

INTEROFFICE MEMORANDUM

Path Forward for Tank 12 Annulus Liquid Removal

SRR-LWE-2015-00048, Rev. 0
RSM Track No: 10080

Date: July 7, 2015

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From: A. L. Griffin
G. C. Arthur

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Subject:

Path forward provides details on actions required for water removal from Tank 12 Annulus.

References:

- 1) X-CLC-H-00988, Rev. 0, "Inhalation Dose Potential Determination of Tank 12 Annulus Material".
- 2) X-CLC-H-00992, Rev. 4, "Inhalation Dose Potential (IDP) Determination of Tank 12 Annulus Material".
- 3) G-CLC-G-00083, Rev. 0, "Waste Transfer System Siphon Mitigation".
- 4) T-CLC-F-00383, Rev. 1, "Type I Tank Liner Integrity Under Oxalic Acid Induced Corrosion".
- 5) WSRC-TR-2002-00403, Rev. 21, "Tank Farm Transfer control Program & Pump Tank Transfer Jet Control Program".

Background:

A credited annulus liquid level instrument or operable annulus ventilation are not required for a tank in Closure Mode per mode applicability requirements of Limiting Conditions for Operation (LCO) 3.8.5. Tank 12 was placed in Closure Mode in February of 2014. Tank 12 Annulus level detection instruments and annulus ventilation were disabled as a part of electrical isolation in February of 2015. Electrical isolation of the tank was done in preparation for grouting. In April of 2015, a compensatory action for disabling the annulus level monitoring was establishment of a bi-weekly video camera inspection. On May 16, 2015, an increased water level was identified. Using landmarks in the annulus, the Tank 12 annulus water level was determined to be approximately 11 inches. The video inspection frequency of the Tank 12 annulus was changed to daily on May 20, 2015.

Discussion:

The following information provides justification for removing the current liquid in Tank 12 annulus as a non-waste transfer. Any future transfers will require additional evaluation unless documented otherwise. Tank 12 has a history of groundwater intrusion due to its underground location and the relative elevation of the water table around the tank. This intrusion was prevented when the installed heated, positive pressure annulus ventilation system was in service. Intrusion is not easily managed when there is no annulus ventilation or when negative pressure ventilation is necessary. For example, the Tank 12 annulus was ventilated using a negative pressure configuration during oxalic acid chemical cleaning. During this time, water intrusion occurred. Samples of the annulus liquid were obtained and analyzed seven times (6/12/13, 6/22/13, 7/8/13, 7/25/13, 8/8/13, 8/19/13 and 9/3/13). While the samples contained low levels of contamination, all of these samples were evaluated and determined to be non-waste (Reference 1 and 2) per the methodology contained in Section 3.4.1.5.1 of the Documented Safety Analysis (DSA) and detailed in the Transfer Control Program PDD (Reference 5). Since annulus ventilation was secured to support tank isolation in preparation for grouting, groundwater intrusion has again occurred. The Tank 12 annulus liquid was sampled on 5/21/15 per Attachment 1 and found to contain low level contamination, and the liquid was classified as non-waste.

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In the Tank 12 area, groundwater elevation levels in March 2015 were between 274.5 feet and 272.6 feet Mean Sea Level (MSL). These levels were determined using measurements taken from five wells. Attachment 2 contains the location and groundwater levels from April 2013 to March 2015 for each well. The elevation of the Tank 12 bottom is 244.39 feet MSL (Reference 3). Using Reference 3 and Attachment 3, the tank ceiling elevation was determined to be approximately 267.39 feet MSL, and the riser top elevation was determined to be approximately 279.83 feet MSL.

Calculation T-CLC-F-00383 (Reference 4) provides an annulus liquid level relative to tank level that will ensure structural integrity of the tank wall. For Tank 12, the annulus liquid level should not exceed a conservative 17 inch difference from the tank level. As previously stated, the daily video inspection has not identified an increase from the approximate 11 inch water level, but actions and recommendations identified in this path forward are required to reduce the current water level.

Conclusion:

Groundwater has increased liquid levels in Tank 12 annulus. Fluctuations of the water table around Tank 12 can exceed the base and ceiling elevation of Tank 12 as shown in Attachment 2. The lack of constant annulus ventilation has prevented the drying of water in the annulus. The following recommendations are provided to reduce the current water level in Tank 12 annulus.

Recommended Path Forward Actions:

The recommended path forward is to transfer the current liquid out of Tank 12 annulus to Tank 10. Tank 10 was chosen as a destination tank due to its close proximity to Tank 12 and an available down comer already exists. Details of the equipment required to pump the liquid are shown in Attachment 4. Also to promote annulus drying, supplementary annulus ventilation was installed and operated in the positive mode. Engineering will also evaluate Tank 10 for chemistry changes related to the liquid transfer from Tank 12 annulus.

Groundwater intrusion in the annulus of Tank 12 can be controlled by transferring the liquid out of the annulus and positive air flow into the annulus. These actions will not prevent groundwater intrusion. Therefore, the ability to transfer liquid from Tank 12 annulus must be maintained prior to tank grouting. It is recommended that the equipment required to pump out the annulus be installed as a temporary modification. The duration of the temporary modification will be linked to the start of tank grouting, and sampling of the liquid in the annulus will be required prior to transferring unless documented otherwise.

Actions

- Develop field sketch of proposed non-waste transfer system between Tank 12 and Tank 10. (Complete)
- Develop work package to pump water out of Tank 12. (Complete Work Package 1429502)

Responsible Parties

Closure Engineering
Tim Chandler

Facility Maintenance
Henry Bell

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- Develop Data Modification Tracker (DMT) for chemistry changes to Tank 10. (Complete DMT-2015-00157) Closure Engineering
Carol Sherburne
- Install positive ventilation on Tank 12 annulus. (Complete Work Package 1418979) Closure Engineering
Tim Chandler
- Verify Tank 12 annulus sample results identify the transfer as a non-waste transfer. (Complete) Closure Engineering
Tim Chandler
- Develop Temporary Modification to transfer future liquid from Tank 12 annulus. (Due on 8/14/15) Closure Engineering
Roger Poore

Prepared By: Alfred Griffin Date: 7/7/15
Alfred Griffin
Closure Engineering

Reviewed By: Robert Voegtlen Date: 7/7/15
Robert Voegtlen
Closure Engineering

Approved By: Per Delegation LP TIM CHANDLER Date: 7/7/15
Gregory Arthur
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Concur By: Douglas Bumgardner Date: 08 JUL 15
Douglas Bumgardner
Deputy Facility Manager

Concur By: J. E. Occhipinti Date: 7-7-15
J. E. Occhipinti
Waste Removal and Closure Engineering Manager

Concur By: George R. Davis Date: 7-13-15
George R. Davis
Tank 12 Project Manager

Sample Id: 200680784 Lot ID: TANK 12 ANNULUS
Product Code: SPECIAL H WASTE FARM Sample Class: SPECIAL

Date Logged: 26-MAY-2015 15:51
Date Sampled: 21-MAY-2015 09:30
Date Received: 26-MAY-2015 15:50:39

Sample Text:

301913827 TOTAL ALPHA ANALYSIS (APEX) S

Condition: APPROVED

Low End	1.24E-01	dpm/mL	N/A
Np-237/U-234	8.35E-01	dpm/mL	N/A
Pu-238	2.33E+00	dpm/mL	N/A
Bi-212	2.17E-01	dpm/mL	N/A
U-235/36	6.20E-02	dpm/mL	N/A
U-238	1.25E-01	dpm/mL	N/A
Pu-239/40	1.12E+00	dpm/mL	N/A
Cm-244	3.72E-01	dpm/mL	N/A
Total Alpha	5.19E+00	dpm/mL	N/A

301913829 GAMMA PHA FOR SPECIALS

Condition: APPROVED

Co-60 (0 for LT)	.00E+00	d/m/mL	N/A
Sb-125 (0 for LT)	.00E+00	d/m/mL	N/A
Cs-137 (0 for LT)	1.72E+05	d/m/mL	N/A
Pb-212 (0 for LT)	.00E+00	d/m/mL	N/A
Bi-212 (0 for LT)	.00E+00	d/m/mL	N/A
Pa-233 (0 for LT)	.00E+00	d/m/mL	N/A
Pa-234m (0 for LT)	.00E+00	d/m/mL	N/A
Th-234 (0 for LT)	.00E+00	d/m/mL	N/A
U-235 (0 for LT)	.00E+00	d/m/mL	N/A
Am-241 (0 for LT)	.00E+00	d/m/mL	N/A
Total Activity (gamma)	1.72E+05	d/m/mL	N/A
Nuclide (1): Activity		d/m/mL	N/A
Nuclide (2): Activity		d/m/mL	N/A
Nuclide (3): Activity		d/m/mL	N/A
Nuclide (4): Activity		d/m/mL	N/A

301913831 RAD SCREEN

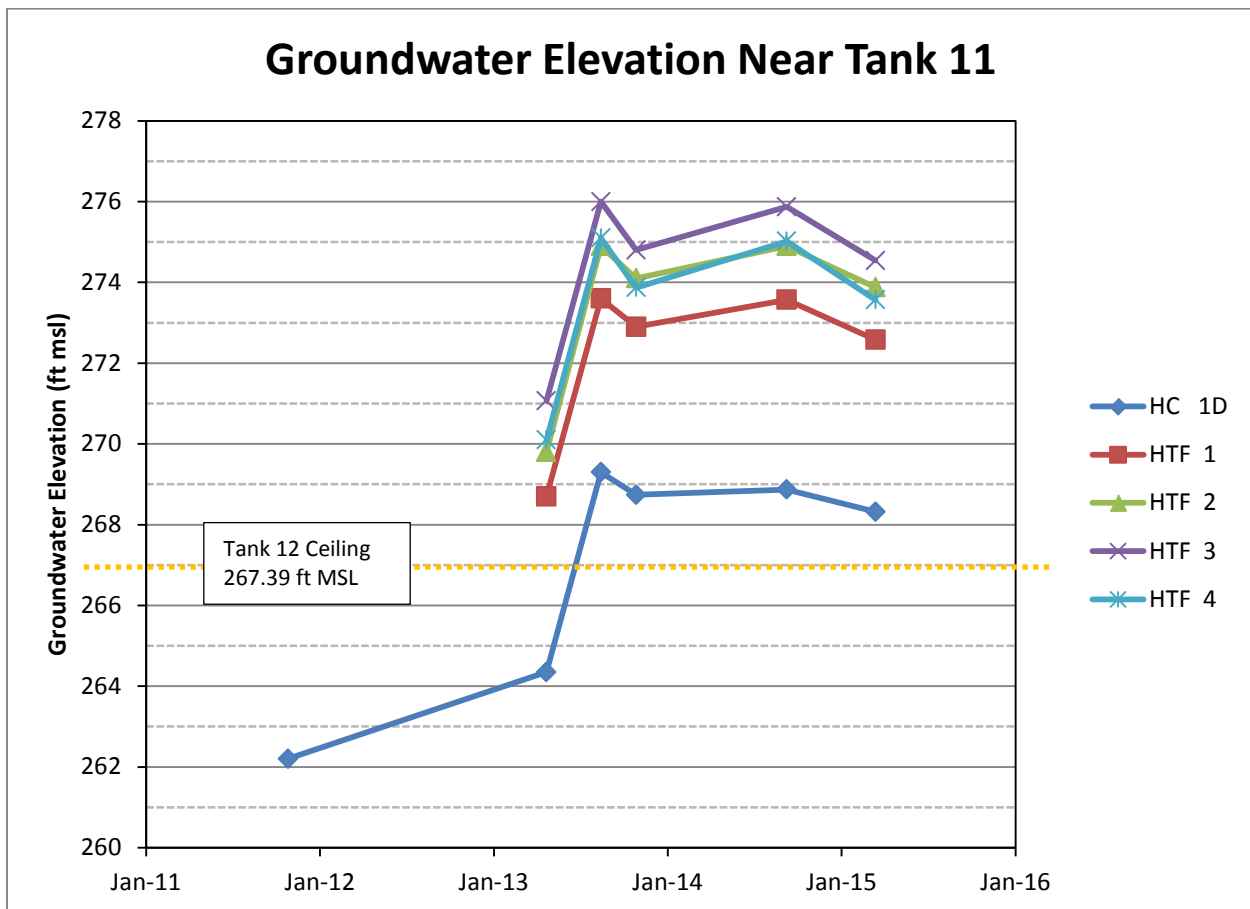
Condition: APPROVED

Gross Alpha	7.22E+01	d/m/mL	N/A
Gross Beta	1.98E+05	d/m/mL	N/A
Tritium	1.88E+05	d/m/mL	N/A

Groundwater elevations in five wells around Tank 11 were most recently measured in March 2015. The next sampling event and water level measurements for the tank farms is scheduled for 3Q 2015.

The measurements from March 2015 show the water table elevation between 274.5 and 272.6 feet Mean Sea Level (MSL). Since August 2013, water level measurements have fluctuated slightly and are currently lower by approximately 1.5 feet (see time trend below).

Shallow groundwater elevations are influenced by seasonal and annual precipitation trends. SRS experienced drier than normal years in 2010, 2011, and 2012 and water table elevations fell during these years. In 2013, annual precipitation was significantly higher than normal which resulted in a water table rise of approximately 5 feet. In 2014, precipitation was near normal and water levels fluctuated only slightly.

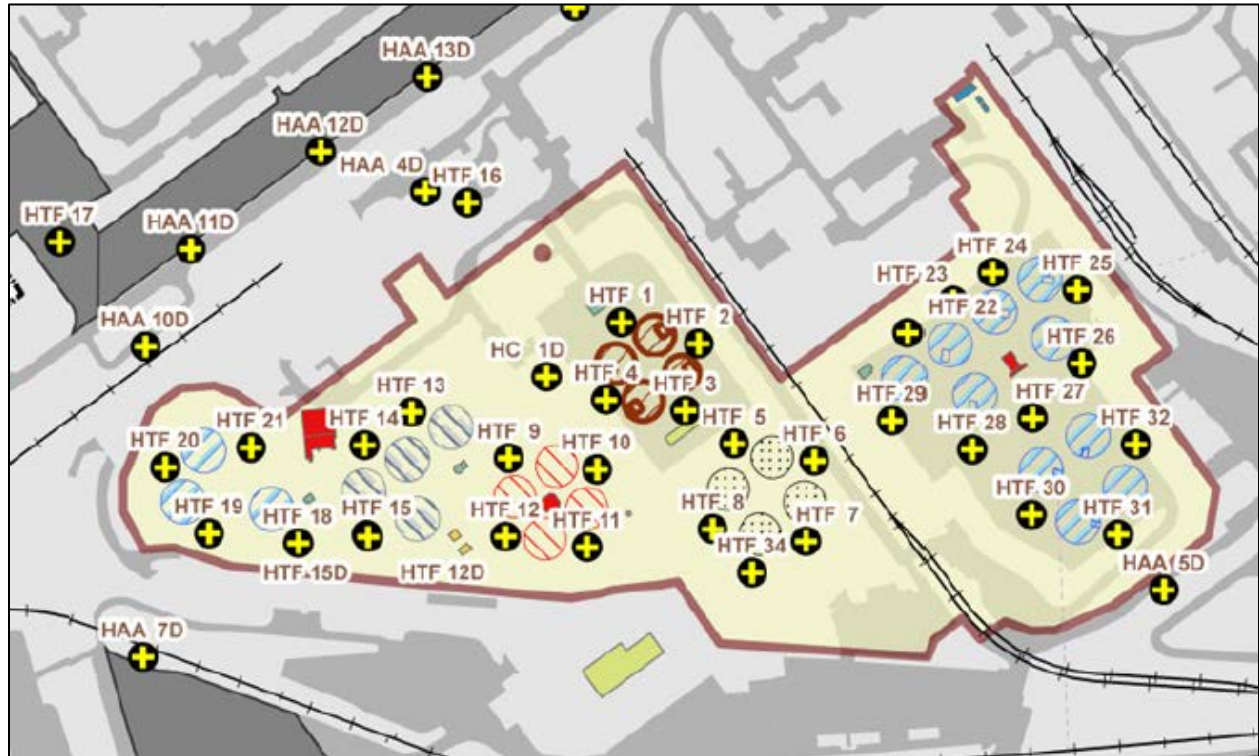


Water Table Elevation Near Tank 11

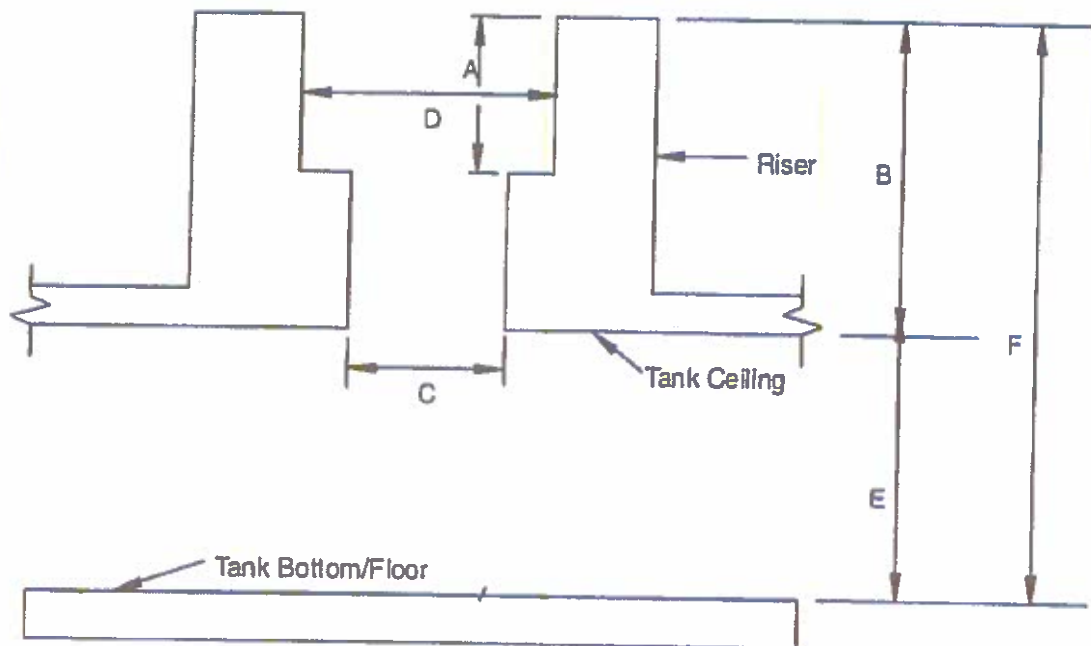
Well	Date	Table Elevation (ft msl)	Depth to Water (ft)	Top of Well Elevation (ft msl)
HC 1D	26-Oct-11	262.2	39	301.2
HC 1D	22-Apr-13	264.35	36.85	301.2
HC 1D	15-Aug-13	269.3	31.9	301.2
HC 1D	28-Oct-13	268.74	32.46	301.2
HC 1D	10-Sep-14	268.87	32.33	301.2
HC 1D	16-Mar-15	268.32	32.88	301.2
HTF 1	22-Apr-13	268.7	13.3	282
HTF 1	15-Aug-13	273.6	8.4	282
HTF 1	28-Oct-13	272.9	9.1	282
HTF 1	10-Sep-14	273.57	8.43	282
HTF 1	16-Mar-15	272.58	9.42	282
HTF 2	22-Apr-13	269.8	12	281.8
HTF 2	15-Aug-13	274.9	6.9	281.8
HTF 2	28-Oct-13	274.1	7.7	281.8
HTF 2	10-Sep-14	274.9	6.9	281.8
HTF 2	16-Mar-15	273.88	7.92	281.8
HTF 3	22-Apr-13	271.07	9.63	280.7
HTF 3	15-Aug-13	276	4.7	280.7
HTF 3	28-Oct-13	274.8	5.9	280.7
HTF 3	10-Sep-14	275.87	4.83	280.7
HTF 3	16-Mar-15	274.54	6.16	280.7
HTF 4	22-Apr-13	270.1	12.8	282.9
HTF 4	15-Aug-13	275.1	7.8	282.9
HTF 4	28-Oct-13	273.87	9.03	282.9
HTF 4	10-Sep-14	275.02	7.88	282.9
HTF 4	16-Mar-15	273.57	9.33	282.9

Most recent measurements are highlighted.

H Tank Farm Well Locations



Tank Design Data & Dimensions for All Type Tanks at SRS



Waste Tank Type	A	B	C ¹	D ²	E	F
Type I (75' dia.)	37.37"	149.25"	23.00"	35.50"	294.00"	443.25"
Type II (85' dia.)	26.37"	51.50"	25.00"	37.00"	324.00"	375.50"
Type III (85' dia.)	27.00"	54.50"	24.50"	36.75"	396.00"	450.50"
Type IIIA (85' dia.)	27.00"	60.50"	36.50"	48.75"	396.00"	456.50"
Type IV (85' dia.)	12.00"	60.00"	24.00"	28.00"	Note 3	504.00"

Note 1: C dimension is the diameter of the opening

Note 2: D dimension is the square (length & width) opening for Type I tanks only, for all other tank types it is the diameter opening.

Note 3: 411.00" bottom of tank to spring line (top of steel wall liner plate).
444.00" bottom of tank to center of riser

Type I tanks: 1F, 2F, 3F, 4F, 5F, 6F, 7F, 8F, 9H, 10H, 11H, & 12H

Type II tanks: 13H, 14H, 15H, & 16H

Type III tanks: 29H, 30H, 31H, 32H, 33F, & 34F

Type IIIA tanks: 25F, 26F, 27F, 28F, 35H, 36H, 37H, 38H, 39H, 40H, 41H, 42H, 43F, 44F, 45F, 46F, 47F, 48H, 49H, 50H, 51H, & 52H

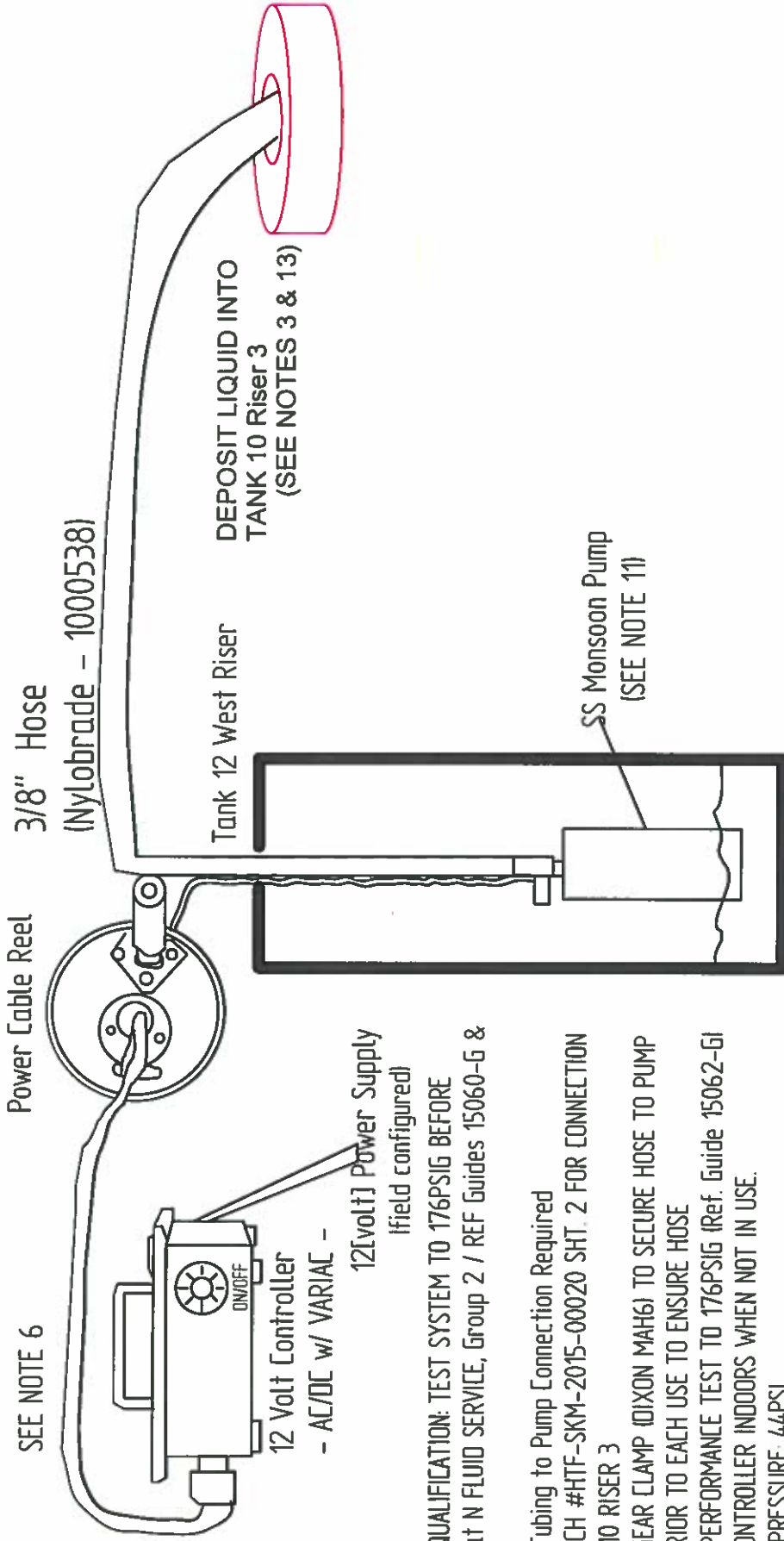
Type IV tanks: 17F, 18F, 19F, 20F, 21H, 22H, 23H, & 24H

Tank Type	Type I	Type II	Type III/IIIA	Type IV
Tank Full Volume (gallons)	793,411	1,121,357	1,373,238	1,703,024
Tank Fill Factor (gal/in)	2710	3500	3510	3540
Tank Fill Limit (inch)	274	304	372	380
Tank Annulus Fill Factor (gal/in)	379.4	428.4	428.4	N/A
Tank Annulus Volume (gallons)	118,933	146,325	179,600 III 181,700 IIIA	N/A

Tank 12 Annulus Dewatering Diagram

ATTACHMENT 4
SRR-LWE-2015-00048, REV. 0

(WO# 1429502)



NOTES

- 1) HOSE ASSEMBLY QUALIFICATION: TEST SYSTEM TO 176PSIG BEFORE INSTALLATION (Cat N FLUID SERVICE, Group 2 / REF Guides 15060-G & 15062-G)
- 2) NO TESTING OF Tubing to Pump Connection Required
- 3) REFERENCE SKETCH #HTF-SKM-2015-00020 SHT. 2 FOR CONNECTION SETUP AT TANK 10 RISER 3
- 4) USE S.S. WORM GEAR CLAMP (DIXON MAH6) TO SECURE HOSE TO PUMP
- 5) INSPECT HOSE PRIOR TO EACH USE TO ENSURE HOSE FUNCTIONALITY. PERFORMANCE TEST TO 176PSIG (Ref. Guide 15062-G)
- 6) STORE POWER CONTROLLER INDOORS WHEN NOT IN USE.
- 7) SYSTEM DESIGN PRESSURE: 44PSI
- 8) NYLOBRAD HOSE: WORKING PRESSURE = 230PSI
- 9) SHIELD HOSE AS DIRECTED BY RADIOLOGICAL ENGINEERING.
- 10) INSTALL TEMPORARY PORT COVER/SHEILDING ON TANK 12 WEST RISER PORT DURING INSTALLATION.
- 11) PUMP SPECS: PUMP MODEL # = PS-10400; CONTROLLER MODEL # = PA-10670; 7.5"H x 18.2"W; 130[FT] 12AWG WIRE (EQUIPPED); 38AMPS MAX; 120[FT] DISCHARGE HEAD; PROACTIVE PUMPS IS THE VENDOR.
- 12) SLEEVE HOSE WITH 3" DIA POLY SLEEVING OR ENGINEERING EQUIVALENT PRIOR TO INSTERTING INTO TANK.
- 13) 150 [FT] MIN.) OF HOSE WILL BE NEEDED.

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Tank 12 Annulus Dewatering Diagram

(WO# 1429502)

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ATTACHMENT 4
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NOTE

- 1) TEST NEW INSTALLATION TO 176PSIG BEFORE USE
- 2) USE S.S. FITTINGS & VALVES, UNLESS OTHERWISE NOTED (OR ENG APPROVED EQUALS).
- 3) FITTING TYPES MAY BE SUBSTITUTED WITH ENG APPROVAL. CHANGES MUST BE MARKED ON SKETCH AND LOGGED WITH WORK ORDER.

