GW-010

APPROVALS

DATE:
03.2011

Lowe, Leonard, EMNRD

From: VonGonten, Glenn, EMNRD
Sent: Friday, March 25, 2011 4:12 PM
To: James C. Hunter, RG; Rose.Slade@SUG.com
Cc: Sanchez, Daniel J., EMNRD; Lowe, Leonard, EMNRD
Subject: RE: Revised Scope of Work for Tank Closure and Retrofitting at SUGS Jal #3 Gas Plant

James,

OCD has received and reviewed SUG's revised scope of work for the below-grade tanks at the SUGS Jal No. 3 Gas Plant and hereby approves the plan as proposed with the following condition: SUG shall submit a closure report documenting all work conducted during the closure and shall provide the analytical data collected during the closure activities no later than three months after beginning closure. The closure report should contain a sufficient number of photographs to document the closure activities.

Please call Leonard Lowe at 505-476-3492 with any questions. Thank you for your cooperation during this review process.

Glenn

From: James C. Hunter, RG [mailto:jch@geolex.com]
Sent: Thursday, March 24, 2011 11:29 AM
To: VonGonten, Glenn, EMNRD
Cc: Lowe, Leonard, EMNRD; 'Slade, Rose'; curt.stanley@sug.com; jacob.krautsch@sug.com; herb.harless@sug.com; aag@geolex.com
Subject: Revised Scope of Work for Tank Closure and Retrofitting at SUGS Jal #3 Gas Plant

Mr. von Goten:

In response to you comments last week, and our telephone conversation on Monday, we are submitting the final version of the Scope of Work for the tank work at the SUGS Jal #3 Gas plant.

Thank you for your offer to review this submittal in the next few days. SUGS will proceed to schedule the field work as soon as we receive your final approval.

James C. Hunter, R.G.

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APPROVED 3.25.11 Lowe

GvG 2

Alberto A. Gutiérrez, C.P.G.

March 24, 2011

RECEIVED OCD
2011 MAR 25 A 10:15

Mr. Glenn von Gonten
Environmental Bureau Chief
New Mexico Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, New Mexico 87505

VIA EMAIL AND FIRST CLASS MAIL

RE: PROPOSED RETROFITTING AND CLOSURE OF SUBGRADE TANKS AT SOUTHERN UNION GAS SERVICES JAL #3 GAS PLANT (SECTION 33, TOWNSHIP 24 SOUTH, RANGE 37 EAST – NMOCD PERMIT GW010)

Dear Mr. von Gonten:

Pursuant to our meeting in February and following the comments on our proposal from NMOCD sent last week we are submitting our final plan for the retrofitting and closure of several existing below-grade tanks at the Southern Union Gas Services (SUGS) Jal #3 gas plant. As described in detail below, SUGS will modify several elements of their wastewater management system pursuant to the conditions required in the March 7, 2008 approval of the renewal of their currently approved NMOCD Discharge Plan GW-10.

Purpose and Scope

In accordance with the conditions of NMOCD DP GW-10 and in consultation with your office, Geolex and SUGS have developed a plan and schedule for closure of the Contingency Tank, the Classifier Tank, and replacement of three miscellaneous wastewater collection sumps which are considered below-grade tanks at the Jal #3 Gas Plant. Locations of these units are shown in Plates 1-6.

The closure of the contingency and classifier tanks and replacement of the below-grade tanks will achieve:

- the separation of cooling tower blowdown from other wastewater streams and reroute this blowdown, which does not require separation, directly to the above-ground surge tank for the AGI well.
- compliance with existing NMOCD subsurface pit/tank rules, 19.15.17.8 (A) NMAC and 19.15.17.9 NMAC.
- a retrofit (per 19.15.17.11 I(1-6) NMAC) of three existing wastewater below-grade tanks, which are operated under 19.15.17.12 (D) NMAC
- closure of the existing Contingency Tank in-place.
- the removal and replacement of the two Classifiers currently below-grade with above-grade separation tanks within secondary containment.

Since the cooling tower blowdown water is non-contact, it does not contain hydrocarbons and does not require phase separation. The separation and isolation of the cooling tower blowdown from other hydrocarbon-contacted Class II wastewater will reduce the amount of water now flowing into the Classifier by approximately 90%. This will eliminate the need for the existing Contingency Tank and allow the new Classifier Tanks to be much smaller and more easily maintained and operated within an above-ground secondary concrete containment. The non-hydrocarbon contact cooling tower blowdown water will be piped directly to the surge tank at the Jal 3 AGI #1 permitted injection well (API # 3002538822), while the oily wastewater will be separated in a new separation tank system (replacing the

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Classifiers) prior to the delivery of the aqueous phase to the well and the routing of the recovered hydrocarbon phase for recycling in the plant's three phase system.

All new below-grade tanks will be constructed using a standard design (per 19.15.17.9 B (4) NMAC) double-wall design with integral leak detection. General specifications for the new below-grade tanks are included in Appendix A. The existing Classifier Tanks will be closed and replaced with existing above-ground tanks, protected by a concrete secondary containment designed to hold at least133% of the maximum amount of fluids to be held in the new above-grade separation tanks.

During the retrofitting of the below-grade tanks and the closure of the existing Classifiers, soils will be visually inspected for stains or excessive moisture, and potential releases will be investigated and reported as necessary. As described below, both the Contingency Tank and adjacent exposed soils will be visually inspected prior to its closure in place. During the closure of the Classifier Tanks, if visual evidence of a release is detected, representative soil samples will be collected and analyzed according to 19.15.17.13 E (1-6) NMAC to determine if any impacts to the soils have been caused by previous operations. Any required soil sampling will follow Part 17 closure standards include analyzing a 5-point composite sample for benzene (8021B or 8260B), <0.2 mg/kg, Total BTEX (8021B or 8260B), <50 mg/kg, TPH (418.1) <100 mg/l, and chlorides (300.1, 300.0 or SM 4500B) <50 mg/l or less than background. If a visual inspection of the soils indicate that impacts have occurred, NMOCD will be notified verbally within 24 hours of analytical result verification per 19.15.17.13 E (4) NMAC, and followed by documentation on Form C-141 if needed. Appropriate remediation plans would then be developed, approved by NMOCD, and implemented consistent with applicable regulatory standards.

Following the completion of this retrofit and replacement program and, if necessary, remediation tasks, the final specifications and as-builts will be provided to NMOCD in conjunction with the required modifications to the Discharge Plan.

Procedures for Tank Closure and Retrofitting Tasks

We intend to close the existing Contingency Tank (Figure 1, Plate 6) in place. This closure will consist of removing and disposal of all of the contents of the Contingency Tank (oily water and sludges) at an NMOCD-approved facility, followed by a thorough cleaning of the tank, and detailed inspection. If the inspection shows no evidence of releases, we will close the tank by cutting the tank walls to a level several feet below existing grade, filling the tank with clean fill, and re-grading the site. Because the Contingency Tank is located within the process areas of the plant, the final soil cover will consist of the engineered fill used throughout the plant. A permanent steel marker will be placed to document the location of the closed tank for safety reasons, and to facilitate the necessary infrastructure removals during the potential closure of the entire Jal #3 facility in the future.

If the visual inspection of the Contingency Tank bottom and sides after cleanout indicates that releases may have occurred, representative soil samples will be collected and analyzed pursuant to 19.15.17.13 E (1-6) NMAC to determine if any impacts to the soils have been caused by previous operations. If required, this sampling will be performed pursuant to Part 17 closure standards which include analyzing a 5-point composite sample for benzene (8021B or 8260B), <0.2 mg/kg, Total BTEX (8021B or 8260B), <50 mg/kg, TPH (418.1) <100 mg/l, and chlorides (300.1, 300.0 or SM 4500B) <50 mg/l or less than background. If impacts are determined to have occurred (per 19.15.17.13 E (4) NMAC), NMOCD will be notified verbally within 24 hours of analytical result verification, followed by documentation in a Form

C-141. Appropriate remediation plans will be developed, and submitted for review and approval by NMOCD.

The two existing Classifier Tanks(Figure 2, Plate 6) will be closed and replaced with an above-ground separation tank system within a concrete containment (Figure 3) structure that is approximately 28" tall and currently contains two tanks (one of which is completely out of service and will be removed). Two additional new above-grade separation tanks will be located adjacent to the location of the existing Classifier Tanks.

The existing below-grade wastewater tanks will be replaced with new below-grade tanks. These below-grade tanks will collect oily wastewaters and feed the wastewaters to the new separation tanks. These new tanks will be pre-manufactured, standard-design, double-walled fiberglass tanks with integral leak detection. A representative tank is shown in Figures 4 and 5.

Below-grade tank 1a ("West Sump"; Figure 6, Plate 3) was installed in a virgin location as a replacement for the former below-grade tank 1 (Plate 2), which was located on the northern side of the S-Plant approximately 800 feet to the south and which was only in service for approximately 3 years. Inspection during the removal of the former below-grade tank 1 showed no indications (staining or moisture) of releases. This below-grade tank holds oily wastewater from the S-Plant, and discharges to the current Classifier and Contingency Tank system. Below-grade tank 1a is constructed from double-walled fiberglass construction, with leak detection. Other than documentation and approval for the final report by NMOCD, no additional work will be performed at this new below-grade tank location.

Three other below-grade tanks ("West Boiler Sump", "East Boiler Sump" Figures 7 and 8, Plate 4; and "North Sump", Plate 5)) will also be closed and replaced with manufactured double-walled fiberglass tanks with leak detection. Where possible, the new below-grade tanks will be located in the same locations as, or immediately adjacent to the existing below-grade tanks being removed. If impacted soils are discovered during the retrofitting process, alternative locations may be used to allow remediation without any interruption of process activities.

If no constituents of concern are found at levels requiring remediation, the existing below-grade tanks will be removed and the new, double-walled below-grade tanks will be installed in the same original locations. If remediation is required, SUGS will select alternative locations for the new below-grade tanks, and a remediation plan will be developed and submitted to NMOCD for review and approval.

To allow inspection, NMOCD will be notified at least 48 hours prior to the excavation and sampling associated with each retrofit and/or closure. Following completion of the retrofitting and closure operations, a final report will be submitted describing the work performed, along with engineering diagrams of the as-built work, stamped by a licensed Professional Engineer. This documentation will be included as a modification of the existing Discharge Plan (GW-10) for the Jal #3 Gas Plant.

If this revised plan incorporating NMOCD comments for the modifications of the wastewater system are acceptable, please advise us immediately so that SUGS and Geolex can schedule the field work.

Thank you again for your consideration in these matters. We look forward to your prompt approval and our implementation of these improvements which will have a substantial environmental and operational benefit. If you have any additional questions regarding this matter, please call me or Alberto at 505-842-8000, or contact us by email at jch@geolex.com or aag@geolex.com, respectively.

Sincerely,
Geolex, Inc.®

James C. Hunter, R.G.
Senior Hydrogeologist

Enclosures

cc: Mr. Leonard Lowe, NMOCD
Mr. Alberto A. Gutierrez, R.G., Geolex
Mr. Rose Slade, SUGS
Mr. Jacob Krautsch, SUGS

Projects/10-008/Correspondence/vonGonten001.ltr.docx

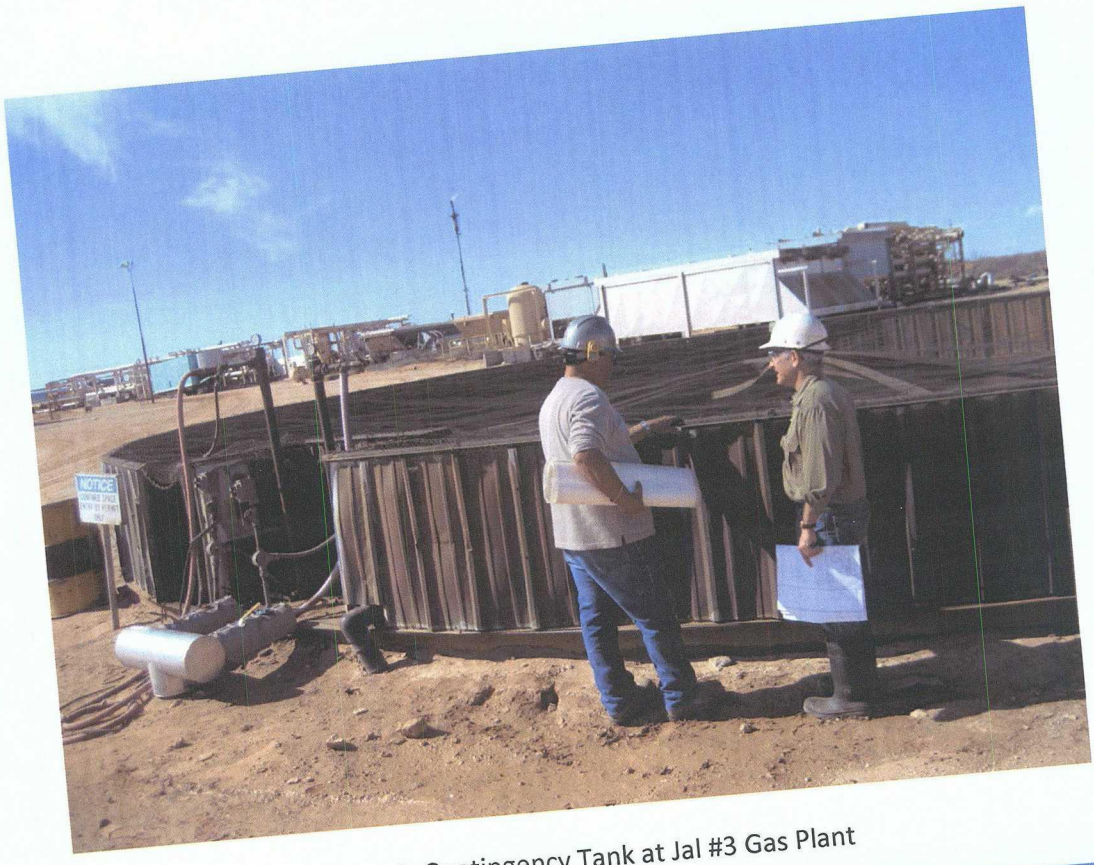

Figure 1: Contingency Tank at Jal #3 Gas Plant

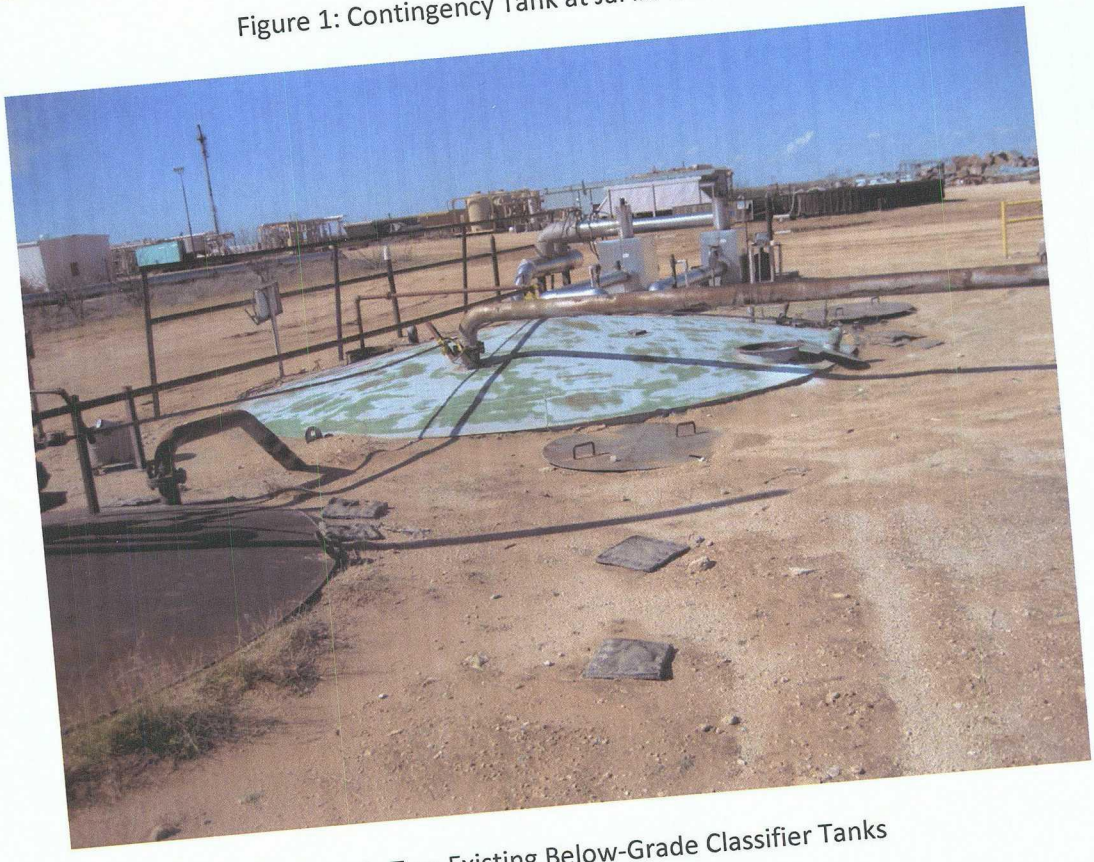

Figure 2: Two Existing Below-Grade Classifier Tanks

Figure 3: Existing Above-Ground Tanks in Concrete Secondary Containment Which Will Replace Existing Below-Grade Classifier Tanks

Figure 4: Typical Fiberglass Double-Walled Below-Grade Tank

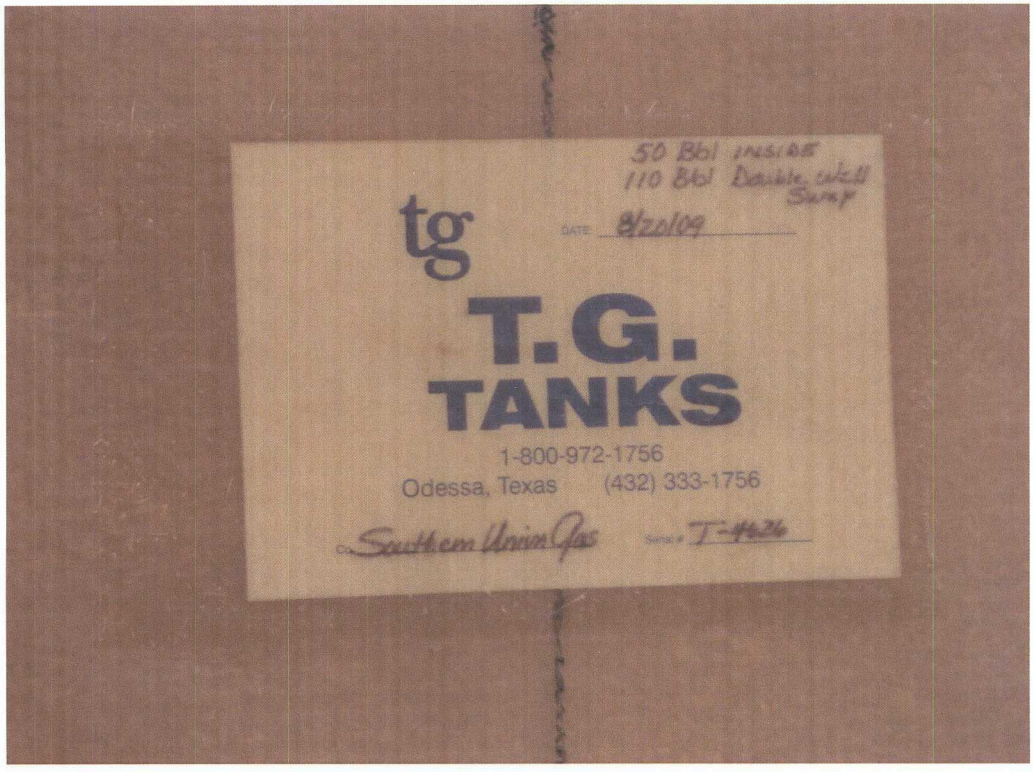

Figure 5: Detail of Typical Fiberglass Double-Walled Below-Grade Tank

Figure 6: Completed New Below-Grade Tank "West Sump" Installation

Figure 7: Existing Below-Grade Tank #2 (East Boiler Sump)

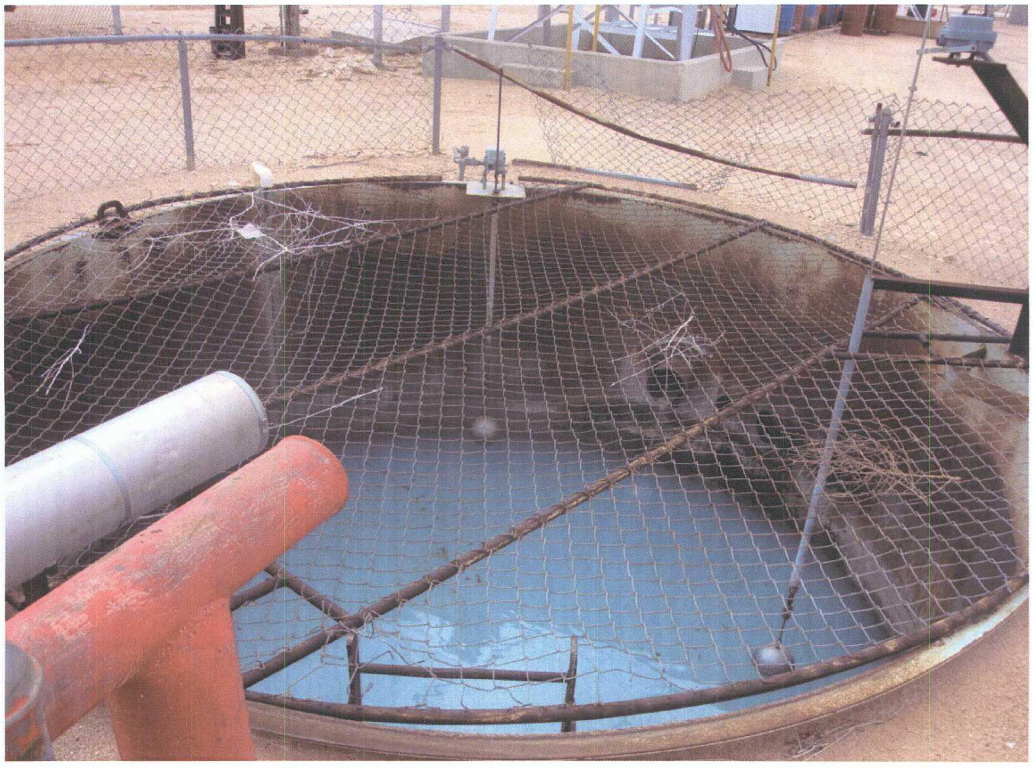

Figure 8: Existing Below-Grade Tank #3 (West Boiler Sump)

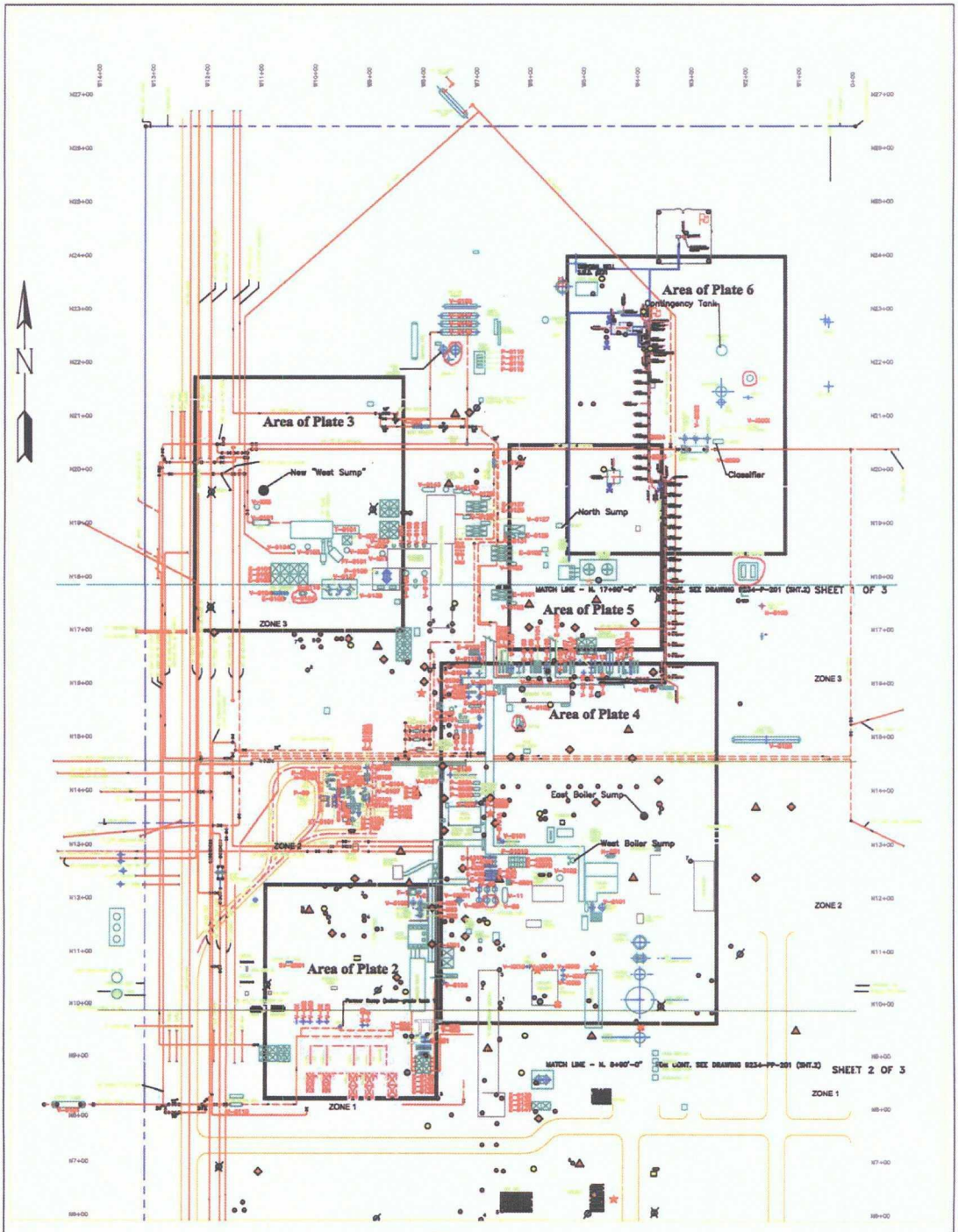

Plate 1:
General Facility Map and Locations of Plates 2-6

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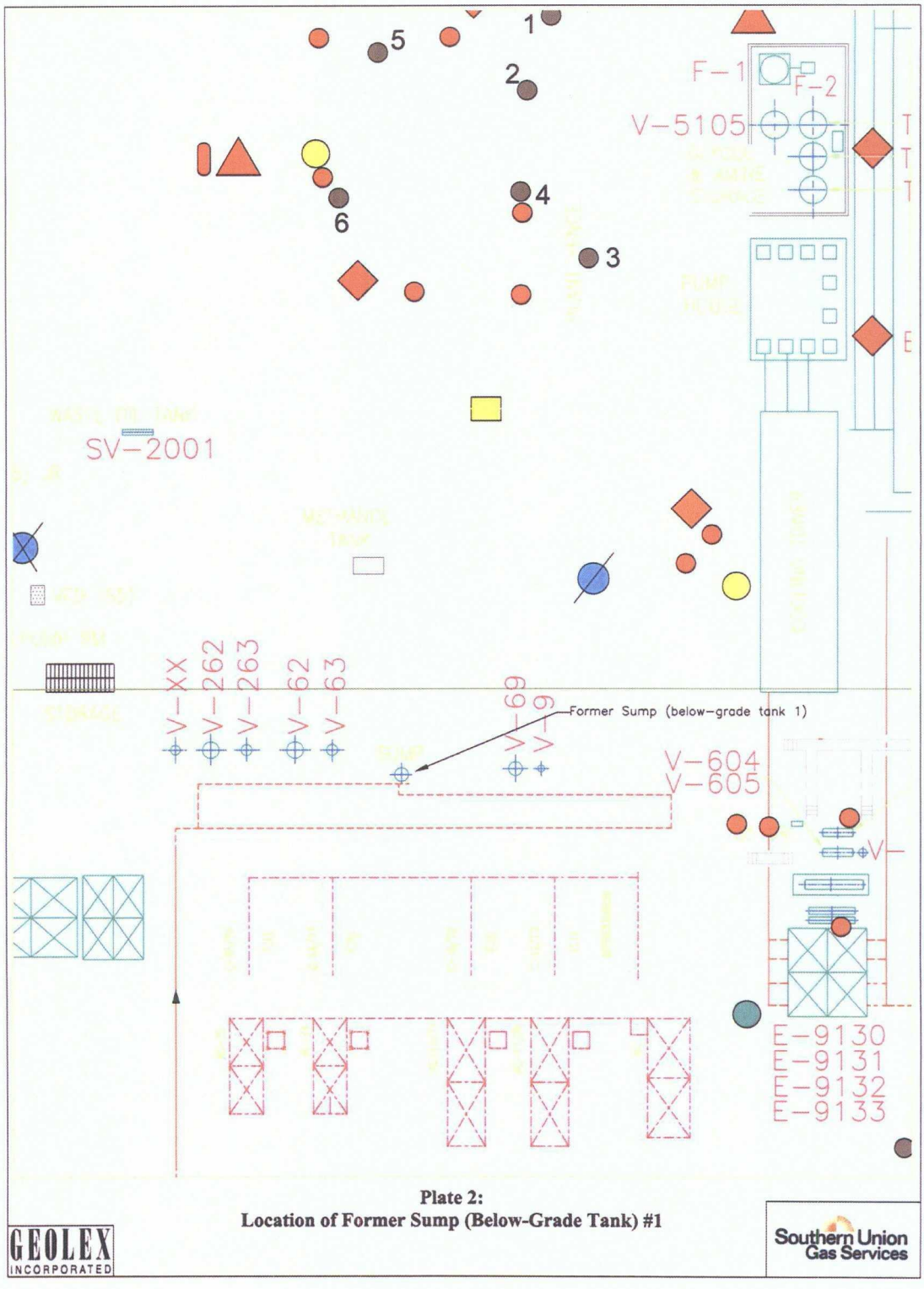

Plate 2:
Location of Former Sump (Below-Grade Tank) #1

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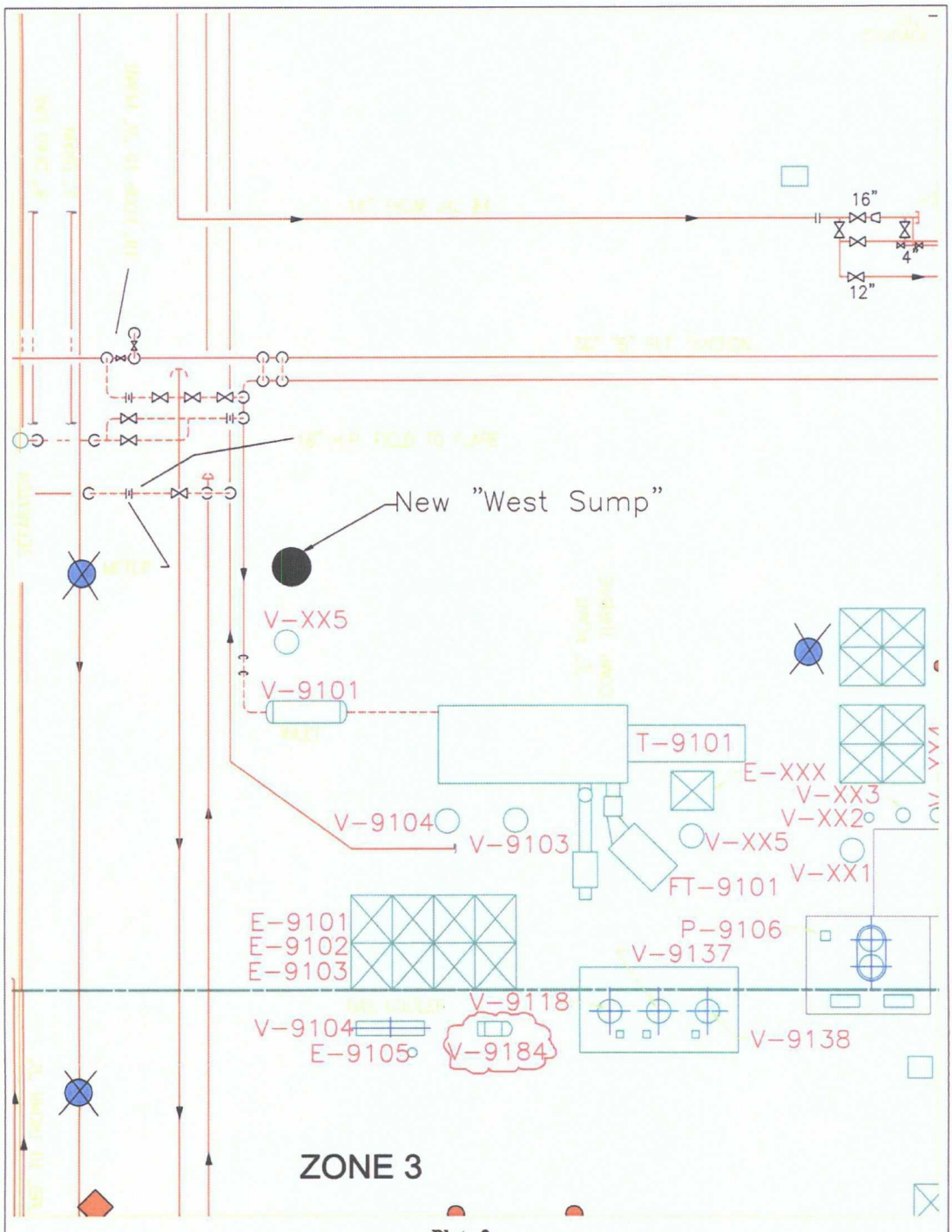

Plate 3:
Location of New "West Sump" (Below-Grade Tank) #1A

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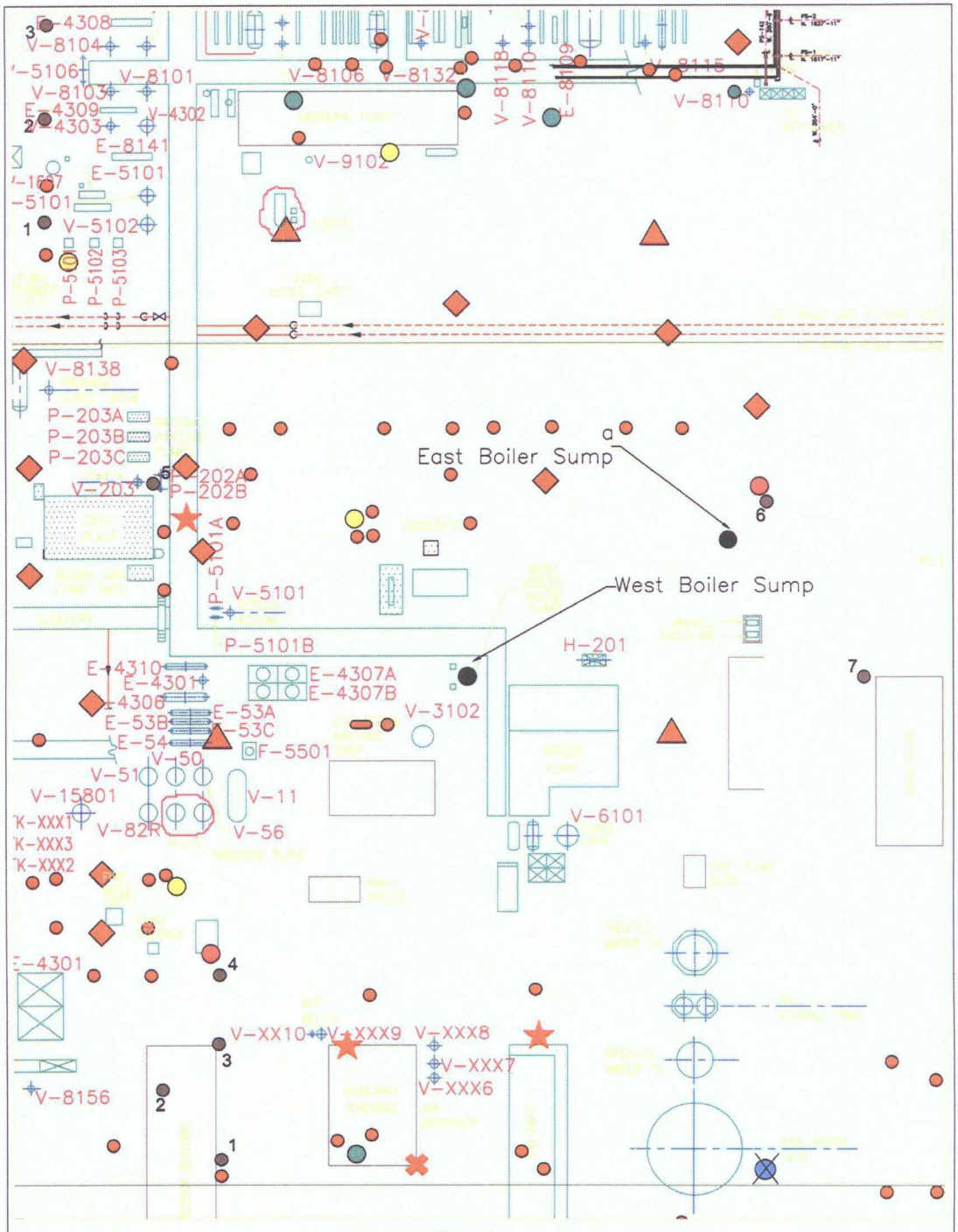

Plate 4:
Location of "West Boiler" and "East Boiler" Sumps (Below-Grade Tanks)

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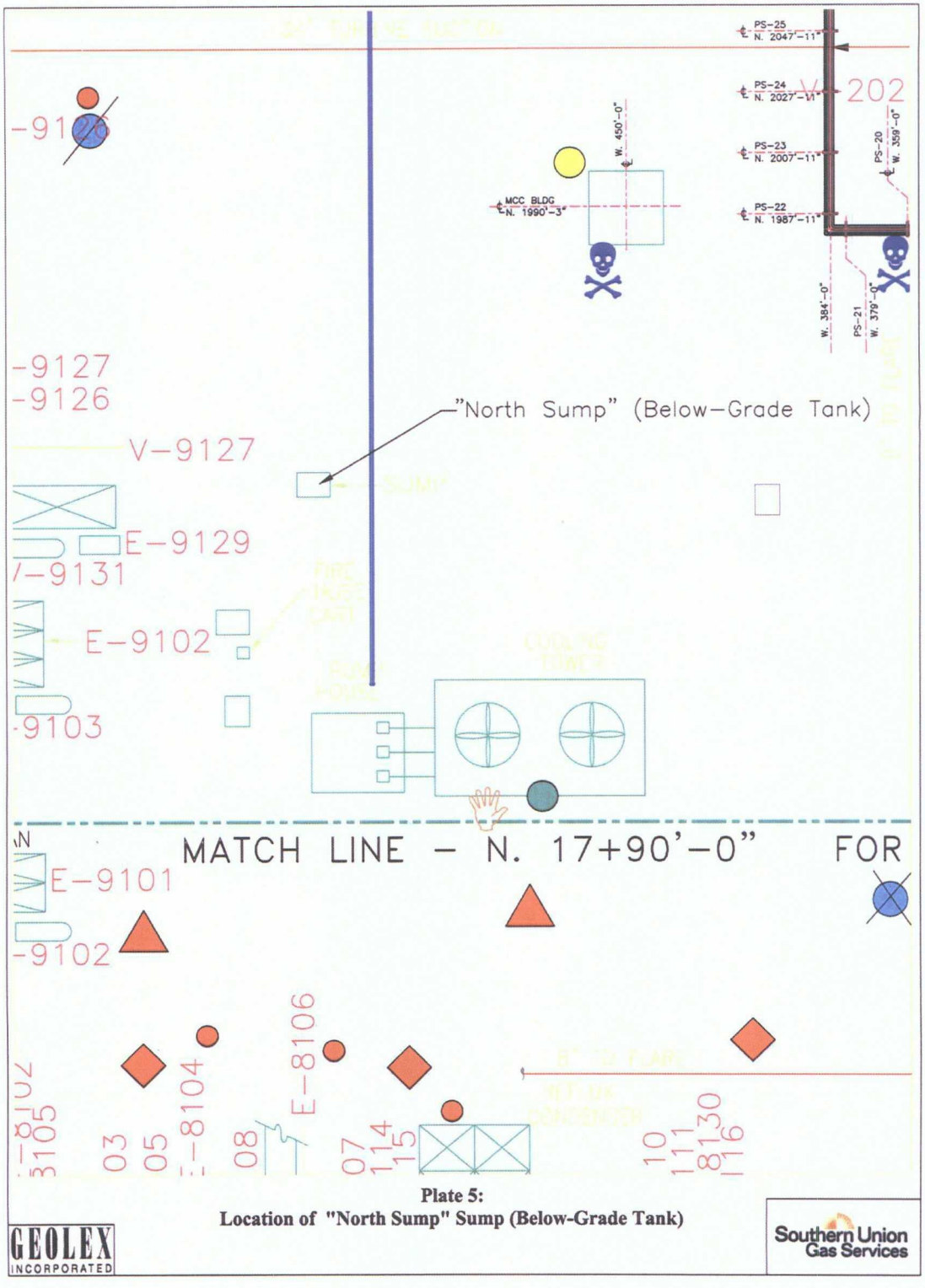

Plate 5:
Location of "North Sump" Sump (Below-Grade Tank)

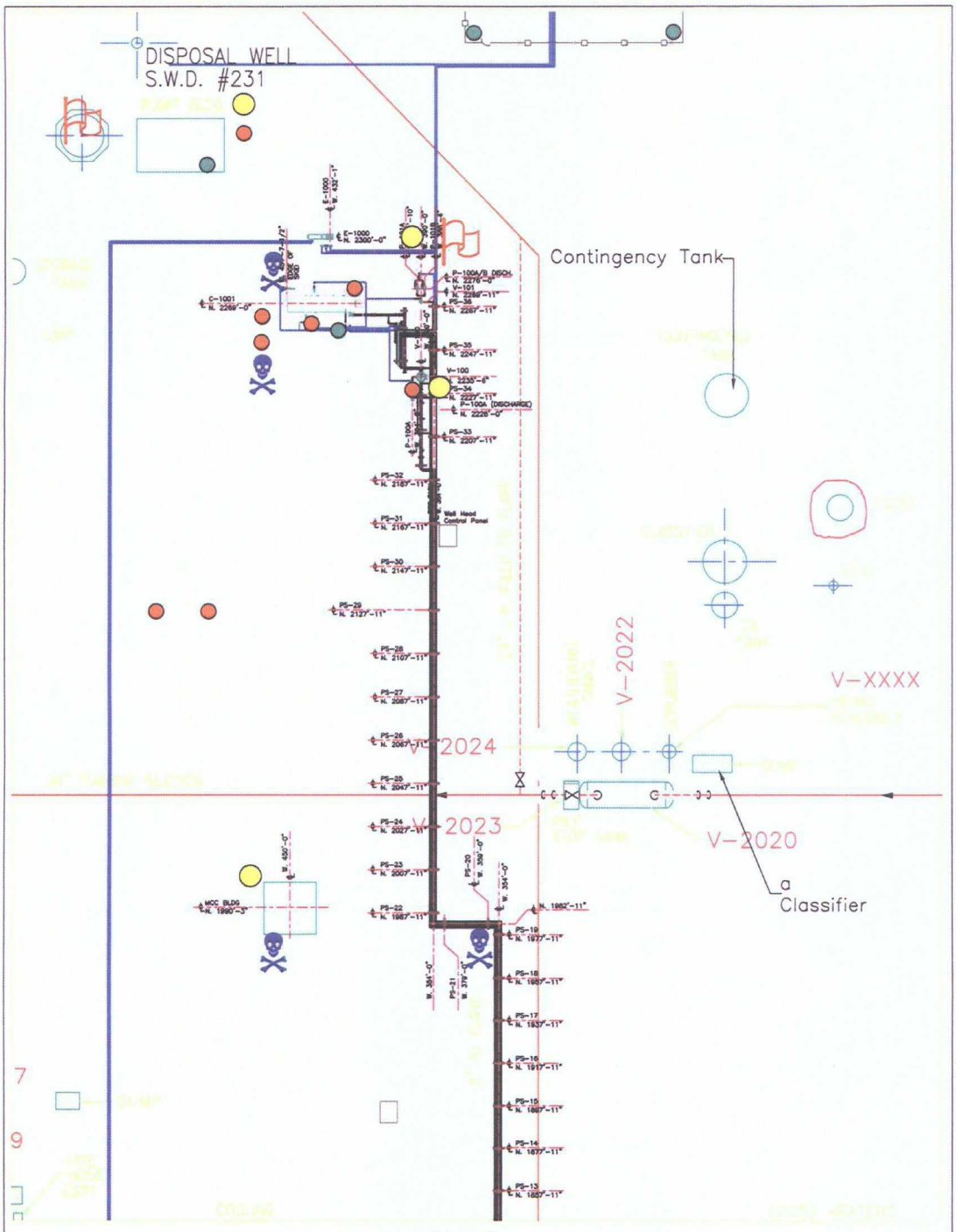

Plate 6:
Location of Contingency Tank and Classifier

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APPENDIX A:

SPECIFICATIONS FOR DOUBLE-WALLED FIBERGLASS TANKS

1. APPLICABLE STANDARDS: (Double Wall Sump)

Unless otherwise agreed to between T-G-TANKS and purchaser, the design, fabrication, testing, and installation of T-G-TANKS storage tanks will meet or exceed the following industry standards:

A.S.T.M. D-3299-88 – Filament Wound Glass-Fiber-Reinforced Thermoset Resin Chemical-Resistant Tanks.

A.S.T.M. D-4097-88 – Contact Molded Glass-Fiber-Reinforced Thermoset Resin Chemical-Resistant Tanks.

Where applicable, provision from A.N.S.I./A.W.W.A. D120-84 – Thermoset Fiberglass Reinforced Plastic Tanks and A.S.M.E./A.N.S.I. RTP-1-1995 – Reinforced Thermoset Plastic Corrosion Resistant Equipment will be used.

Due to variations between the above specifications, many possibilities of design parameters are available. Design characteristics may be modified to suit. Consult with the factory for more specific details.

1.1 DESCRIPTION OF TERMS:

1.1.1 Definitions for most terms used within this standard are in accordance with A.S.T.M. D-883 Definitions of terms relating to plastics.

1.1.2 FILAMENT WOUND – The process in which the principle circumferential load bearing reinforcement is applied by continuous filament winding.

1.1.3 CONTACT MOLDED – A molding process that includes spray-up, hand lay-up, or a combination of those manufacturing processes.

1.1.4 HEAD – The end closure of cylindrical tanks (top or bottom).

1.2 TANK CLASSIFICATION – Tanks will be classified in the following manner:

Type I: Atmospheric pressure tanks vented directly to the atmosphere, designed for pressure no greater or lower than atmospheric.

Type II: Atmospheric pressure tanks vented directly into a fume conservation system, and designed to withstand the specified positive and negative pressure not to exceed 14 in. of water when all tie-down lugs are properly secured.

CLASS I: (Premium) Tanks manufactured using a vinylester resin throughout.

3. MATERIALS.

3.1 RESIN – The resins used shall be a corrosion resistant vinylester or isophthalic polyester thermoset resin that has been determined by previous documented service to be acceptable for the particular service conditions.

3.1.1 The resin shall contain no pigments, colorants, or fillers unless specified by the customer.

3.1.2 Ultraviolet absorber may be added to exterior resin layer if specified by the customer.

3.1.3 3-5% Antimony Trioxide may be added to halogenated resin in the structural laminate only, to increase the ignition resistance of the resin.

3.2 REINFORCEMENTS:

3.2.1 SURFACING VEIL – The inner surface reinforcement shall consist of either a synthetic fiber veil or a chemical resistant glass veil. The surfacing veil shall contain a coupling agent or binder that is compatible with the corrosion barrier resin. Veil thickness shall be 10 mil. minimum.

3.2.2 CHOPPED STRAND MAT OR GUN APPLIED CHOPPED STRANDS – shall be constructed from single-end type E-glass strands 1/2" minimum to 2" maximum length. The coupling agent or binder shall be compatible with the resin used.

3.2.3 CONTINUOUS ROVING – Filament winding requires a single-end type E-glass reinforcement with 250 yards/pound yield. The coupling agent or binder shall be compatible with the resin used.

3.2.4 WOVEN ROVING – Shall be minimum 18 ounces/square yard and compatible with the resin used.

4. LAMINATE CONSTRUCTION:

4.1 STRUCTURAL INNER TANK - The laminate comprising the structural tank (bottom head, sidewall, and top head) shall consist of three separate laminates. These are the inner surface and the interior layer which make up the corrosion barrier, and the structural layer, the exterior layer and the exterior surface.

4.1.1 INNER SURFACE – The inner surface exposed to the chemical environment shall be a resin rich layer .010 to .020 inch thick, reinforced with a surfacing veil. The glass content shall be 10% by weight maximum in this layer.

4.1.2 INTERIOR LAYER – The interior layer shall consist of a resin rich laminate reinforced with chopped strands. The glass content shall be 27% +/- 5% by weight. The combined thickness of the inner surface and the interior layer shall not be less than 0.100 inch.

4.1.3 STRUCTURAL LAYER:

4.1.3.1 FILAMENT WOUND STRUCTURAL LAYER – Subsequent reinforcement shall be continuous strand roving. Glass content of the filament wound structural layer shall be 60% to 70% by weight. The thickness of the filament wound portion of the tank shell will vary with tank height (tapered wall construction). If additional axial strength is required, the use of chopped strands or unidirectional glass strands interspersed between wind layers is acceptable.

4.1.3.2 CONTACT MOLDED STRUCTURAL LAYER – Subsequent reinforcement shall be comprised of alternating layers of chopped strands and such additional number of plies of woven roving to a thickness as required to meet the physical properties that are used for the design. Each successive ply or pass of reinforcement shall be well rolled prior to the application of additional reinforcement. All woven shall be overlapped 1". Laps in subsequent layers shall be staggered at least 3" from laps in the preceding layer. The final outer layer shall be chopped strands in all cases.

4.1.4 EXTERIOR LAYER – The exterior layer shall consist of a resin rich laminate reinforced with chopped strands. The glass content shall be 27% +/- 5% by weight. The thickness of the exterior layer will be 0.30 inch thick.

4.1.5 EXTERIOR SURFACE – The exterior surface shall be a resin rich layer 0.010 to 0.020 inch thick, reinforced with a surfacing veil. The glass content shall be 10% by weight maximum in this layer.

4.2 INTERSTITIAL SPACE – The tank shall have an interstitial space of 0.08 to 0.12 thick with biplanar flow to allow product to gravity flow to the leak detection.

4.3 STRUCTURAL OUTER TANK – The laminate comprising the structural outer tank (sidewall and bottom head) shall consist of three separate laminates. These are the inner surface and the interior layer which make up the corrosion barrier and the structural layer.

4.3.1 INNER SURFACE – The inner surface exposed to the chemical environment shall be a resin rich layer 0.010 to 0.020 inch thick, reinforced with a surfacing veil. The glass content shall be 10% by weight maximum in this layer.

4.3.2 INTERIOR LAYER – The interior layer shall consist of a resin rich laminate reinforced with chopped strands. The glass content shall be 27% +/- 5% by weight. The combined thickness of the inner surface and the interior layer shall not be less than 0.100 inch.

4.3.3 STRUCTURAL LAYER:

4.3.3.1 FILAMENT WOUND STRUCTURAL LAYER – Subsequent reinforcement shall be continuous strand roving. Glass content of the filament wound structural layer shall be 60% to 70% by weight. The thickness of the filament wound portion of the tank shell will vary with tank height (tapered wall construction). If additional axial strength is required, the use of chopped strands or unidirectional glass strands interspersed between wind layers is acceptable.

4.3.3.2 CONTACT MOLDED STRUCTURAL LAYER – Subsequent reinforcement shall be comprised of alternating layers of chopped strands and such additional number of plies of woven roving to a thickness as required to meet the physical properties that are used for the design. Each successive ply or pass of reinforcement shall be well rolled prior to the application of additional reinforcement. All woven shall be overlapped 1". Laps in subsequent layers shall be staggered at least 3" from laps in the preceding layer. The final outer layer shall be chopped strands in all cases.

4.3.3.3 The outer surface shall be coated with a 10 mil. thick layer of resin for spill protection. This layer may contain ultraviolet absorbers, pigments, or fire retardant additives if specified by the customer.

4.3.3.4 Where air inhibited resin is exposed to air during cure, a full surface cure shall be obtained by coating the surface with a coat of resin containing 0.2% to 0.6% paraffin wax surfacing agent. (The acetone sensitivity test can be used to check surface cure, see Section 13.2, page 11).

4.4 JOINTS:

4.4.1 The cured resin surfaces of parts to be joined shall be ground to expose the glass fiber reinforcement. The ground area shall extend beyond the lay-up areas so that no reinforcement is applied to an unprepared surface. The surface shall be clean and dry before lay-up. The entire ground area shall be coated with paraffinated resin after joint overlay is made.

4.4.2 The gap between bell and spigot joints shall be filled with a resin pour to eliminate any air pockets between the two pieces to be joined.

4.4.3 Highly filled resin putty shall be spread over the crevices and irregular shapes between joined pieces, leaving a smooth surface for lay-up.

4.4.4 The width of the first layer of joint overlay shall be 6" minimum. Successive layers shall increase 2" width to form a smooth contour laminate that is centered on the joint +/- 1/2 inch.

4.5 FITTINGS AND ACCESSORIES

4.5.1 The surfaces of fittings and accessories exposed to product shall have the same corrosion barrier laminate as outlined in section 4.1.1 and 4.1.2.

4.5.2 The cut edges of all laminates exposed to the product shall be sealed with the corrosion barrier laminate as outlined in 4.1.1 and 4.1.2.

4.5.3 Where shape, thickness, or other restrictions preclude covering the edges with the laminate outlined in 4.1.1 and 4.1.2, the edges shall be coated with paraffinated resin.

4.5.4 NOZZLE AND MANWAY INSTALLATION – follow the requirements of ASTM D-3299 or D-4097 for minimum installation standards.

4.5.5 NOZZLE AND MAYWAY CUTOUT REINFORCEMENT – Where a tank sidewall or head is cut in an area bearing hydrostatic pressure, the cutout reinforcing laminate shall not be less than two times the nominal nozzle diameter. For nozzles less than 6" diameter, the reinforcement diameter shall be the nozzle size plus 6".

4.5.5.1 CUTOUT REINFORCEMENT LAMINATE THICKNESS – The thickness of the cutout reinforcement laminate shall be determined using the following formula, but shall not be less than 1/4 inch.

$$Tr = 0.036 \times \gamma \times H \times D \times K / 2\,Sr$$

WHERE:

Tr = Cutout reinforcement laminate thickness (in inches)
γ = Specific gravity of product.
H = Height of liquid above nozzle.
D = Tank nominal inside diameter (in inches).
K = 1.0 for nozzles 6 inch diameter and larger.
K = (d/dr-d) for nozzles less than 6 inch diameter.
Sr = Allowable tensile stress (not to exceed 10% of reinforcement laminate tensile strength).
d = Nominal nozzle diameter (in inches).
dr = Cutout reinforcement diameter (greater of 2 times d or d+6) (in inches).

This thickness (Tr), may be applied to the outer or inner surfaces, or be divided between them.

4.6 LEAK DETECTION AND VENT DRIER:

5. LAMINATE DESIGN PHYSICAL PROPERTIES:

T-G-TANKS standard laminate design physical properties meet or exceed ASTM D-3299, ASTM D-4097 and ASME RTP-1 standards.

6. DESIGN REQUIREMENTS:

6.1 SIDEWALL – The minimum required wall thickness of the cylindrical straight shell at any fluid level shall be determined by using the following formula, but shall not be less than 1/4".

$$t = .036 \times \gamma \times H \times D / 2 \times Sh$$

WHERE:

t = Wall thickness in inches.
γ = Product specific gravity.
H = Fluid head in inches.
D = Tank nominal diameter in inches.
Sh = Allowable hoop stress in P.S.I. (see 6.1.1).

6.1.1 Allowable stress shall be determined using the following formula:

$$Sh = Et \times Z$$

WHERE:

ET = Tensile Modulus of laminate in hoop direction.
Z = Allowable strain (maximum allowable strain of the tank shall not exceed 0.001 inch/inch).

6.1.1.1 Allowable hoop stress (Sh) shall not exceed 1/10 of hoop tensile strength.

6.2 TOP HEAD – The minimum allowable head thickness shall be 1/4". The top head must be able to support a 250 pound load on a 16 square inch area without damage.

6.3 FLAT BOTTOM HEAD – Flat bottom heads shall be molded integrally with the straight shell portion of the tank, unless otherwise agreed upon. The perimeter of the tank bottom shall not have any variations from a flat plane that would prevent uniform contact with a properly prepared flat tank support pad when filled with liquid. The sidewall to bottom knuckle radius shall be not less than 1 1/2" for tanks less than 10' diameter and not less than 2 1/2" for tanks 10' diameter and above.

6.3.1 THICKNESS AND REINFORCEMENT – The minimum thickness for a fully supported flat bottom head shall be 1/4" and shall include no less than 1 layer of woven roving reinforcement. The minimum thickness of the sidewall to bottom knuckle radius shall be equal to the combined thickness of the sidewall and bottom. The reinforcement of the knuckle radius area shall not extend beyond the tangent line of the radius and flat bottom, and shall extend up the tank sidewall a minimum of 4" for tanks less than 4' diameter and 12" for tanks 4' diameter and above. The reinforcement will then taper into the sidewall for an additional length of 3" to 4".

6.4 ELEVATED DISHED BOTTOM HEAD – Elevated dished bottom heads may be either molded integrally with the straight shell portion of the tank or molded separately using a bell and spigot joint for attachment to shell. The dished bottom head shall have a radius of curvature that is equal to or less than the tank nominal inside diameter.

6.4.1 THICKNESS – The thickness of the elevated dished bottom head shall be determined using the following formula, but shall not be less than 1/4".

$$Tb = .885\,(.036 \times \gamma \times H \times R) / S$$

WHERE:

Tb = Thickness (in inches)
S = Allowable stress – (not to exceed 1/10 of laminate tensile strength) in pounds/square inch.
γ = Product specific gravity.
R = Inside radius of dished head (in inches).
H = Fluid head at deepest point (in inches).

6.5 SLOPE TANK BOTTOMS – Shall conform to section 6.3 with the exception that the slope bottom may be molded separately from the straight shell.

6.6 OPEN TOP TANKS – Open top tanks shall incorporate a stiffening ring or flange. Additional stiffening may be incorporated into the design depending upon the intended use. Customer must advise fabricator of any equipment such as agitation, pumps, etc. causing external forces.

6.7 Above ground horizontal, and rectangular tanks require special design considerations for each application and will not be considered in the design portion of this specification. However, all other portions of this specification apply to the above tank configurations.

6.8 JOINTS – Joints between sidewall sections, and for attachment of top heads or bottom heads shall conform to the width and thicknesses as specified in ASTM D-3299 or ASTM D-4097 as a minimum.

6.9 FITTINGS:

The corrosion barrier of tank nozzles shall be equivalent to the inner corrosion barrier of the tank they are installed in. Construction shall be as follows:

6.9.1 FLANGED NOZZLES – Dimensions for flanged nozzles shall be per chart. The nozzle shall be of hand lay-up construction. Press molded flanges attached to pipe with adhesive are not acceptable, except for the inner flange on a double flange nozzle.

Flange Size	Flange Face O.D.	Bolt Circle	Bolt Hole Size	Flange Face Thickness *	Bolts
1"	4-1/4"	3-1/8"	5/8"	5/8"	4 - 1/2
1-1/2"	5"	3-7/8"	5/8"	5/8"	4 - 1/2
2"	6"	4-3/4"	3/4"	5/8"	4 - 5/8
2-1/2"	7"	5-1/2"	3/4"	5/8"	4 - 5/8
3"	7-1/2"	6"	3/4"	3/4"	4 - 5/8
4"	9"	7-1/2"	3/4"	7/8"	8 - 5/8
6"	11"	9-1/2"	7/8"	1"	8 - 3/4
8"	13-1/2"	11-3/4"	7/8"	1-1/8"	8 - 3/4
10"	16"	14-1/4"	1"	1-5/16"	12 - 7/8
12"	19"	17"	1"	1-5/8"	12 - 7/8

* 125 psi Design Pressure.

6.9.2 COUPLINGS, NIPPLES, PIPE STUBS – Shall be of filament wound or contact molded construction. Press molded fittings are not acceptable.

6.9.3 TOP AND SIDE MANWAYS – Shall be constructed using hand lay-up construction, and of the same materials as the tank they are installed in. Pre-fabricated press molded flat plate side manhole covers are not acceptable.

6.9.4 VENTS – Unless agreed upon in advance by ~~CRECO, INC.~~, all tanks shall be vented to prevent an internal pressure or vacuum. The vent must be of sufficient size to handle the flow displacement of all combined inlet or outlet nozzles. NOTE: Tanks are not designed for Improper Air Loading.

6.9.5 HOLDDOWN LUGS – Holddown lugs or plates shall be installed on all tanks. The size and number of holddown lugs shall depend on the wind, seismic, and other loads the tank will be subjected to during normal operation.

6.9.6 LIFTING LUGS – Shall be installed on tanks over 200 pounds weight unless otherwise specified.

7. INSULATED TANKS:

7.1 SIDEWALL INSULATION – 2 pound density foam insulation shall be used on tank sidewalls. Either pre-fabricated foam board or sprayed-on insulation is acceptable.

7.2 TOP OR BOTTOM HEAD INSULATION – Must conform to 7.1.

7.3 INSULATION CASING - The protective exterior casing over insulation shall be either contact molded or filament wound. The minimum allowable thickness for insulation casing shall be 1/8". The insulation casing resin shall contain a pigment to protect insulation from ultra violet rays.

7.4 EXPANSION JOINT – To allow for differences in expansion between the tank and the insulation casing, one or more expansion joints must be installed in insulation casing. The expansion joint must allow free movement of tank and insulation casing and be sealed off from water infiltration. T-Molding or silicone caulk type expansion joints are not acceptable.

8. TANK HEATING:

8.1 ELECTRICAL RESISTANCE HEAT TRACING – Wrapped-on electric resistance heat tape or banding is not acceptable because of the very difficult accessibility in case of a failure.

8.2 HEAT PANELS – Heat panels shall be used where external electrical heat tracing is specified. Each heat panel system shall use a product temperature control thermostat and a panel overheat thermostat to protect tank and contents from possible damage.

8.3 STEAM COILS – Hairpin type steam coils are acceptable. Follow manufacturer's recommendations for materials and installation procedures.

8.4 OTHERS – Immersable electrical bayonet and plate type heat systems are acceptable. Follow manufacturer's recommendations for materials and installation procedures.

9. NAMEPLATE:

Tank nameplate shall be constructed of FRP materials and located approximately 5' up from tank bottom where possible. The nameplate shall include the following information:

1. Serial number.
2. Customer.
3. Customer purchase order number.
4. Tank model.
5. Tank capacity.

10. WORKMANSHIP AND LAMINATE QUALITY:

10.1 GENERAL APPEARANCE – Tank should be uniform in color. Joints and matting ground fittings shall not be whited out from overcatalization. On pigmented tanks color of matting on joints and fittings shall be matched as close as possible to the color of the tank exterior. There shall be no burrs or sharp edges on tank. No knots in filament winding. All cut or ground edges shall be coated with paraffinated resin.

10.2 INNER SURFACE – Shall be free of cracks, crazes and blisters.

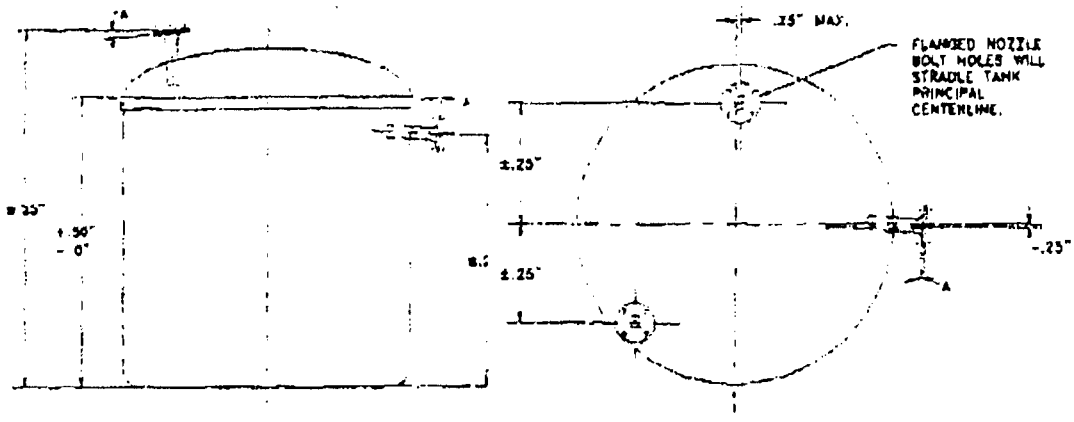
10.2.1 PITS – (Craters in the laminate surface) no more than 10 per square foot. Pits must be less than 1/8 inch diameter and 1/32 inch deep, and shall be coated with paraffinated resin to avoid exposure to product and possible contamination.

10.3 INTERIOR LAYER – Shall be free of dry glass, burned areas and foreign matter.

10.3.1 ENTRAPPED AIR – (Bubbles or voids in laminate) no more than 10 per square inch and less than 1/16 inch in diameter.

10.4 STRUTURAL LAMINATE – See table Section 14, page 11.

11. DIMENSIONS AND TOLERANCES:



A= 1° for Nozzles 1" to 8" and 1/2° for Nozzles 10" and Up.