Upon completion, recommendations for replanting will be made. In order to accelerate plant growth, and system efficiency, ARC will either harvest wetland plant species from the Main Drainage Swale or obtain plants from an off-site source and replant the wetland cells as needed. This work is expected to be performed by hand and will occur during the shutdown period.

At this time ARC is requesting that USEPA approve a temporary shutdown of the groundwater extraction system and operation of the Wetland Treatment System.

ARC anticipates the necessary conveyance system repairs and Wetland Treatment System maintenance items described in this Work Plan will take approximately four weeks. Therefore, ARC would like to temporarily shut down pumping during the week of March 30, 2009 and resume approximately four weeks later after the work is completed. ARC will notify EPA when the work is completed and before the system is restarted.

Figures



LEGEND

———	CONVEYANCE LINE
MH-D	DEWATERING SUMP MANHOLE
TPZ-01	TRENCH PIEZOMETER
RG08-11	RIVER STAFF GAUGE
V.F.#2	VERTICAL FLOW WETLANDS
S.F.#1	SURFACE FLOW WETLANDS

0 150 300
SCALE (FEET)

BAR IS ONE-INCH ON ORIGINAL DRAWING
0 ½ 1
IF NOT ONE-INCH, THEN ADJUST SCALES ACCORDINGLY

ISSUED FOR BIDDING DATE BY

ADDENDUM REVISIONS

ADDENDUM NO	ADDENDUM DATE	BY

ISSUED FOR CONSTRUCTION DATE BY

REVISIONS

NO.	DESCRIPTION	DATE	BY

RECORD DRAWINGS DATE BY

DRAWN NSG	DATE 3-26-09
CHECKED	JOB # 13812820
SCALE: AS SHOWN	

FORMER SINCLAIR REFINERY SITE
WELLSVILLE, NEW YORK

SITE LOCATION MAP

FIGURE 1

URS

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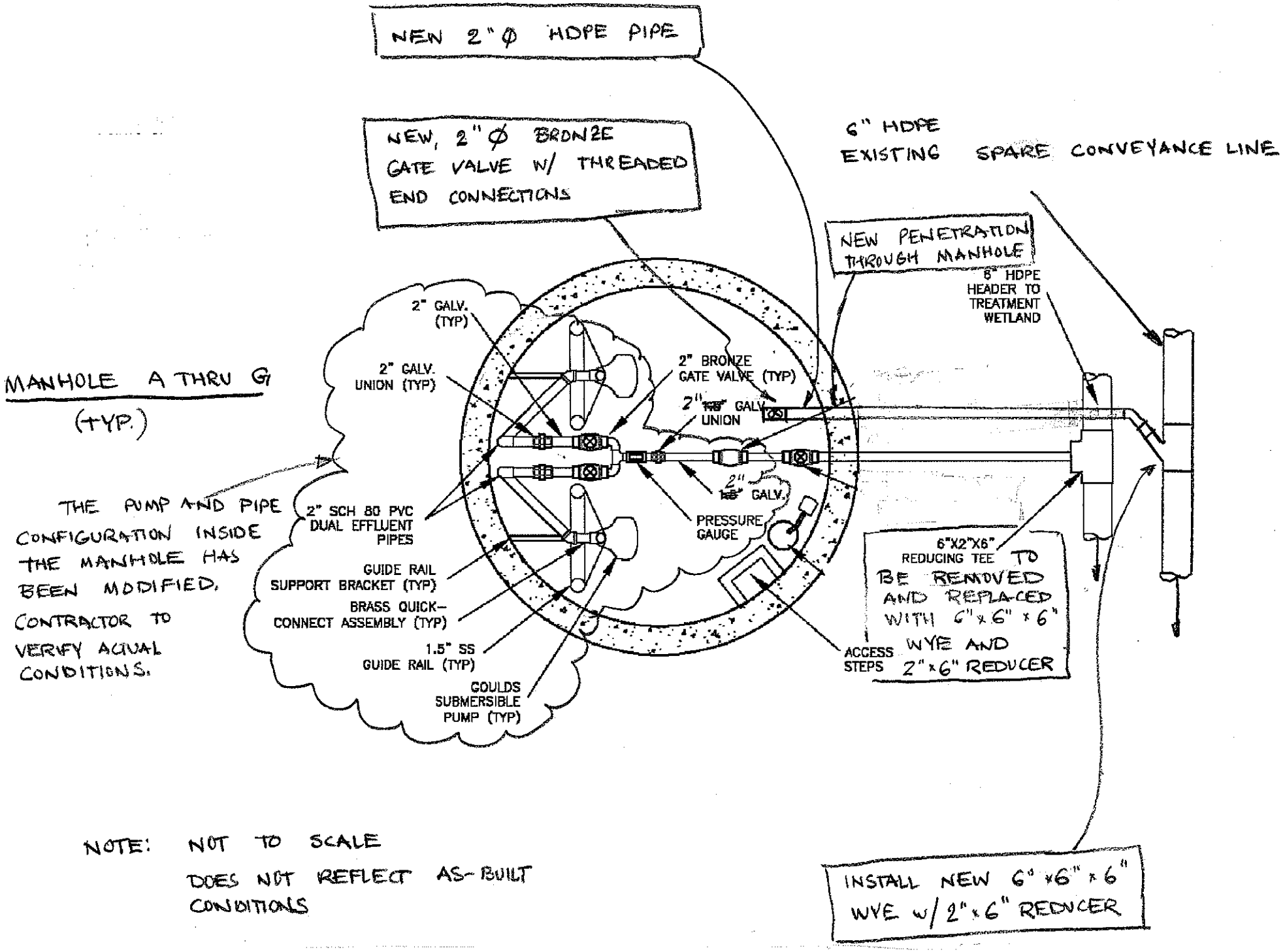
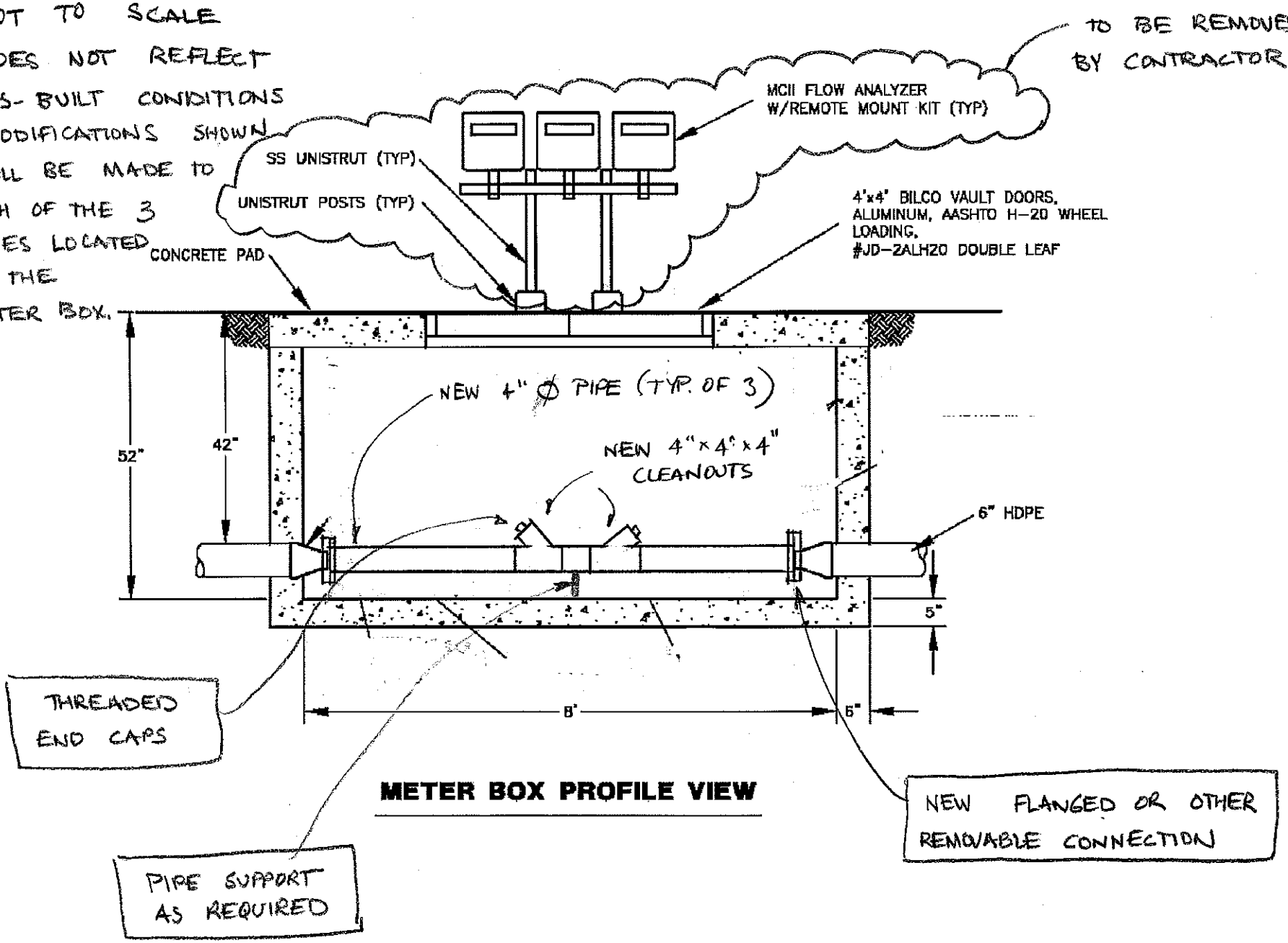


Figure 2 - Typical Manhole Installation View

NOTE: 1. NOT TO SCALE
2. DOES NOT REFLECT AS-BUILT CONDITIONS
3. MODIFICATIONS SHOWN SHALL BE MADE TO EACH OF THE 3 LINES LOCATED IN THE METER BOX.



METER BOX PROFILE VIEW

Figure 3

Attachment A

SECTION 15060
PLASTIC PIPE AND FITTINGS

PART 1: GENERAL

1.1 Summary

The Contractor shall furnish, install, test and place into operation all underground piping required to transport water from the extraction wells to the wetlands treatment areas. This piping includes two 6-inch groundwater conveyance lines, and a spare 6-inch line. Piping used for the transport of water shall consist of smooth-wall high density polyethylene (HDPE) materials. The Contractor shall furnish, install, test and place into operation all piping in the wetlands treatment area; the underground piping and the wetlands piping connection will be made by the contractor.

1.2 References

A. ASTM D3915 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds for Plastic Pipe and Fittings Used in Pressure Applications.

B. ASTM F1668 Standard Guide for Construction Procedures for Buried Plastic Pipe.

C. ASTM D1784 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

D. ASTM D2239 Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

E. ASTM D3350 Specification for Polyethylene Plastics Pipe and Fittings Materials

F. ASTM D2774 Standard Practice for Underground Installation of Thermoplastic Pressure Piping.

G. ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

1.3 Inspections

All work shall be inspected by an Authorized Representative of Atlantic Richfield Company who shall have the authority to halt construction if, in his opinion, these specifications or standard construction practices are not being followed. Whenever any portion of these specifications is violated, the Project Engineer or his Authorized Representative, shall, by written notice, order further construction to cease until all deficiencies are corrected.

PART 2: PRODUCTS

2.1 Piping

A. Piping and fittings conveying water from the extraction well vaults to the wetlands treatment areas shall be 6-inch diameter high density polyethylene (HDPE) with a minimum DR of 11 (minimum wall thickness – 0.602”; average inside diameter – 5.373”; weight – 4.971 pounds per linear foot) and standard grade hydrostatic design basis (HDB) rating of 160 psi at 73ºF. Pipe and fittings from different manufacturers shall not be interchanged.

B. HDPE piping and fittings shall be PE3408 in accordance with ASTM D-3350, cell classification of PE 345434C, and shall be so marked.

B. All fittings shall be factory manufactured by an approved manufacturer.

C. The twelve northern most wells piping shall be connected to a common 6-inch pipe routed to the wetlands treatment area. The remaining well piping shall be connected to the second 6-inch manifold directed to the wetlands treatment area. The second manifold will be connected to the southernmost wells. A separate, spare, 6-inch pipe will be routed to the wetlands treatment area through all of the wells.

2.2 Custom Fabrications and Manholes

A. Custom fabrications and manholes shall be constructed to shop drawings that have been approved by the Project Engineer. Manholes shall be designed in accordance with ASTM F 1759.

2.3 Polyethylene Flange Adapters

A. Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion-joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves (serrations) to promote gasketless sealing, or restrain the gasket against blowout.

B. Flange adapters shall be fitted with convoluted ductile iron back-up rings. The back-up ring bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.

PART 3: EXECUTION

3.1 General Requirements

All pipe and pipe fittings installed below-grade for the purposes of conveying water from the extraction wells to the wetlands treatment areas, and used as electric conduits for the extraction well equipment shall be installed inside excavated trenches prepared as specified in Section 02210 "Earthworks."

A. Pipe shall be cut in a neat manner with mechanical cutters. Sharp and rough edges shall be ground smooth and loose material removed from the pipe before laying. All piping shall be examined before assembly to ensure that all foreign materials, including pipe cuttings, are removed from the piping sections.

B. Piping connections and joints between plain end pipes and fittings shall be made by butt fusion using procedures recommended by the manufacturer.

C. Polyethylene pipe and fittings may be joined together or to other materials by means of (a) flanged connections (flange adapters and back-up rings), (b) mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material, (c) MJ Adapters, or (d) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be observed.

D. The pipe and pipe fittings must be completely clean and dry, free of any residual moisture, dust or dirt prior to the application of primer or glue. No pipe shall be laid in wet trench conditions or fitted under rainy weather conditions.

E. After the pipes have been laid and the joints have had a minimum time, as required by the manufacturer, to set, the Contractor may begin placing backfill material in the trench. There shall be no walking or working over the pipes (except as necessary in tamping) until there is a covering of at least two feet in depth over the pipe.

F. The interior of all pipes and fittings shall be kept clean during installation. Care shall be taken so that no dirt or other foreign materials enter the open end of the pipe. At the close of each workday, the end of the pipe shall be closed with a stopper to prevent soil or water from entering the pipe.

G. Buttresses and anchors shall be installed at all bends, tees, reducers or other special fittings where changes in direction or pipe size occur.

H. Plastic pipe shall not be laid when the temperature is below 40^{o} F.

I. All direction changes shall be made using long, sweeping bends.

J. The Contractor shall allow clearances for expansion and contraction of the pipe.

K. When lifting with slings, only wide fabric choker slings capable of safely carrying the load shall be used to lift, move, or lower pipe and fittings. Wire rope and chain are prohibited. Slings shall be of sufficient capacity for the load, and shall be inspected before use. Worn or damaged equipment shall not be used.

3.2 Piping Support Systems

A. No attempt has been made to show all required pipe supports in all locations where shown on the engineering drawings. The absence of pipe supports and details on any Drawing shall not relieve the Contractor of the responsibility for providing them where needed or in accordance with applicable Standards and Codes or manufacturers recommendations.

B. Where piping connects to equipment, piping connections shall be supported by pipe support, not equipment, instruments or controls.

C. Pipe support system components shall withstand the dead loads imposed by the weight of the pipe system (filled with water where applicable). Commercial pipe supports and hangers shall have a minimum safety factor of 5.

D. Horizontal piping runs shall be supported by a fiberglass or stainless steel framing system attached to acceptable anchors, Unistrut, Kin-Line or Resident Engineer approved equal. No pipe shall be supported from a pipe above it or in-line instruments, control devices or valves.

E. Vertical piping hangers and supports shall be channel and pipe straps manufactured by Unistrut, Kin-Line, or Resident Engineer approved equal.

F. All piping shall be supported in a manner which will prevent undue strain on any valve, fitting, instrument or control device, or equipment. In addition, supports shall be provided at changes in direction or elevation, adjacent to flexible couplings and where otherwise shown on engineering drawings.

G. Pipe shall be laid on a stable foundation that provides continuous support without voids below the pipe. Unstable trench bottom soils shall be removed, and a 6" foundation or bedding of compacted Class I material shall be installed to pipe bottom grade. Excess groundwater shall be removed from the trench before laying the foundation or bedding and the pipe. A trench cut in rock or stony soil shall be excavated to 6" below pipe bottom grade, and brought back to grade with compacted Class I bedding. All ledge rock, boulders, and large stones shall be removed. The trench bottom shall be graded to the requited slope before placing the pipe in the trench. Where bedding must be removed to provide clearance for devices such as mechanical joints, bolted flanges, or appurtenances, the bedding shall be replaced and compacted beneath the device before backfilling so that the pipeline grade and continuous support without voids are maintained. All necessary precautions shall be taken to ensure a safe working environment in accordance with all applicable safety codes and standards.

H. Embedment material soil type and particle size shall be in accordance with ASTM D 2774. Embedment shall be placed and compacted to at least 90% Standard Proctor Density in 6" lifts to at least 6" above the pipe crown. During embedment placement and compaction, care shall be taken to ensure that the haunch areas below the pipe springline are completely filled and free of voids.

3.3 Quality Control

A. Piping shall be designed and installed to allow for testing of new pipe sections connected to existing piping or piping installed by others. Use flanges, blinds, etc, as needed.

B. Contractor shall perform pressure testing of all pipe sections and fittings while piping is exposed, test prior to cover and backfill. The test method is to be approved by the QA Official and piping manufacturer. Prior to final acceptance of the piping system by the QA Official, the Contractor shall perform hydrostatic testing of the piping systems. Contractor shall provide Engineer twenty-four (24) hours notice to witness piping test prior to completion of test and backfill. The Contractor shall supply to the Engineer a written procedure for conducting the test at least one week in advance of conducting any tests; the procedure must be in accordance with the manufacturers recommendations/requirements.

C. Test pipe in accordance with piping manufacturer's recommendations. Contractor shall provide all material, equipment and labor for testing of piping systems. At a minimum, records shall include:

1. Date and time of test,
2. Description, identification and location of piping tested,
3. Test fluid,
4. Test pressure and duration,
5. Remarks and notes identifying any leaks or other issues,
6. Repairs made,
7. Results of retest, and
8. Certification by Contractor that the test was conducted and successful in accordance with the manufacturers recommendations and signed acknowledgment by the QA Official.

END OF SECTION

Attachment B

Attachment B Pressure Test Procedure

Notify Engineer at least 24-hours prior to test so that Engineer can observe test. Charge line with water prior to starting test. Vent air from line at each manhole and cleanout along the portion of the line being tested. Pressurize line to a target pressure 50 pounds per square inch (psi), which is slightly more than 150% of the maximum head (67 feet of water) that can be produced by pumps in the manholes. Note the initial pressure observe throughout the test. The line will be deemed to pass the pressure test if the final pressure is within 5% of the initial pressure after 90 minutes. Data from the pressure test will be provided to the Engineer after the test.