



**NYSEG**  
**SENECA LAKE CAES**  
**PROPOSED NEW LEACHING WELLHEAD**  
**CAVERN No.1**

Number	
Date	11/11
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**Section A**

1. Casing Head – 30” API 2M x 30” SOW with bowl prep for slips (24”). Complete with (2) 2” LP Taps below Seal location. API 6A - Class CC, Temp U, PSL - 1, PR - 1
2. Slip & Seal assembly for 24” casing.
3. Bull Plug – 2-1/16” 2M LP w/1/2” NPT Tap.
4. Bull Plug – 2-1/16” 2M LP, Solid.

**Section B**

1. Double Studded Adapter – 30” API 2M x 20-3/4” API 3M, Including ASTM A-193 GR B7 Studs and ASTM GR 2H Nuts. PI 6A – Class DD, Temp U, PSL - 1, PR - 1
2. Casing Spool – 20-3/4”, API 3M Bottom Flange (w/Double “P”-Seal for 24” casing) x 20-3/4” API 3M Top, w/ (2) 4”, API 3M, Extended Flanged Side Outlets. Top complete with Bowl for Mandrel to hang 8-5/8” OD Brine Casing, Lockscrews and Stuffing Boxes. API 6A – Class DD, Temp U, PSL – 1, PR – 1.
3. Mandrel Hanger w/ Extended Neck: 8-5/8” LT&C Threads (Top and Bottom). API 6A - Class DD, Temp U, PSL - 1, PR - 1.
4. Blind Flange. (1) API 3M, 4-1/16” w/1/2” NPT Tap. API 6A - Class DD, Temp U, PSL - 1, PR - 1.
5. Ball Valve - (2) 4” ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.

**Section C**

1. Casing Spool – 20-3/4” API 3M Bottom Flange x 13-5/8” API 3M Top, w/(2) 4”, API 3M, Extended Flanged Side Outlets. Top complete with Bowl for Mandrel to hang 5 1/2” OD Brine Casing, Lockscrews and Stuffing Boxes. API 6A - Class DD, Temp U, PSL - 1, PR - 1.
2. Mandrel Hanger w/ Extended Neck: 5-1/2”, LT&C Threads (Top and Bottom). API 6A – Class DD, Temp U, PSL - 1, PR - 1.
3. Ball Valve – (2) 4” ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.

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**Section D**

1. Casing Spool - 13-5/8", API 3M x 7-1/16" API 3M w/ (2) 4" API 3M Extended Flanged Side Outlets. API 6A – Class DD, Temp U, PSL - 1, PR - 1.(Bottom Flange w/Double "P"-Seal Sized for 5 1/2" Extended Neck Mandrel Hanger, Pos. B-2)
2. Ball Valve – (2) 4" ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.

**Section E**

1. Crown Valve – 6" ANSI 900 Flanged, Full Opening, Manual Operated. Ball Valve for Fresh Water, Brine, and Nitrogen Service.
2. Double Studded Adapter – 7-1/16" API 3M x 4-1/16" API 3M, Including ASTM A-193 GR B7 Studs and ASTM GR 2H Nuts. API 6A – Class AA, Temp U, PSL - 1, PR - 1
3. Ball Valve – 4" ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.
4. Blind Flange. API 3M, 4-1/16" w/1/2" NPT Tap. API 6A - Class DD, Temp U, PSL - 1, PR - 1.

**Accessories**

1. All required studs, nuts, ring gaskets and flange protectors for connecting the spools and valves to the spools.
  - ASTM A193 Grade B7 bolts, ASTM A194 2H nuts, Teflon coated.
  - All ring gaskets stainless steel.

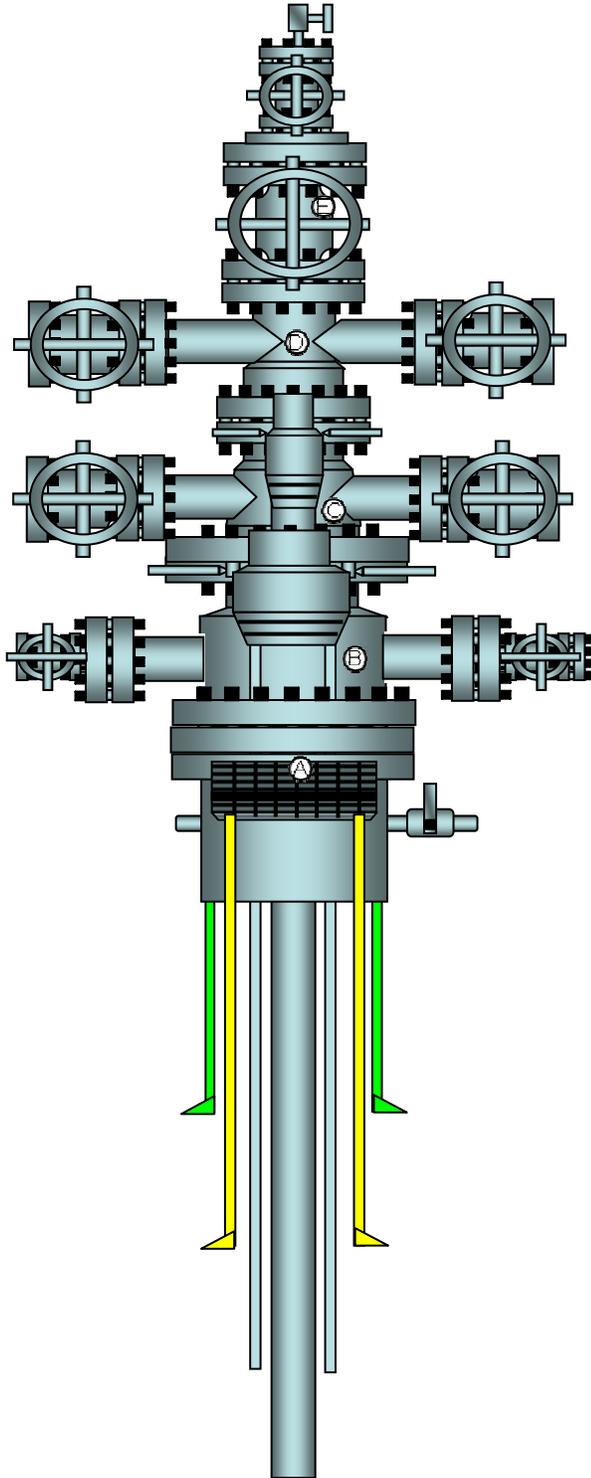
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**NYSEG  
SENECA LAKE CAES  
PROPOSED NEW LEACHING WELLHEAD  
CAVERN No. 2 & 3**

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**Section A**

1. Casing Head – 26-3/4” API 2M x 26” SOW with bowl prep for slips (20”). Complete with (2) 2” LP Taps below Seal location. API 6A - Class CC, Temp U, PSL - 1, PR - 1
2. Slip & Seal assembly for 20” casing.
3. 8 ft. section of 20”, 0.75 WT, API 5LX-56 pipe welded and tested to casing head.
4. Bull Plug – 2-1/16” 2M LP w/1/2” NPT Tap.
5. Bull Plug – 2-1/16” 2M LP, Solid.

**Section B**

1. Double Studded Adapter – 26-3/4” API 2M x 20-3/4” API 3M, Including ASTM A-193 GR B7 Studs and ASTM GR 2H Nuts. PI 6A – Class CC, Temp U, PSL - 1, PR - 1
2. Casing Spool – 20-3/4”, API 3M Bottom Flange (w/Double “P”-Seal for 20” casing) x 16-3/4” API 3M Top, w/ (2) 4”, API 3M, Extended Flanged Side Outlets. Top complete with Bowl for Mandrel to hang 8-5/8” OD Brine Casing, Lockscrews and Stuffing Boxes. API 6A – Class DD, Temp U, PSL – 1, PR – 1.
3. Mandrel Hanger w/ Extended Neck: 8-5/8” LT&C Threads (Top and Bottom). API 6A - Class DD, Temp U, PSL - 1, PR - 1.
4. Blind Flange. (1) API 3M, 4-1/16” w/1/2” NPT Tap. API 6A - Class DD, Temp U, PSL - 1, PR - 1.
5. Ball Valve - (2) 4” ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.

**Section C**

1. Casing Spool – 16-3/4” API 3M Bottom Flange x 13-5/8” API 3M Top, w/(2) 4”, API 3M, Extended Flanged Side Outlets. Top complete with Bowl for Mandrel to hang 5 1/2” OD Brine Casing, Lockscrews and Stuffing Boxes. API 6A - Class DD, Temp U, PSL - 1, PR - 1.
2. Mandrel Hanger w/ Extended Neck: 5-1/2”, LT&C Threads (Top and Bottom). API 6A – Class DD, Temp U, PSL - 1, PR - 1.
3. Ball Valve – (2) 4” ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.

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 PROPOSED NEW LEACHING WELLHEAD  
 CAVERN No. 2 & 3**

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**Section D**

1. Casing Spool - 13-5/8", API 3M x 7-1/16" API 3M w/ (2) 4" API 3M Extended Flanged Side Outlets. API 6A – Class DD, Temp U, PSL - 1, PR - 1.(Bottom Flange w/Double "P"-Seal Sized for 5 1/2" Extended Neck Mandrel Hanger, Pos. B-2)
2. Ball Valve – (2) 4" ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.

**Section E**

1. Crown Valve – 6" ANSI 900 Flanged, Full Opening, Manual Operated. Ball Valve for Fresh Water, Brine, and Nitrogen Service.
2. Double Studded Adapter – 7-1/16" API 3M x 4-1/16" API 3M, Including ASTM A-193 GR B7 Studs and ASTM GR 2H Nuts. PI 6A – Class DD, Temp U, PSL - 1, PR - 1
3. Ball Valve – 4" ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.
4. Blind Flange. API 3M, 7-1/16" w/1/2" NPT Tap. API 6A - Class DD, Temp U, PSL - 1, PR - 1.

**Accessories**

1. All required studs, nuts, ring gaskets and flange protectors for connecting the spools and valves to the spools.
  - ASTM A193 Grade B7 bolts, ASTM A194 2H nuts, Teflon coated.
  - All ring gaskets stainless steel.

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**NYSEG**  
**SENECA LAKE CAES**  
**PROPOSED NEW DEWATERING WELLHEAD**  
**CAVERN No. 1**

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**Section A**

Existing

**Section B**

1. Double Studded Adapter – 30” API 2M x 20-3/4” API 3M (w/Double “P”-Seal for 24” casing), Including ASTM A-193 GR B7 Studs and ASTM GR 2H Nuts. PI 6A – Class CC, Temp U, PSL - 1, PR – 1.
2. Casing Spool – 20-3/4”, API 3M Bottom Flange x 20-3/4” API 3M Top, w/ (2) 4”, API 3M, Extended Flanged Side Outlets. Top complete with Bowl for Mandrel to hang 20” OD Stainless Steel Casing, Lockscrews and Stuffing Boxes. API 6A – Class CC, Temp U, PSL – 1, PR – 1.
3. Mandrel Hanger w/ Extended Neck: 5’ Section 20” 316L 3/8” WT Welded to bottom and 20” LT&C Threads (Top). API 6A - Class DD, Temp U, PSL - 1, PR – 1.
4. Blind Flange. API 3M, 4-1/16” w/1/2” NPT Tap. API 6A - Class DD, Temp U, PSL - 1, PR - 1.
5. Ball Valve (2) - 4” ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.

**Section C**

1. Master Ball Valve – 20”, ANSI 900 RTJ Flange, Seats and Ball 316 SST or CF8M SST, Full Internal 316 SST body overlay.

**Section D**

1. Casing Spool – 20-3/4” API 3M Bottom Flange x 13-5/8” API 3M Top, w / (2) 4”, API 3M, Extended Flanged Side Outlets. Top complete with Bowl for Mandrel to hang 5 1/2” OD Brine Casing, Lockscrews and Stuffing Boxes. API 6A - Class DD, Temp U, PSL - 1, PR - 1.
2. Mandrel Hanger w/ Extended Neck: 5-1/2”, LT&C Threads (Top and Bottom). API 6A – Class DD, Temp U, PSL - 1, PR - 1.
3. Blind Flange. API 3M, 4-1/16” w/1/2” NPT Tap. API 6A - Class DD, Temp U, PSL - 1, PR - 1.
4. Ball Valve (2) - 4” ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.

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**Section E**

1. Casing Spool - 13-5/8", API 3M x 7-1/16" API 3M w/ (2) 4" API 3M Extended Flanged Side Outlets. API 6A – Class DD, Temp U, PSL - 1, PR - 1. (Bottom Flange w/Double "P"-Seal Sized for 5 1/2" Extended Neck Mandrel Hanger, Pos. B-2)
2. Blind Flange. ANSI 900, 4-1/16" w/1/2" NPT Tap. API 6A - Class DD, Temp U, PSL - 1, PR - 1.
3. Ball Valve (2) - 4" ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.

**Section F**

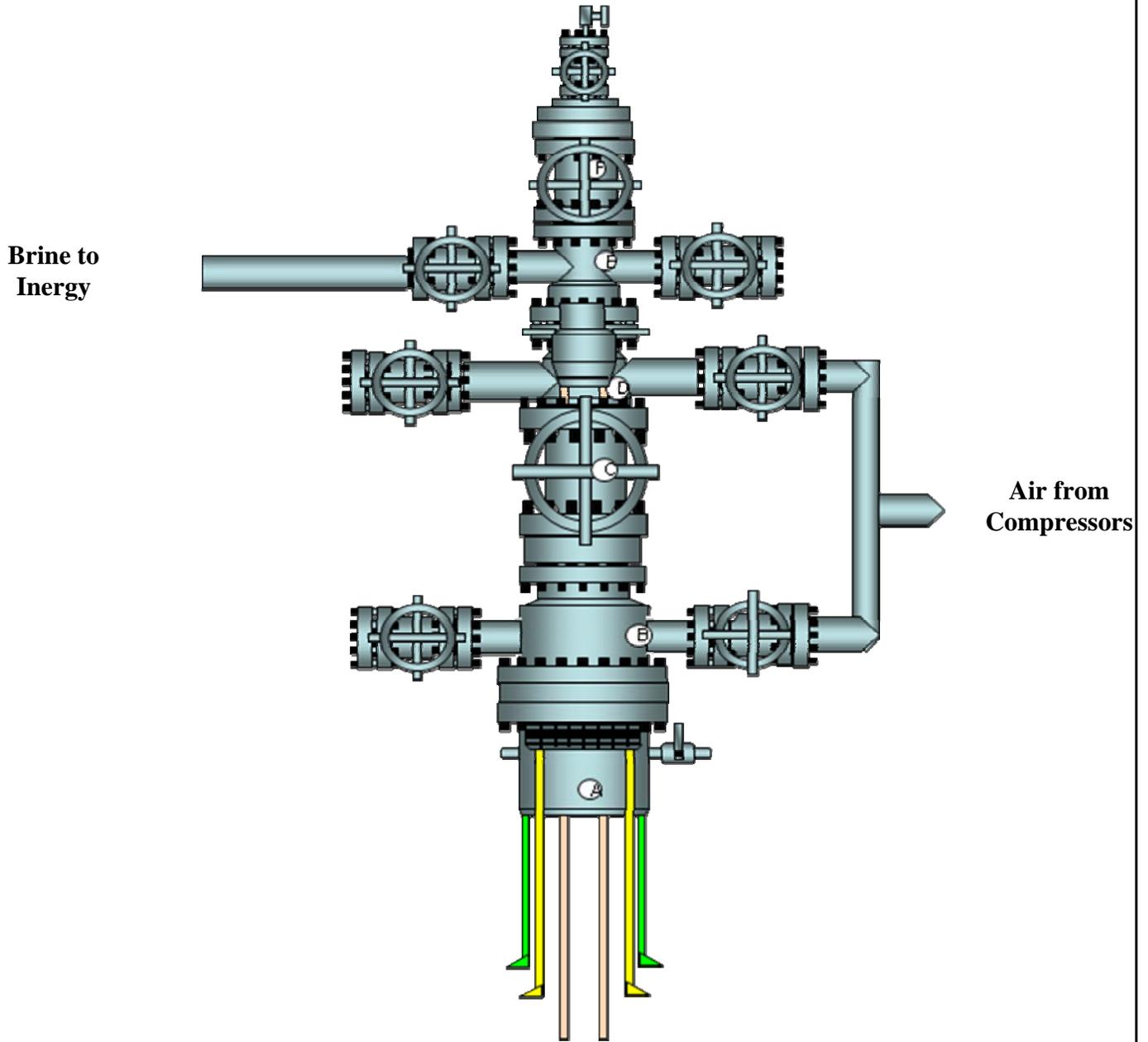
4. Crown Valve – 6" ANSI 900 Flanged, Full Opening, Manual Operated. Ball Valve for Fresh Water, Brine, and Nitrogen Service.
5. Double Studded Adapter – 7-1/16" API 3M x 4-1/16" API 3M, Including ASTM A-193 GR B7 Studs and ASTM GR 2H Nuts. PI 6A – Class DD, Temp U, PSL - 1, PR - 1
6. Ball Valve – 4" ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.
7. Blind Flange. ANSI 900, 4-1/16" w/1/2" NPT Tap. API 6A - Class DD, Temp U, PSL - 1, PR - 1.

**Accessories**

1. All required studs, nuts, ring gaskets and flange protectors for connecting the spools and valves to the spools.
  - ASTM A193 Grade B7 bolts, ASTM A194 2H nuts, Teflon coated.
  - All ring gaskets stainless steel.

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**NYSEG  
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**Section A**

Existing

**Section B**

1. Double Studded Adapter – 20 - 1/4” API 2M x 16-3/4” API 3M (w/Double “P”-Seal for 20” casing), Including ASTM A-193 GR B7 Studs and ASTM GR 2H Nuts. PI 6A – Class AA, Temp U, PSL - 1, PR – 1 (410 SST Body).
2. Casing Spool – 16-3/4”, API 3M Bottom Flange x 16-3/4” API 3M Top, w/ (2) 4”, API 3M, Extended Flanged Side Outlets. Top complete with Bowl for Mandrel to hang 20” OD Stainless Steel Casing, Lockscrews and Stuffing Boxes. API 6A – Class DD, Temp U, PSL – 1, PR – 1.
3. Mandrel Hanger w/ Extended Neck: 5’ Section 20” 316L 3/8” WT Welded to bottom and 20” LT&C Threads (Top). API 6A - Class DD, Temp T, PSL - 1, PR – 2, 410 SST Body.
4. Blind Flange. ANSI 900, 4-1/16” w/1/2” NPT Tap. API 6A - Class DD, Temp U, PSL - 1, PR - 1.
5. Ball Valve (2) - 4” ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.

**Section C**

1. Master Ball Valve – 16”, ANSI 900 RTJ Flange, Seats and Ball 316 SST or CF8M SST, Full Internal 316 SST body overlay.

**Section D**

1. Casing Spool – 16-3/4” API 3M Bottom Flange x 13-5/8” API 3M Top, w / (2) 4”, API 3M, Extended Flanged Side Outlets. Top complete with Bowl for Mandrel to hang 5 1/2” OD Brine Casing, Lockscrews and Stuffing Boxes. API 6A - Class DD, Temp U, PSL - 1, PR - 1.
2. Mandrel Hanger w/ Extended Neck: 5-1/2”, LT&C Threads (Top and Bottom). API 6A – Class DD, Temp U, PSL - 1, PR - 1.
3. Blind Flange. ANSI 900, 4-1/16” w/1/2” NPT Tap. API 6A - Class DD, Temp U, PSL - 1, PR - 1.
4. Ball Valve (2) - 4” ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.

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 SENECA LAKE CAES  
 PROPOSED NEW DEWATERING WELLHEAD  
 CAVERN No. 2 & 3**

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**Section E**

1. Casing Spool - 13-5/8", API 3M x 7-1/16" API 3M w/ (2) 4" API 3M Extended Flanged Side Outlets. API 6A – Class DD, Temp U, PSL - 1, PR - 1. (Bottom Flange w/Double “P”-Seal Sized for 5 1/2" Extended Neck Mandrel Hanger, Pos. B-2)
2. Blind Flange. ANSI 900, 4-1/16" w/1/2" NPT Tap. API 6A - Class DD, Temp U, PSL - 1, PR - 1.
3. Ball Valve (2) - 4" ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.

**Section F**

4. Crown Valve – 6" ANSI 900 Flanged, Full Opening, Manual Operated. Ball Valve for Fresh Water, Brine, and Nitrogen Service.
5. Double Studded Adapter – 7-1/16" API 3M x 4-1/16" API 3M, Including ASTM A-193 GR B7 Studs and ASTM GR 2H Nuts. PI 6A – Class AA, Temp U, PSL - 1, PR - 1
6. Ball Valve – 4" ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.
7. Blind Flange. ANSI 900, 4-1/16" w/1/2" NPT Tap. API 6A - Class DD, Temp U, PSL - 1, PR - 1.

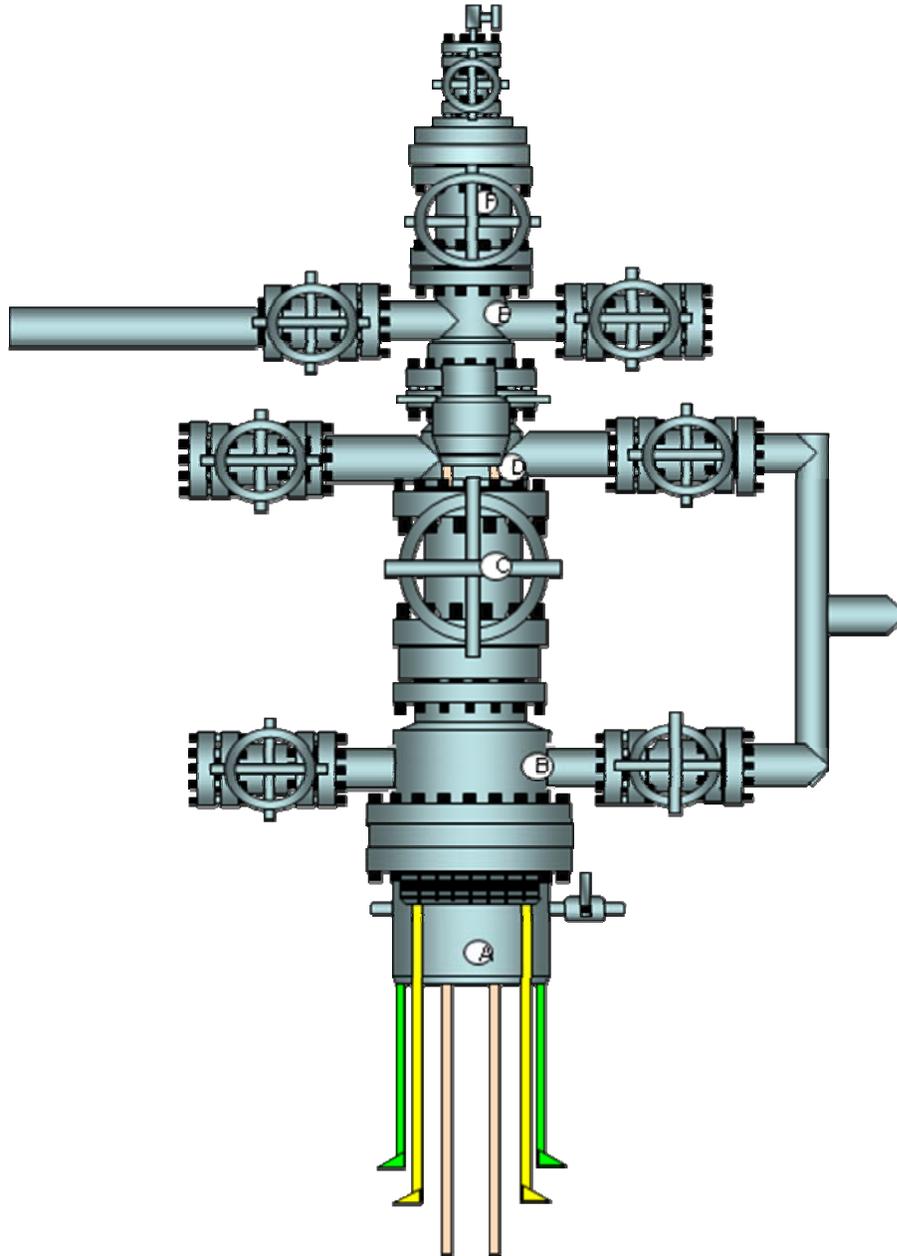
**Accessories**

1. All required studs, nuts, ring gaskets and flange protectors for connecting the spools and valves to the spools.
  - ASTM A193 Grade B7 bolts, ASTM A194 2H nuts, Teflon coated.
  - All ring gaskets stainless steel.

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NYSEG  
**SENECA LAKE CAES**  
**PROPOSED NEW DEWATERING WELLHEAD**  
**CAVERN No. 2 & 3**

**Brine to Inergy**



**Air from Compressors**

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**NYSEG  
 SENECA LAKE CAES  
 PROPOSED NEW PRODUCTION WELLHEAD  
 WELL No. 1**

Number 50756B

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**Section A**

Existing

**Section B**

Existing

**Section C**

Existing

**Section D**

1. Casing Spool – 20-3/4” API 3M Bottom Flange x 13-5/8” API 3M Top, w/(2) 16-3/4”, API 3M, Extended Flanged Side Outlets. API 6A - Class CC, Temp U, PSL - 1, PR - 1.
2. Ball Valve (2) - 16” ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service. Seats and Ball 316 SST or CF8M SST, Full Internal 316 SST body overlay.
3. Ball Valve (2) – 16” ANSI 900 Flanged Full Opening (Actuated). For Fresh Water, Brine, and Nitrogen Service. Seats and Ball 316 SST or CF8M SST, Full Internal 316 SST body overlay.

**Section E**

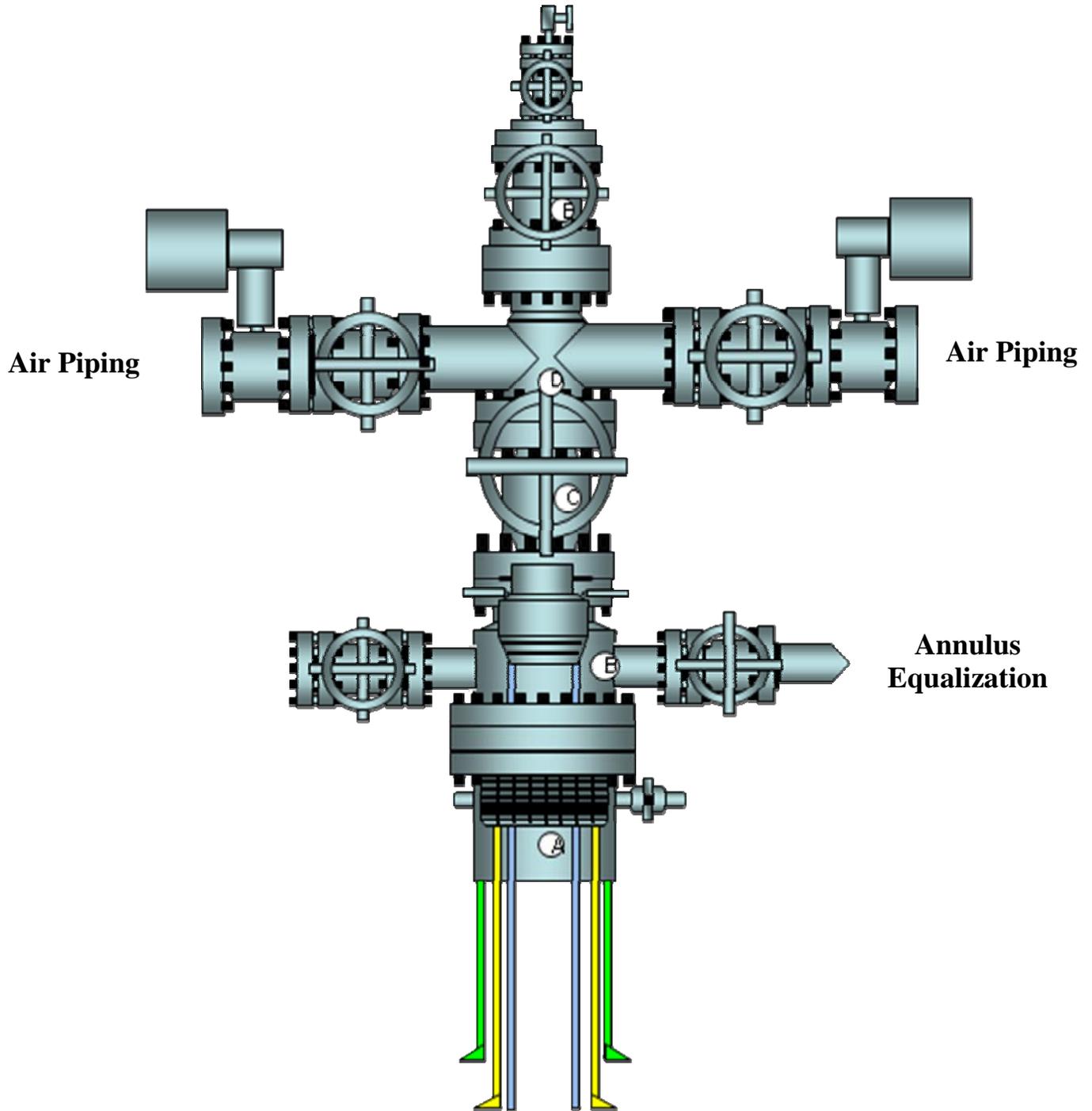
4. Double Studded Adapter – 16-3/4” API 3M x 7-1/16” API 3M, Including ASTM A-193 GR B7 Studs and ASTM GR 2H Nuts. PI 6A – Class CC, Temp U, PSL - 1, PR - 1.
5. Ball Valve 6” ANSI 900 Flanged Full Opening (Actuated). For Fresh Water, Brine, and Nitrogen Service. Seats and Ball 316 SST or CF8M SST, Full Internal 316 SST body overlay.
6. Double Studded Adapter – 7-1/16” API 3M x 4-1/16” API 3M, Including ASTM A-193 GR B7 Studs and ASTM GR 2H Nuts. PI 6A – Class CC, Temp U, PSL - 1, PR - 1
7. Ball Valve – 4” ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.
8. Blind Flange. ANSI 900, 4” w/1/2” NPT Tap. API 6A - Class CC, Temp U, PSL - 1, PR - 1.

**Accessories**

1. All required studs, nuts, ring gaskets and flange protectors for connecting the spools and valves to the spools.
  - ASTM A193 Grade B7 bolts, ASTM A194 2H nuts, Teflon coated.
  - All ring gaskets stainless steel.

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NYSEG  
SENECA LAKE CAES  
PROPOSED NEW PRODUCTION WELLHEAD  
WELL No. 1





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**NYSEG  
SENECA LAKE CAES  
PROPOSED NEW PRODUCTION WELLHEAD  
WELL No. 2 & 3**

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**Section A**

Existing

**Section B**

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**Section C**

Existing

**Section D**

1. Casing Spool – 16-3/4” API 3M Bottom Flange x 13-5/8” API 3M Top, w / (2) 16-3/4”, API 3M, Extended Flanged Side Outlets. API 6A - Class DD, Temp U, PSL - 1, PR - 1.
2. Ball Valve (2) - 16” ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service. Seats and Ball 316 SST or CF8M SST, Full Internal 316 SST body overlay.
3. Ball Valve (2) – 12” ANSI 900 Flanged Full Opening (Actuated). For Fresh Water, Brine, and Nitrogen Service. Seats and Ball 316 SST or CF8M SST, Full Internal 316 SST body overlay.

**Section E**

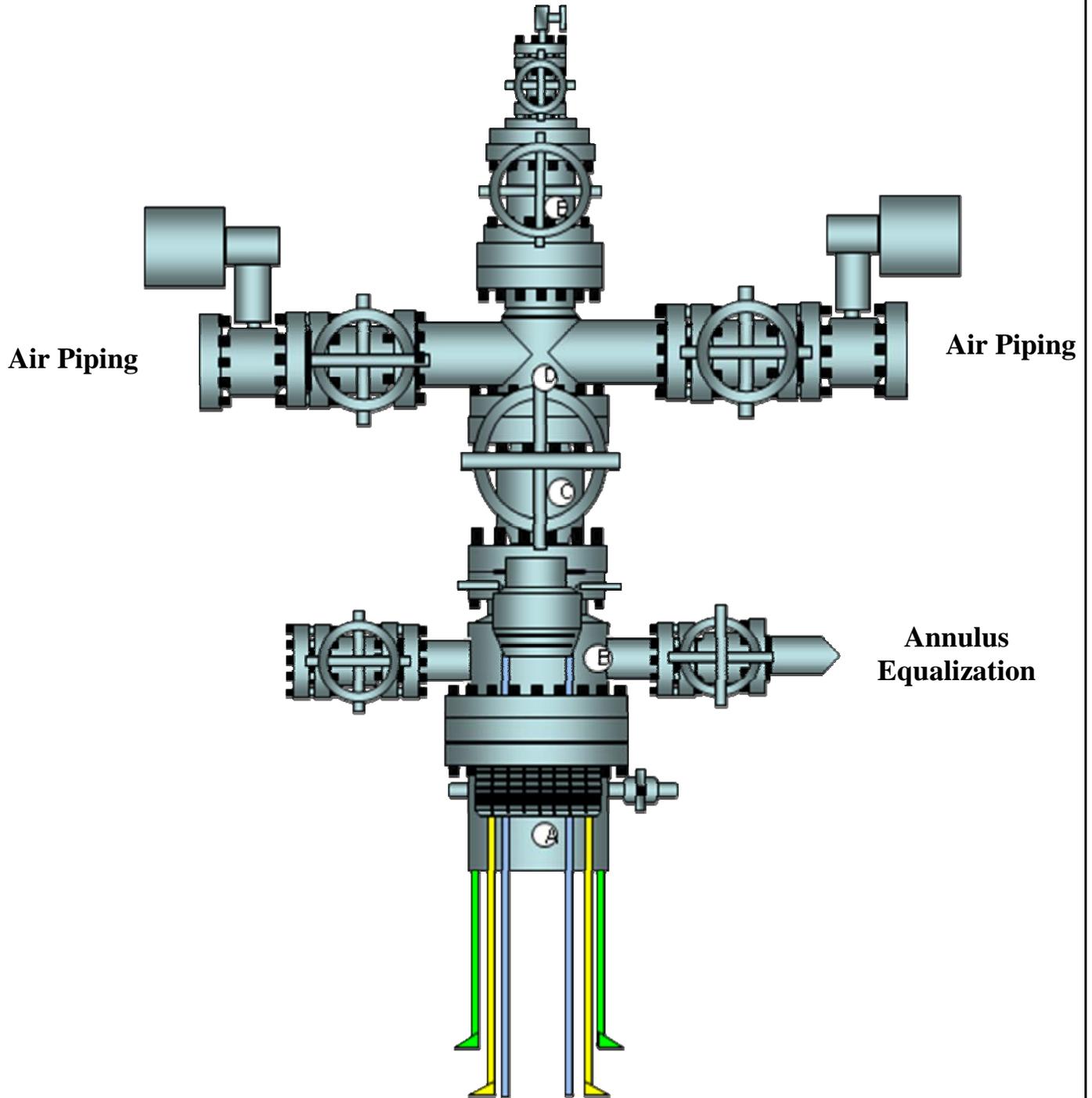
4. Double Studded Adapter – 13-5/8” API 3M x 7-1/16” 3M API, Including ASTM A-193 GR B7 Studs and ASTM GR 2H Nuts. PI 6A – Class AA, Temp U, PSL - 1, PR – 1 (410 SST Body).
5. Ball Valve (2) – 6” ANSI 900 Flanged Full Opening (Actuated). For Fresh Water, Brine, and Nitrogen Service. Seats and Ball 316 SST or CF8M SST, Full Internal 316 SST body overlay.
6. Double Studded Adapter – 7-1/16” API 3M x 4-1/16” API 3M, Including ASTM A-193 GR B7 Studs and ASTM GR 2H Nuts. PI 6A – Class AA, Temp U, PSL - 1, PR - 1
7. Ball Valve – 4” ANSI 900 Flanged, Full Opening, Manual Operated. For Fresh Water, Brine, and Nitrogen Service.
8. Blind Flange. ANSI 900, 4-1/16” w/1/2” NPT Tap. API 6A - Class DD, Temp U, PSL - 1, PR - 1.

**Accessories**

1. All required studs, nuts, ring gaskets and flange protectors for connecting the spools and valves to the spools.
  - ASTM A193 Grade B7 bolts, ASTM A194 2H nuts, Teflon coated.
  - All ring gaskets stainless steel.

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NYSEG  
SENECA LAKE CAES  
PROPOSED NEW PRODUCTION WELLHEAD  
WELL No. 2 & 3





SPECIFICATION

Number 50756B

**NYSEG  
WATKINS GLEN  
PROPOSED CAES WELL 1  
DRILLING PROGRAM**

Date 09/11

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Well: CAES Well No. 1  
 Operator: NYSEG Permit No. NA  
 Field: Reading  
 County: Schuylar  
 Lease: NA Survey: NA

Regulatory Information –

Proposed wellbore configuration: Also see attached wellbore schematic

- 42” Conductor: 0 - Approx. 175 ft.
- 30” Surface Casing: 0 - Approx. 850 ft. (36” Hole)
- 24” Final Casing: 0 – Approx. 2,360 ft. (30” Hole)
- 8-5/8” Outer Leaching Casing: 0 – Approx. 2,530 ft.
- 5-1/2” Inner Leaching Casing: 0 ft. – 2,630 ft.
- Total Depth: 2632 ft.
- Bottom of USDW –
- Top of Caprock – NA
- Top of F Salt – Approx. 2,352 ft.

Note: All depths from Ground Level (GL)

1. Move in the “Rat Hole” drilling rig and drill 48” conductor hole to approximately 175 ft.
2. Run and cement approximately 175 ft of 42” conductor pipe.
3. Drill rat hole and mouse hole according to drilling rig contractor’s specifications.
4. Move in drilling rig with 27-1/2’ rotary and set up over the 42” conductor pipe.
5. After 24 hours WOC, pressure test the 42” casing. Hold the test for 30 minutes, record it on a pressure test recorder. Use a chart recorder to record this test. There shall not be more than a 10% drop in pressure. If so, then the test must be repeated. Bleed off the pressure.
6. Cut the 42” and nipple up flow line.
7. Pick up and run in a 39-1/2” center-punch assembly and run in hole to TD.
8. Circulate and condition the hole.
9. Drill out the cement and 10 - 15 feet of new formation.

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SPECIFICATION

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**NYSEG  
WATKINS GLEN  
PROPOSED CAES WELL 1  
DRILLING PROGRAM**

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10. Circulate hole clean and treat mud for cement contamination.
11. Pull the center-punch assembly out of the hole and lay down.
12. Make a rough cut on the 42" casing. Pull the 42" casing out of the floor and lay it down.
13. Install 42" x 20" swage w/ 21 1/4" 2M temporary flange.
14. Nipple up the 20" well control equipment including drilling nipple and flow line.
15. Function test the annular preventer.
16. Pick up and run in a 17 1/2" rock bit to TD. Drill a 17 1/2" pilot hole to +/- 850 ft. GL, running a deviation survey (TOTCO) every 90 ft. (every 30 ft. if deviation is a problem). There shall be no more than 1 - 2 degree per 100 ft.
17. Circulate and condition the hole for running logs.
18. Rig up a wireline service company. Run the appropriate logs. Rig down and move out the wireline company.
19. Pick up and run in a 27-1/2" hole-opener with a 17 1/2" rock bit strapped to the bottom.
20. Open the 17-1/2" pilot hole to 27-1/2" to +/- 850 ft. GL.
21. Circulate and condition the hole.
22. POOH with the 27-1/2" hole opening assembly.
23. Pick up and run in a 36" hole-opener with a 26" rock bit strapped to the bottom.
24. Open the 27-1/2" hole to 36" from the end of the 42" to +/- 850 ft. GL.
25. Circulate and condition the hole.
26. Pick up and run in a 39.5" hole-opener with a pilot guide strapped to the bottom.
27. Open 36" hole to 39.5" to +/- 850 ft. GL.
28. Circulate and condition the hole.
29. POOH with the 39.5" hole opening assembly.
30. Rig up a wireline service company and run a 60" 4-arm XY Caliper log from TD to conductor pipe.
31. Weld float shoe and float collar (stinger type) to the first double joint of surface casing.

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32. Rig up a casing crew service and welders and run approx. 4 double joints of 30", .875" WT, and 6 double joints of 0.75 WT, PE casing to +/- 850 ft. GL. (install centralizers in the middle of the first two joints then one on every other joint to surface).
33. Pick up and run in a cementing string of 5" drill pipe with a stinger sub on bottom and a bow centralizer in the middle of the first joint, to the top of the float collar (do not sting in).
34. Strip a 30" by 7 5/8" 8rd cementing head over the string. Weld the 30" connection.
35. Strip a 7 5/8" 8rd by 5" pack-off assembly over the string. Make it up onto the cementing head.
36. Sting into the float collar then pack off the drill pipe (fill the 30" by 5" annulus before packing off).
37. Circulate the well with the rig pumps until the cement pumping units are rigged up.
38. Rig up a cementing company. Cement the 30" casing to surface. Top off if necessary.
39. Pull the 5" cementing string out of the stab-in float collar. Test float equipment. Circulate the well "indirect" to check that the 5" cementing string is clear.
40. Cut/split the 42" casing and flow line, and lay down.
41. After 24 hours WOC, pressure test the 30" casing. Hold the test for 30 minutes; record it on a pressure test recorder. Use a chart recorder to record this test. There shall not be more than a 10% drop in pressure. If so, then the test must be repeated. Bleed off the pressure.
42. Unpack the 5" drill pipe. Loosen the 7 5/8" pack off assembly on top of the cementing head. Cut the 30" weld on the casing. Strip the 30" by 7 5/8" 8rd cementing head over the cementing string.
43. Pull the 5" cementing string out of the hole.
44. Cut the 30" casing and nipple up a flow line.
45. Pick up and run in a 27-1/2" center-punch assembly to the top of the float collar.
46. Circulate and condition the hole.
47. Drill out the float collar, cement, float shoe, cement, and 10 - 15 feet of new formation.
48. Circulate hole clean and treat mud for cement contamination.
49. Pull the center-punch assembly out of the hole and lay down.

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50. Make a rough cut on the 30" casing. Pull the 30" casing out of the floor and lay it down. Install 30" x 20" swage w/21 1/4" 2M temporary flange.
51. Nipple up the 20" well control equipment including drilling nipple and flow line. Function test the annular preventer.
52. Pick up and run in a 17 1/2" rock bit to approx. 850 GL.
53. Drill a 17 1/2" pilot hole to +/- 2300 ft. GL (Top of salt expected at approx. 2352 GL), running a deviation survey (TOTCO) every 90 ft. (every 30 ft. if deviation is a problem). There shall be no more than 1 - 2 degree per 100 ft.
54. Clean out mud tanks and haul off fresh water mud for disposal. Fill tanks with salt saturated drilling mud.
55. Displace the fresh water mud with salt-water gel.
56. Drill 17 1/2" pilot hole to +/-2632'.
57. Pull out of hole with 17 1/2" bit.
58. Circulate and condition the hole for running logs.
59. Rig up a wireline logging service company. Run the appropriate logs. Rig down and move out the wireline service company.
60. Nipple down the well control equipment.
61. Cut off the 30" by 20" swage and 21 1/4" 2M flange.
62. Pick up the 42" drilling nipple and weld it back to the 42" conductor pipe. Nipple up fill-up line and flow-line.
63. Pick up and run in a 27-1/2" hole-opener with a 17 1/2" rock bit strapped to the bottom.
64. Open the 17-1/2" pilot hole to 27-1/2" to +/- 2360 ft. GL.
65. Circulate and condition the hole.
66. Pull out of the hole with the 27-1/2" hole opening assembly.
67. Pick up and run in a 30" under reamer.
68. Open 27-1/2" hole to 30" to +/- 2360 ft. GL.
69. Circulate and condition the hole.
70. Pull out of the hole with the under reamer assembly.

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71. Circulate and condition the hole.
72. Run in the hole to +/- 2450 ft. GL with blank 5" DP. Pump a 50 ft cement plug through the 5" DP and spot in the 17-1/2" bore hole. Pull out of the hole with the 5" DP. Wait on cement approx. 24 hrs.
73. Rig up a casing crew service and welders and run approx. 5 double joints of 24", 1.25"WT, 12 double joints of 24" & 1.0" WT and 12 double joints of 24" 0.75" WT, X-52, PE casing to +/- 2360 ft. GL. Float shoe and float collar (stinger type) will be welded to the first double joint, install centralizers in the middle of the first two joints then one on every other joint to surface.
74. Pick up and run in a cementing string of 5" drill pipe with a stinger sub on bottom and a bow centralizer in the middle of the first joint, to the top of the float collar (do not sting in).
75. Strip a 24" by 7-5/8" 8rd cementing head over the string.
76. Weld the 24" connection. Strip a 7 5/8" 8rd by 5" pack-off assembly over the string. Make it up onto the cementing head.
77. Sting into the float collar then pack off the drill pipe (fill the 24" by 5" annulus before packing off). Circulate the well with the rig pumps until the cement pumping units are rigged up.
78. Rig up a cementing company. Cement the 24" casing to surface. Top off if necessary. Pull the 5" cementing string out of the stab-in float collar. Test float equipment. Circulate the well "indirect" to check that the 5" cementing string is clear.
79. Cut/split the 42" casing and flow line, and lay down.
80. After 72 hours WOC, pressure test the 24" casing. Hold the test for 30 minutes, record it on a pressure test recorder. Use a chart recorder to record this test. There shall not be more than a 10% drop in pressure. If so, then the test must be repeated. Bleed off the pressure and open the annular preventer.
81. Unpack the 5" drill pipe. Loosen the 7 5/8" pack off assembly on top of the cementing head. Cut the 24" weld on the casing. Strip the 24" by 7 5/8" 8rd cementing head over the cementing string. Pull the 5" cementing string out of the hole.
82. Cut the 24" casing and nipple up a flow line.
83. Pick up and run in a 21-1/2" center-punch assembly to the top of the float collar.
84. Circulate and condition the hole.
85. Drill out the float collar, cement; float shoe, cement, and 10 - 15 feet of new formation.

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86. Circulate hole clean and treat mud for cement contamination.
87. Pull the center-punch assembly out of the hole and lay down.
88. Make a rough cut on the 24" casing. Pull the 24" casing out of the floor and lay it down. Install 24" x 20" swage w/21 1/4" 2M temporary flange and 20" well control equipment.
89. Pick up and run in hole with 17 1/2" rock bit to approx. 2360' GL.
90. Drill a 17 1/2" pilot hole to +/- 2632 ft. GL.
91. Circulate and condition the hole for cement contamination and running logs.
92. Rig up a wireline logging service company. Run the appropriate logs. Rig down and move out the wireline service company.
93. Pick up 24" under reamer and open 17-1/2" hole to 2632' GL.
94. Nipple down the well control equipment. Cut off the 24" by 20" swage and 21 1/4" 2M flange.
95. Circulate the hole clean.
96. Remove salt saturated drilling mud from the rig tanks and haul it off to a disposal site. Fill the tanks with clean 10 lb/gal brine water.
97. Pick up and run in a 24" under reamer to TD.
98. Rig up directional survey service company and run a multi-shot gyroscopic survey (measure wellbore deviation). Rig down and move out wireline truck.
99. Pull out of the hole laying down the drilling assembly.
100. Install the 24" 2M double studded adapter. Energize the 'P' seals then test the 24" casing section to the appropriate test pressure for 15 minutes.
101. Install the leaching wellhead B spool.
102. Rig up to run +/-2530 ft. of 8-5/8", J-55 casing with a modified BT&C thread. Run 8-5/8" casing, externally testing to 80% of collapse on each connection under tension for 60 to 90 seconds each.
103. Install the leaching wellhead C (5-1/2") casing spool. Energize the 'P' seals then test the 8 5/8" hanger section to the appropriate test pressure for 15 minutes.
104. Rig up to run +/-2630 ft. of 5-1/2", J-55 casing having a BT&C connection.

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- 105. Install the leaching wellhead D casing spool. Energize the 'P' seals then test the 5 1/2" hanger section to the appropriate test pressure for 15 minutes.
- 106. Install the crown valve, DSA, logging valve, and blind flange. Install valves and flanges as needed to secure the well.
- 107. Rig down and move out the drilling rig.

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Well: CAES Well No. 2  
 Operator: NYSEG Permit No. NA  
 Field: Reading  
 County: Schuylar  
 Lease: NA Survey: NA

Regulatory Information –

Proposed wellbore configuration: Also see attached wellbore schematic

- 42” Conductor: 0 - Approx. 175 ft.
- 26” Surface Casing: 0 - Approx. 850 ft.
- 20” Final Casing: 0 – Approx. 2,360 ft.
- 8-5/8” Outer Leaching Casing: 0 – Approx. 2,530 ft.
- 5-1/2” Inner Leaching Casing: 0 ft. – 2,630 ft.
- Total Depth: 2,632 ft.
- Bottom of USDW –
- Top of Caprock – NA
- Top of F Salt – Approx. 2,352 ft.

Note: All depths from Ground Level (GL)

1. Move in the “Rat Hole” drilling rig and drill 48” conductor hole to approximately 175 ft.
2. Run and cement approximately 175 ft of 42” conductor pipe.
3. Drill rat hole and mouse hole according to drilling rig contractor’s specifications.
4. Move in drilling rig with 27-1/2’ rotary and set up over the 42” conductor pipe.
5. After 24 hours WOC, pressure test the 42” casing. Hold the test for 30 minutes, record it on a pressure test recorder. Use a chart recorder to record this test. There shall not be more than a 10% drop in pressure. If so, then the test must be repeated. Bleed off the pressure.
6. Cut the 42” casing and nipple up a flow line.
7. Pick up and run in a 39-1/2” center-punch assembly to the top of the float collar.
8. Circulate and condition the hole.
9. Drill out the cement and 10 - 15 feet of new formation.

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10. Circulate hole clean and treat mud for cement contamination.
11. Pull the center-punch assembly out of the hole and lay down.
12. Make a rough cut on the 42" casing. Pull the 42" casing out of the floor and lay it down. Install 42" x 20" swage w/ 21 1/4" 2M temporary flange. Nipple up the 20" well control equipment including drilling nipple and flow line. Function test the annular preventer.
13. Pick up and run in a 17 1/2" rock bit to TD. Drill a 17 1/2" pilot hole to +/- 850 ft. GL, running a deviation survey (TOTCO) every 90 ft. (every 30 ft. if deviation is a problem). There shall be no more than 1 - 2 degree per 100 ft.
14. Circulate and condition the hole for running logs.
15. Rig up a wireline service company. Run the appropriate logs. Rig down and move out the wireline company.
16. Nipple down 20" well control equipment and lay down.
17. Pick up and run in a 27-1/2" hole-opener with a 17 1/2" rock bit strapped to the bottom.
18. Open the 17-1/2" pilot hole to 27-1/2" to +/- 850 ft. GL.
19. Circulate and condition the hole.
20. POOH with the 27-1/2" hole opening assembly.
21. Pick up and run in a 34-1/2" hole-opener with a 26" rock bit strapped to the bottom. Open the 27-1/2" hole to 36" from the end of the 34-1/2" to +/- 850 ft. GL.
22. Circulate and condition the hole.
23. POOH with the 34-1/2" hole opening assembly.
24. Rig up a wireline service company and run a 60" 4-arm XY Caliper log from TD to conductor pipe.
25. Rig up a casing crew service and welders and run approx. 5 double joints of 26", .625" WT, and approx. 6 double joints of 0.75"WT, X-56, PE casing to +/- 850 ft. GL. Float shoe and float collar (stinger type) will be welded to the first double joint, install centralizers in the middle of the first two joints then one on every other joint to surface.
26. Pick up and run in a cementing string of 5" drill pipe with a stinger sub on bottom and a bow centralizer in the middle of the first joint, to the top of the float collar (do not sting in). Strip a 26" by 7 5/8" 8rd cementing head over the string. Weld the 26" connection. Strip a 7 5/8" 8rd by 5" pack-off assembly over the string. Make it up onto the cementing head. Sting

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into the float collar then pack off the drill pipe (fill the 26" by 5" annulus before packing off). Circulate the well with the rig pumps until the cement pumping units are rigged up.

27. Rig up a cementing company. Cement the 26" casing to surface. Top off if necessary. Pull the 5" cementing string out of the stab-in float collar. Test float equipment. Circulate the well "indirect" to check that the 5" cementing string is clear. Cut/split the 42" casing and flow line, and lay down.
28. After 24 hours WOC, pressure test the 26" casing. Hold the test for 30 minutes; record it on a pressure test recorder. Use a chart recorder to record this test. There shall not be more than a 10% drop in pressure. If so, then the test must be repeated. Bleed off the pressure.
29. Unpack the 5" drill pipe. Loosen the 7 5/8" pack off assembly on top of the cementing head. Cut the 26" weld on the casing. Strip the 26" by 7 5/8" 8rd cementing head over the cementing string. Pull the 5" cementing string out of the hole.
30. Cut the 26" casing and nipple up a flow line.
31. Pick up and run in a 24" center-punch assembly to the top of the float collar.
32. Circulate and condition the hole.
33. Drill out the float collar, cement, float shoe, cement, and 10 - 15 feet of new formation.
34. Circulate hole clean and treat mud for cement contamination.
35. Pull the center-punch assembly out of the hole and lay down.
36. Make a rough cut on the 26" casing. Pull the 26" casing out of the floor and lay it down. Install 26" x 20" swage w/21 1/4" 2M temporary flange.
37. Nipple up the 20" well control equipment including drilling nipple and flow line.
38. Function test the annular preventer.
39. Pick up and run in a 17 1/2" rock bit to approx. 850 GL.
40. Drill a 17 1/2" pilot hole to +/- 2290 ft. GL (Top of salt expected at approx. 2352 GL), running a deviation survey (TOTCO) every 90 ft. (every 30 ft. if deviation is a problem). There shall be no more than 1 - 2 degree per 100 ft.
41. Clean out mud tanks and haul off fresh water mud for disposal. Fill tanks with salt saturated drilling mud.
42. Displace the fresh water mud with salt-water gel.

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43. Pull out of hole with 17 1/2" bit.
44. Pick up and run in 8 1/2" core bit and 60 ft. of 4" (inner) x 6" (outer) core barrel to +/- 2290 ft. GL.
45. Cut a 4" core from +/- 2290 ft. to 2350 ft. GL. Pull out of hole and lay out the core. Lay down coring assembly.
46. Pick up and run in 8 1/2" core bit and 60 ft. of 4" (inner) x 6" (outer) core barrel to +/- 2350 ft. GL.
47. Cut a 4" core from +/- 2350 ft. to 2410 ft. GL. Pull out of hole and lay out the core. Lay down coring assembly.
48. Pick up and run in a 12-1/4" rock bit to +/- 2290 ft. GL.
49. Open the 8 1/2" core hole to 12-1/4". Drill a 12-1/4" pilot hole from to +/- 2475 ft. GL, running a deviation survey every 90 ft. (every 30 ft. if deviation is a problem). There shall be no more than 1 - 2 degree per 100 ft.
50. Circulate and condition the hole for coring.
51. Pull out of hole.
52. Pick up and run in 8 1/2" core bit and 40 ft. of 4" (inner) x 6" (outer) core barrel to +/- 2475 ft. GL.
53. Cut a 4" core from +/- 2475 ft. to 2515 ft. GL. Pull out of hole and lay out the core. Lay down coring assembly.
54. Pick up and run in a 12-1/4" rock bit to +/- 2475 ft. GL.
55. Open the 8 1/2" core hole to 12-1/4".
56. Drill a 12-1/4" pilot hole to +/- 2632 ft. GL, running a deviation survey every 90 ft. (every 30 ft. if deviation is a problem). There shall be no more than 1 - 2 degree per 100 ft.
57. Nipple down the well control equipment. Cut off the 26" by 20" swage and 21 1/4" 2M flange. Pick up the 26" drilling nipple and weld it back to the 26" pipe. Nipple up fill-up line and flow-line.
58. Pick up 17-1/2 inch hole opener with 12-1/4" rock bit strapped to bottom and open the 12-1/4" hole to 17-1/2" to +/- 2632 ft. GL.
59. Pull out of hole
60. Circulate and condition the hole for running logs.

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61. Rig up a wireline logging service company. Run the appropriate logs. Rig down and move out the wireline service company.
62. Pick up and run in hole with a 26" under reamer. Open the 17-1/2" pilot hole to 26" to +/- 2360 ft. GL.
63. Circulate and condition the hole.
64. Pull out of the hole with the 26" under reamer assembly.
65. Run in the hole to +/- 2450 ft. GL with blank 5" DP. Pump a 50 ft cement plug through the 5" DP and spot in the 17-1/2" bore hole. Pull out of the hole with the 5" DP. Wait on cement approx. 24 hrs.
66. Rig up a casing crew service and welders and run approx. 11 double joints of 20", .906"WT, 12 double joints of 20" & .75" WT and 6 double joints of 20" 0.5" WT, X-56, PE casing to +/- 2360 ft. GL. Float shoe and float collar (stinger type) will be welded to the first double joint, install centralizers in the middle of the first two joints then one on every other joint to surface.
67. Pick up and run in a cementing string of 5" drill pipe with a stinger sub on bottom and a bow centralizer in the middle of the first joint, to the top of the float collar (do not sting in).
68. Strip a 20" by 7-5/8" 8rd cementing head over the string. Weld the 20" connection. Strip a 7 5/8" 8rd by 5" pack-off assembly over the string. Make it up onto the cementing head.
69. Sting into the float collar then pack off the drill pipe (fill the 20" by 5" annulus before packing off).
70. Circulate the well with the rig pumps until the cement pumping units are rigged up.
71. Rig up a cementing company. Cement the 20" casing to surface. Top off if necessary.
72. Pull the 5" cementing string out of the stab-in float collar. Test float equipment. Circulate the well "indirect" to check that the 5" cementing string is clear.
73. Cut/split the 26" casing and flow line, and lay down.
74. After 72 hours WOC, pressure test the 20" casing. Hold the test for 30 minutes, record it on a pressure test recorder. Use a chart recorder to record this test. There shall not be more than a 10% drop in pressure. If so, then the test must be repeated. Bleed off the pressure and open the annular preventer.
75. Unpack the 5" drill pipe. Loosen the 7 5/8" pack off assembly on top of the cementing head. Cut the 20" weld on the casing. Strip the 20" by 7 5/8" 8rd cementing head over the cementing string. Pull the 5" cementing string out of the hole.

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76. Cut the 20" casing and nipple up a flow line.
77. Pick up and run in a 17-1/2" center-punch assembly to the top of the float collar.
78. Circulate and condition the hole.
79. Drill out the float collar, cement; float shoe, cement, and 10 - 15 feet of new formation.
80. Circulate hole clean and treat mud for cement contamination.
81. Pull the 17-1/2" center-punch assembly out of the hole and lay down.
82. Make a rough cut on the 20" casing. Pull the 20" casing out of the floor and lay it down. Install 21 1/4" 2M temporary flange and 20" well control equipment.
83. Pick up and run in hole with 17 1/2" rock bit to approx. 2360' GL.
84. Open hole to 17 1/2" to +/- 2632 ft. GL.
85. Nipple down the well control equipment. Cut off the 21 1/4" 2M flange.
86. Circulate the hole clean.
87. Remove salt saturated drilling mud from the rig tanks and haul it off to a disposal site. Fill the tanks with clean 10 lb/gal brine water.
88. Pick up and run in a 17 1/2" rock bit to TD.
89. Rig up directional survey service company and run a multi-shot gyroscopic survey (measure wellbore deviation). Rig down and move out wireline truck.
90. Pull out of the hole laying down the drilling assembly.
91. Install the 20" 2M double studded adapter. Energize the 'P' seals then test the 20" casing section to the appropriate test pressure for 15 minutes.
92. Install the leaching wellhead B spool.
93. Rig up to run +/-2530 ft. of 8-5/8", J-55 casing with a modified BT&C thread. Run 8-5/8" casing, externally testing to 80% of collapse on each connection under tension for 60 to 90 seconds each.
94. Install the leaching wellhead C (5-1/2") casing spool. Energize the 'P' seals then test the 8 5/8" hanger section to the appropriate test pressure for 15 minutes.
95. Rig up to run +/-2630 ft. of 5-1/2", J-55 casing having a BT&C connection.

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- 96. Install the leaching wellhead D casing spool. Energize the 'P' seals then test the 5 1/2" hanger section to the appropriate test pressure for 15 minutes.
- 97. Install the crown valve, DSA, logging valve, and blind flange. Install valves and flanges as needed to secure the well.
- 98. Rig down and move out the drilling rig.

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PROPOSED CAES WELL 3  
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Well: CAES Well No. 2  
 Operator: NYSEG Permit No. NA  
 Field: Reading  
 County: Schuyler  
 Lease: NA Survey: NA

Regulatory Information –

Proposed wellbore configuration: Also see attached wellbore schematic

- 42” Conductor: 0 - Approx. 175 ft.
- 26” Surface Casing: 0 - Approx. 850 ft.
- 20” Final Casing: 0 – Approx. 2,360 ft.
- 8-5/8” Outer Leaching Casing: 0 – Approx. 2,530 ft.
- 5-1/2” Inner Leaching Casing: 0 ft. – 2,630 ft.
- Total Depth: 2,638 ft.
- Bottom of USDW –
- Top of Caprock – NA
- Top of F Salt – Approx. 2,352 ft.

Note: All depths from Ground Level (GL)

1. Move in the “Rat Hole” drilling rig and drill 48” conductor hole to approximately 175 ft.
2. Run and cement approximately 175 ft of 42” conductor pipe.
3. Drill rat hole and mouse hole according to drilling rig contractor’s specifications.
4. Move in drilling rig with 27-1/2’ rotary and set up over the 42” conductor pipe.
5. After 24 hours WOC, pressure test the 42” casing. Hold the test for 30 minutes, record it on a pressure test recorder. Use a chart recorder to record this test. There shall not be more than a 10% drop in pressure. If so, then the test must be repeated. Bleed off the pressure.
6. Cut the 42” casing and nipple up a flow line.
7. Pick up and run in a 39-1/2” center-punch assembly to the top of the float collar.
8. Circulate and condition the hole.
9. Drill out the cement and 10 - 15 feet of new formation.

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10. Circulate hole clean and treat mud for cement contamination.
11. Pull the center-punch assembly out of the hole and lay down.
12. Make a rough cut on the 42" casing. Pull the 42" casing out of the floor and lay it down. Install 42" x 20" swage w/ 21 1/4" 2M temporary flange. Nipple up the 20" well control equipment including drilling nipple and flow line. Function test the annular preventer.
13. Pick up and run in a 17 1/2" rock bit to TD. Drill a 17 1/2" pilot hole to +/- 850 ft. RKB, running a deviation survey (TOTCO) every 90 ft. (every 30 ft. if deviation is a problem). There shall be no more than 1 - 2 degree per 100 ft.
14. Circulate and condition the hole for running logs.
15. Rig up a wireline service company. Run the appropriate logs. Rig down and move out the wireline company.
16. Pick up and run in a 27-1/2" hole-opener with a 17 1/2" rock bit strapped to the bottom. Open the 17-1/2" pilot hole to 27-1/2" to +/- 850 ft. RKB.
17. Circulate and condition the hole.
18. POOH with the 27-1/2" hole opening assembly.
19. Pick up and run in a 34-1/2" hole-opener with a 26" rock bit strapped to the bottom. Open the 27-1/2" hole to 34-1/2" from the end of the 42" to +/- 850 ft. RKB.
20. Circulate and condition the hole.
21. POOH with the 34-1/2" hole opening assembly.
22. Rig up a wireline service company and run a 60" 4-arm XY Caliper log from TD to conductor pipe.
23. Rig up a casing crew service and welders and run approx. 5 double joints of 26", .625" WT, and approx. 6 double joints of 0.75"WT, X-56, PE casing to +/- 850 ft. RKB. Float shoe and float collar (stinger type) will be welded to the first double joint, install centralizers in the middle of the first two joints then one on every other joint to surface.
24. Pick up and run in a cementing string of 5" drill pipe with a stinger sub on bottom and a bow centralizer in the middle of the first joint, to the top of the float collar (do not sting in). Strip a 26" by 7 5/8" 8rd cementing head over the string. Weld the 26" connection. Strip a 7 5/8" 8rd by 5" pack-off assembly over the string. Make it up onto the cementing head. Sting into the float collar then pack off the drill pipe (fill the 26" by 5" annulus before packing off). Circulate the well with the rig pumps until the cement pumping units are rigged up.

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25. Rig up a cementing company. Cement the 26" casing to surface. Top off if necessary. Pull the 5" cementing string out of the stab-in float collar. Test float equipment. Circulate the well "indirect" to check that the 5" cementing string is clear. Cut/split the 42" casing and flow line, and lay down.
26. After 24 hours WOC, pressure test the 26" casing. Hold the test for 30 minutes; record it on a pressure test recorder. Use a chart recorder to record this test. There shall not be more than a 10% drop in pressure. If so, then the test must be repeated. Bleed off the pressure.
27. Unpack the 5" drill pipe. Loosen the 7 5/8" pack off assembly on top of the cementing head. Cut the 26" weld on the casing. Strip the 26" by 7 5/8" 8rd cementing head over the cementing string. Pull the 5" cementing string out of the hole.
28. Cut the 26" casing and nipple up a flow line.
29. Pick up and run in a 24-1/2" center-punch assembly to the top of the float collar.
30. Circulate and condition the hole.
31. Drill out the float collar, cement, float shoe, cement, and 10 - 15 feet of new formation.
32. Circulate hole clean and treat mud for cement contamination.
33. Pull the center-punch assembly out of the hole and lay down.
34. Make a rough cut on the 26" casing. Pull the 26" casing out of the floor and lay it down. Install 26" x 20" swage w/21 1/4" 2M temporary flange. Nipple up the 20" well control equipment including drilling nipple and flow line. Function test the annular preventer.
35. Pick up and run in a 17 1/2" rock bit to approx. 850 RKB.
36. Drill a 17 1/2" pilot hole to +/- 2300 ft. RKB (Top of salt expected at approx. 2352 GL), running a deviation survey (TOTCO) every 90 ft. (every 30 ft. if deviation is a problem). There shall be no more than 1 - 2 degree per 100 ft.
37. Clean out mud tanks and haul off fresh water mud for disposal. Fill tanks with salt saturated drilling mud.
38. Displace the fresh water mud with salt-water gel.
39. Drill 17 1/2" pilot hole to +/-2632'.
40. Pull out of hole with 17 1/2" bit.
41. Circulate and condition the hole for running logs.

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42. Rig up a wireline logging service company. Run the appropriate logs. Rig down and move out the wireline service company.
43. Nipple down the well control equipment. Cut off the 26" by 20" swage and 21 1/4" 2M flange. Pick up the 26" drilling nipple and weld it back to the 26" pipe. Nipple up fill-up line and flow-line.
44. Pick up and run in a 24" hole-opener with a 17 1/2" rock bit strapped to the bottom. Open the 17-1/2" pilot hole to 24" to +/- 2360 ft. RKB.
45. Circulate and condition the hole.
46. Pull out of the hole with the 24" hole opening assembly.
47. Pick up and run in a 26" under reamer. Open 24" hole to 26" to +/- 2360 ft. RKB.
48. Circulate and condition the hole.
49. Pull out of the hole with the under reamer assembly
50. Run in the hole to +/- 2450 ft. GL with blank 5" DP. Pump a 50 ft cement plug through the 5" DP and spot in the 17-1/2" bore hole. Pull out of the hole with the 5" DP. Wait on cement approx. 24 hrs.
51. Rig up a casing crew service and welders and run approx. 11 double joints of 20", .906"WT, 12 double joints of 20" & .75" WT and 6 double joints of 20" 0.5" WT, X-56, PE casing to +/- 2360 ft. RKB. Float shoe and float collar (stinger type) will be welded to the first double joint, install centralizers in the middle of the first two joints then one on every other joint to surface.
52. Pick up and run in a cementing string of 5" drill pipe with a stinger sub on bottom and a bow centralizer in the middle of the first joint, to the top of the float collar (do not sting in). Strip a 20" by 7-5/8" 8rd cementing head over the string.
53. Weld the 20" connection.
54. Strip a 7 5/8" 8rd by 5" pack-off assembly over the string. Make it up onto the cementing head. Sting into the float collar then pack off the drill pipe (fill the 20" by 5" annulus before packing off).
55. Circulate the well with the rig pumps until the cement pumping units are rigged up.
56. Rig up a cementing company. Cement the 20" casing to surface. Top off if necessary. Pull the 5" cementing string out of the stab-in float collar. Test float equipment. Circulate the well "indirect" to check that the 5" cementing string is clear. Cut/split the 26" casing and flow line, and lay down.

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57. After 72 hours WOC, pressure test the 20" casing. Hold the test for 30 minutes, record it on a pressure test recorder. Use a chart recorder to record this test. There shall not be more than a 10% drop in pressure. If so, then the test must be repeated. Bleed off the pressure and open the annular preventer.
58. Unpack the 5" drill pipe. Loosen the 7 5/8" pack off assembly on top of the cementing head. Cut the 20" weld on the casing. Strip the 20" by 7 5/8" 8rd cementing head over the cementing string. Pull the 5" cementing string out of the hole.
59. Cut the 20" casing and nipple up a flow line.
60. Pick up and run in a 17-1/2" center-punch assembly to the top of the float collar.
61. Circulate and condition the hole.
62. Drill out the float collar, cement; float shoe, cement, and 10 - 15 feet of new formation.
63. Circulate hole clean and treat mud for cement contamination.
64. Pull the 17-1/2" center-punch assembly out of the hole and lay down.
65. Make a rough cut on the 20" casing. Pull the 20" casing out of the floor and lay it down. Install 21 1/4" 2M temporary flange and 20" well control equipment.
66. Pick up and run in hole with 17 1/2" rock bit to approx. 2360' RKB.
67. Open 17 1/2" pilot hole to +/- 2632 ft. RKB.
68. Circulate and condition the hole for cement contamination.
69. Nipple down the well control equipment. Cut off the 21 1/4" 2M flange.
70. Circulate the hole clean.
71. Remove salt saturated drilling mud from the rig tanks and haul it off to a disposal site. Fill the tanks with clean 10 lb/gal brine water.
72. Pick up and run in a 17 1/2" rock bit to TD.
73. Rig up directional survey service company and run a multi-shot gyroscopic survey (measure wellbore deviation). Rig down and move out wireline truck.
74. Pull out of the hole laying down the drilling assembly.
75. Install the 20" 2M double studded adapter. Energize the 'P' seals then test the 20" casing section to the appropriate test pressure for 15 minutes.
76. Install the leaching wellhead B spool.

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- 77. Rig up to run +/-2530 ft. of 8-5/8", J-55 casing with a modified BT&C thread. Run 8-5/8" casing, externally testing to 80% of collapse on each connection under tension for 60 to 90 seconds each.
- 78. Install the leaching wellhead C (5-1/2") casing spool. Energize the 'P' seals then test the 8 5/8" hanger section to the appropriate test pressure for 15 minutes.
- 79. Rig up to run +/-2630 ft. of 5-1/2", J-55 casing having a BT&C connection.
- 80. Install the leaching wellhead D casing spool. Energize the 'P' seals then test the 5 1/2" hanger section to the appropriate test pressure for 15 minutes.
- 81. Install the crown valve, DSA, logging valve, and blind flange. Install valves and flanges as needed to secure the well.
- 82. Rig down and move out the drilling rig.

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**WORKOVER PROGRAM**

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**NYSEG  
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**INTRODUCTON**

The NYSEG cavern has just finished first the stage of direct leaching. A workover is scheduled to bleed off the nitrogen blanket, remove and inspect the 5-1/2" casing, conduct a through pipe sonar survey, re-set the blanket protection string back into well to a new depth, re-run the 5-1/2" casing back into well to a new setting depth, and re-inject the nitrogen blanket.

**WELL WORKOVER PLAN**

1. Depressure the nitrogen to atmosphere through the ½ inch needle valve on the wellhead nitrogen injection manifold. Approximately 450,000 – 650,000 scf of nitrogen is in the well. Depressurization rate should not exceed 2.5 psi/minute (approximately 9 hrs). This activity will be performed prior to mobilization of the workover rig.
2. Depressure the freshwater (pressure in 5-1/2" tubing) from the well.
3. Remove the wellhead piping.
4. Install rig anchors per the workover rig requirements.
5. Rig up workover rig. The 5-1/2" casing weight is approximately 46,000 pounds in air (2,630 ft of 5-1/2", 17.5 lb/ft casing. The bottom of the 5-1/2" may locked in insoluble on the bottom of the cavern.
6. Remove the upper section of the leaching wellhead along with the leaching wellhead D section. Nipple up the 13-5/8" annular preventer.
7. Back out lock down screws located in the top flange of the leaching wellhead C section.
8. Pick up a spear dressed for 5-1/2", 17.5 lb/ft casing and run in the hole. Set the spear. Pull 5 1/2" hanger/joint (approx. 46,000 lbs in air and set in slips on the annular preventer. Lay down spear and grapple.
9. Rig up the casing crew and tools to pull the 5-1/2" hanging casing.
10. Remove approx. 2,630 feet (estimate 65 joints + hanger joint) of 5-1/2", 17.5 lb/ft, J-55, LT&C casing. Place casing on location for on-site cleaning, inspection, and re-doping threaded connections. Transport the rejected 5-1/2" casing off-site for repairs
11. Nipple down the 13 5/8" well control equipment. Remove the leaching wellhead C section. Nipple up the 13-5/8" 2M annular preventer and 20-3/4" x 13-5/8" DSA.
12. Back out lock down screws located in the top flange of the leaching wellhead B section.
13. Pick up a spear dressed for 8-5/8", 32 lb/ft LT&C casing and run in the hole. Set the spear. Pull 8-5/8" hanger/joint (approx. 80,000 lbs in air) and set in slips in the annular preventer. Lay down spear and grapple.

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14. Rig up the casing crew and tools to pull the 8-5/8" hanging casing.
15. Remove approx. 80 ft (estimate 2 joints + hanger joint) of 8-5/8", 32 lb/ft, J-55, LT&C casing. Place casing on location for on-site cleaning, inspection, and re-doping threaded connections. Hang 8-5/8", 32#, J-55, LT&C casing in slips set in annular preventer.
16. Rig up wireline unit and run a sonar survey. Rig down wireline unit.  
 Note: Have sonar company zero at bradenhead flange (BHF). Tie in the sonar tool with the cemented casing shoe and CCL (2,360 ft WLM). Take sonar survey at 5 ft stations
17. Rig down wireline unit.
18. Run in approx. 14 ft (estimate 1 pup joint) of 8-5/8", 32 lb/ft, J-55, LT&C casing plus hanger (setting depth of approx. 2,472 ft.). The J-55 casing connections will be made up to the optimum torque. Externally pressure test (the 32 lb/ft, J-55) to 1,600-psi and hold for 90 seconds as they are run in.
19. Note: A digital recorder WILL be run in conjunction with the external tester.
20. Land casing using a casing spear dressed for 8-5/8", 32.0 lb/ft casing. Screw in lock down screws located in the top flange of the leaching wellhead B section.
21. Nipple down the 13-5/8" well control equipment and install the leaching wellhead C section. Activate and test P-seals (1,600 psi for 15 minutes).
22. Nipple up 13-5/8" well control equipment.
23. Pick up and run 2,530 ft (estimate 63 joints) of 5-1/2, 17.5 lb/ft, J-55, LT&C casing including hanger. The casing connections will be made up to the torque required to make the triangle on the pin end reach the end of the coupling.
24. Land casing using a casing spear dressed for 5-1/2", 17.5 lb/ft casing. Screw in lock down screws located in the top flange of the leaching wellhead C section.
25. Nipple down 13-5/8" well control equipment and install leaching wellhead D section. Activate and test P-seals. (1,600 psi for 15 minutes).
26. Install the upper portion of the wellhead.
27. Re-connect surface piping.
28. Rig down and move out the workover rig.
29. Close wellhead blanket valve and open nitrogen injection manifold valve. Remove blind from 4" nitrogen injection manifold and connect and test nitrogen injection hoses.
30. Cool down nitrogen pumper.

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31. Inject nitrogen through blanket valve into annulus between 8-5/8" and last cemented casing at temperature of approximately 50° F.
32. Contact Inergy Operations to set up cavern for reverse circulation.
33. Contact Inergy control room and begin reverse circulation. Increase flow rate to 350 gpm water.
34. Rig up wireline contractor to run pulsed neutron interface. Identify nitrogen interface and add or remove nitrogen to achieve interface of 2,420 feet.
35. Rig down wireline contractor and nitrogen contractor.
36. Close wellhead nitrogen blanket valve, nitrogen injection manifold valves, crown valve, and logging valve.
37. Contact Inergy control room when operations are concluded.

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**Attachment 1 Casing Schematics**

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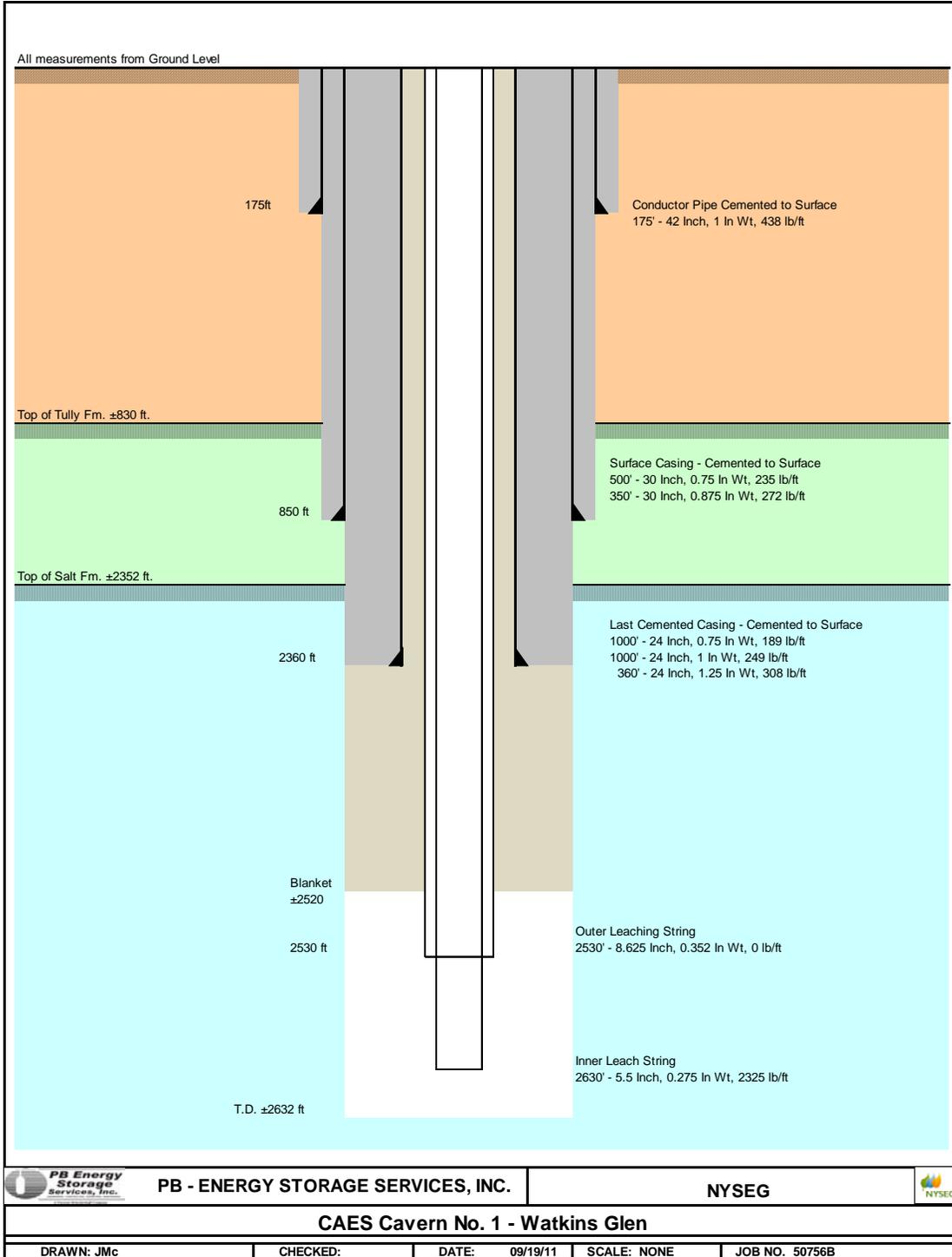
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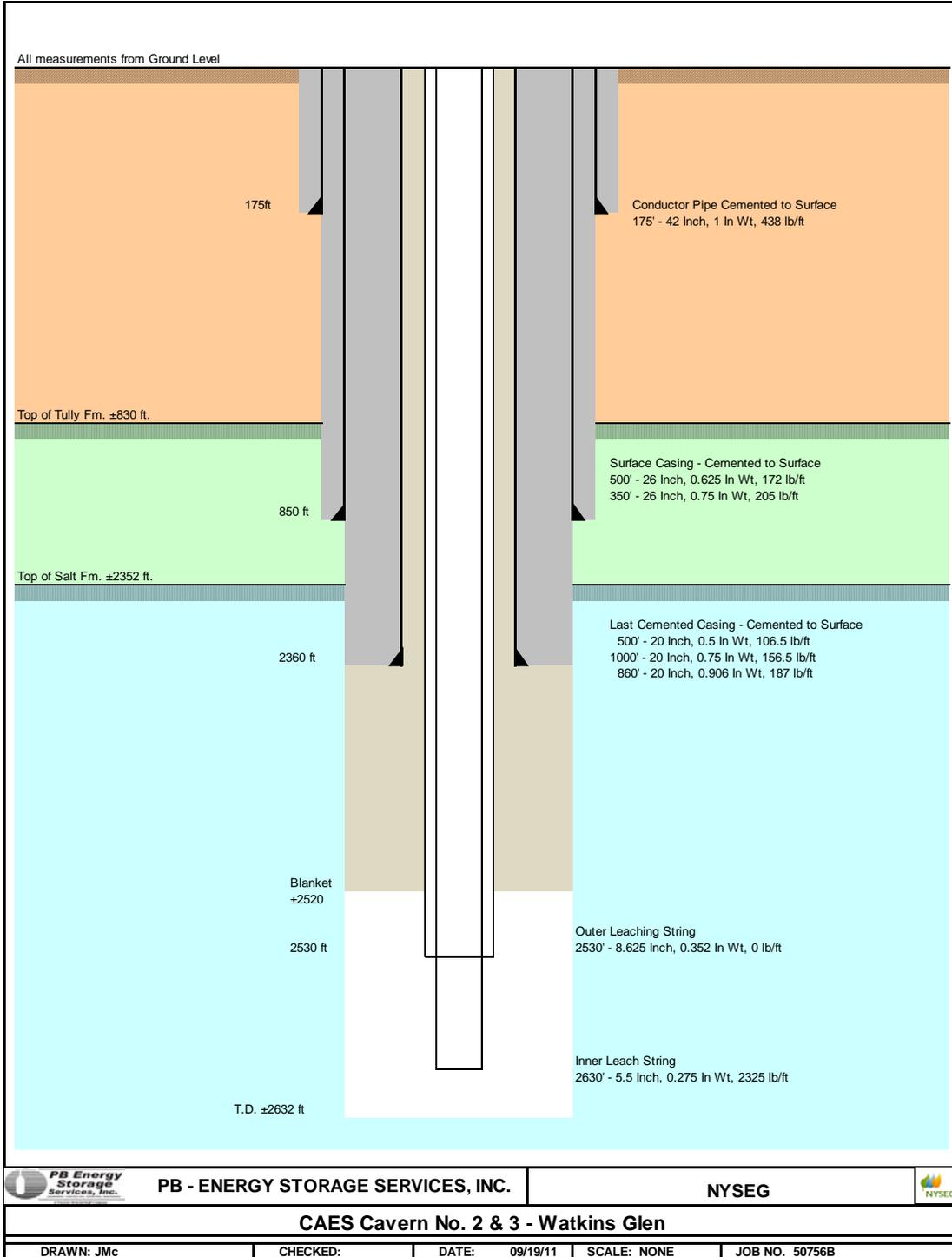
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**Leaching Wellhead – Cavern No. 1**

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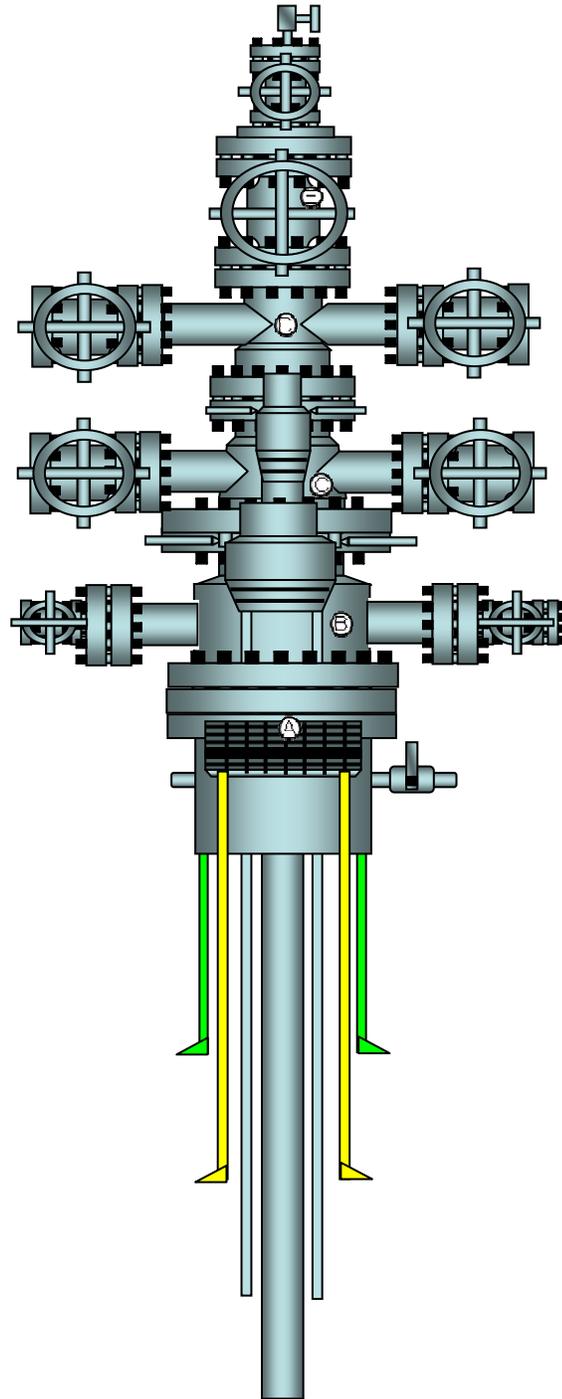
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**Attachment 2 - Wellheads Caverns 1, 2, and 3**



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