Headquarters U.S. Air Force

Integrity - Service - Excellence

FORMER WILLIAMS AIR FORCE BASE

BCT MEETING

27 May 2015

ED_005025_00004680-00001

Headquarters U.S. Air Force

Integrity - Service - Excellence

SITE ST012,

FORMER LIQUID FUELS STORAGE AREA

REMEDIAL ACTION

ED_005025_00004680-00002

ST012 UPDATE

- Steam Enhanced Extraction (SEE) Operations Progress
- Near-term SEE Operational Plan

ED_005025_00004680-00003

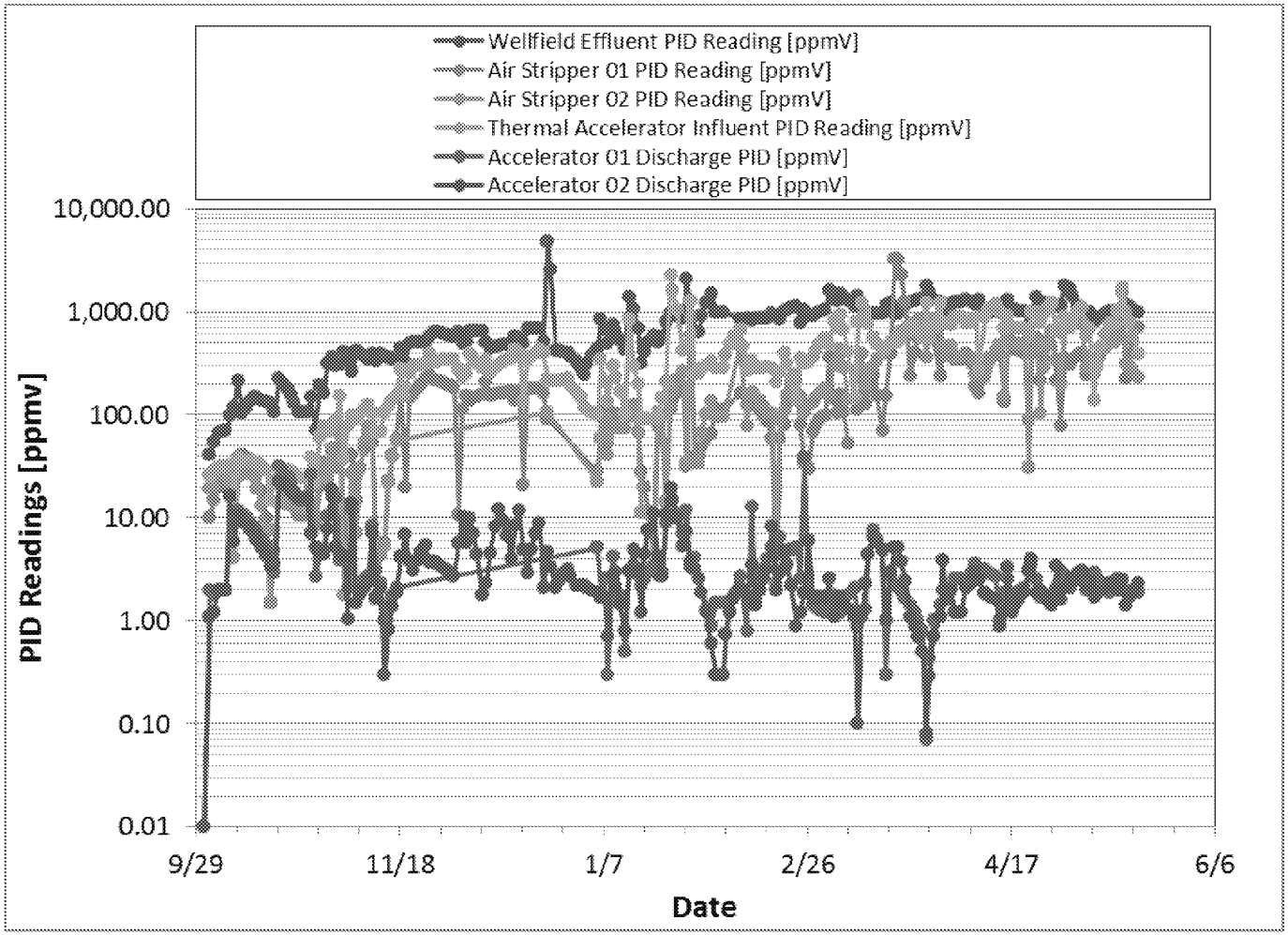
SEE System Updates

ST012 SEE SYSTEM STATUS - SUMMARY

	Value	Unit
Target Treatment Zone (TTZ) Soil Volume	410,000	cubic yards (cy)
Area	199,000	square feet (ft^2)
Upper Depth of Treatment	145	feet (ft) below ground surface (bgs)
Lower Depth of Treatment	245	ft bgs
Vapor Liquid Treatment Started	09/29/14	
Thermal Operations Started	09/29/14	
Last Process Data Update	05/18/15	
Last Temperature Data Update	05/18/15	
Estimated Total Days of Operation	422	days
Days of Operation	231	days
Days of Operation vs. Estimate	55	percent (%)
Estimated Total Energy Usage	11,343,000	kilowatt hours (kWh)
Total Energy Used	2,011,463	kWh
Used Electrical Energy vs. Estimate	18	%
Total Steam Injected	132.7	million pounds (lbs)
Projected Total Steam Injection	320	million lbs
Steam Injected Vs Projected	41	%
Total Mass Removed in Vapor Based on Photoionization Detector (PID) Readings	204,784	lbs
Total Mass Removed as NAPL	606,873	lbs
Average Daily NAPL Mass Removal Last Week	6,065	lbs/day
Total Vapor and Liquid Mass Removal (based on PID readings)	811,657	lbs
Average Power Usage Rate Last Week	431	kilowatts (kW)
Average Wellfield Vapor Extraction Rate Last Week	521	standard cubic feet per minute (scfm)
Average Condensate Production Rate Last Week	1.2	gallons per minute (gpm)
Average Water Extraction Rate Last Week	114	gpm*
Total Water Extracted	34,987,363	gallons
Total Recovered Light Non-Aqueous Phase Liquid	92,230	gallons
Average Water Discharge Rate Last Week	170	gpm
Total Treated Water Discharge	44,566,000	gallons

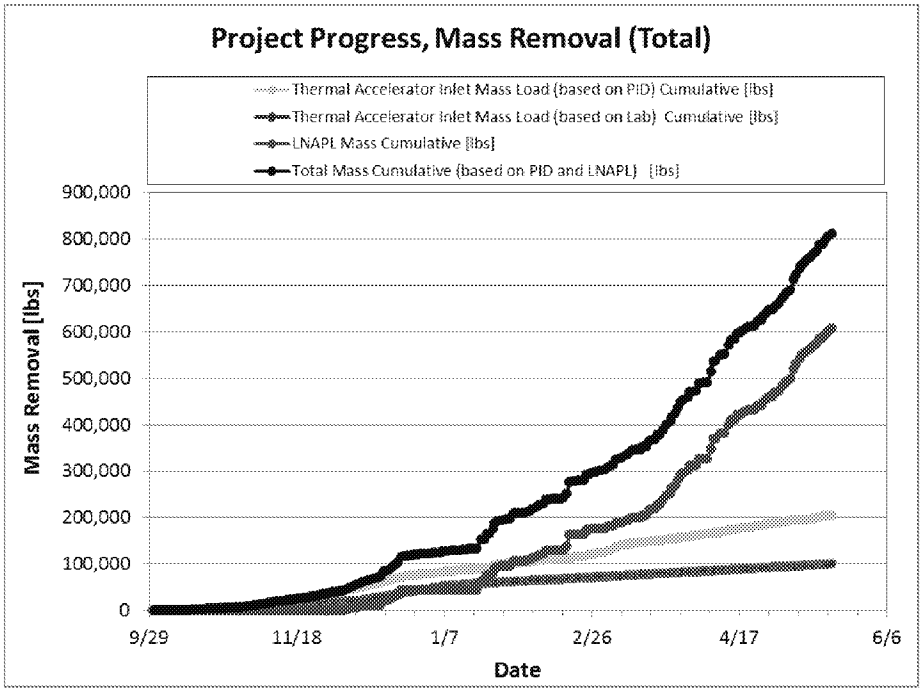
***Average liquid extraction rate was lower due to five eductor wells (LSZ05, LSZ06, LSZ29, UWBZ05 and UWBZ27) requiring service during this operational period. Please note that LSZ29 and UWBZ27 were pulled and put back into service by 5/19/15. Temperatures observed at the remaining wells are close to boiling and therefore the wells cannot be serviced at this time due to health and safety concerns.**

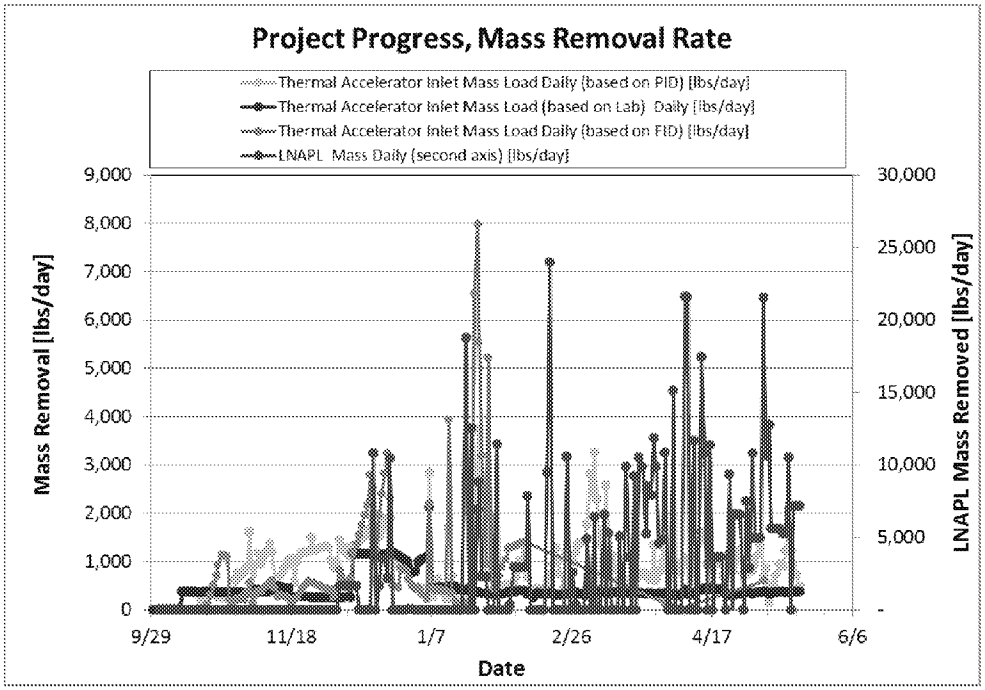
ST012 SEE SYSTEM PHOTO IONIZATION DETECTOR (PID) READINGS



- Vapors continue to be rich in organics

ST012 SEE SYSTEM MASS REMOVAL





- Non-aqueous phase liquid (NAPL) recovery: total mass of 812,000 lbs has been recovered to date
- An estimated 607,000 lbs (~92,000 gallons) of mass has been removed as NAPL
- An estimated 205,000 lbs of mass (PID) has been removed in the vapor phase

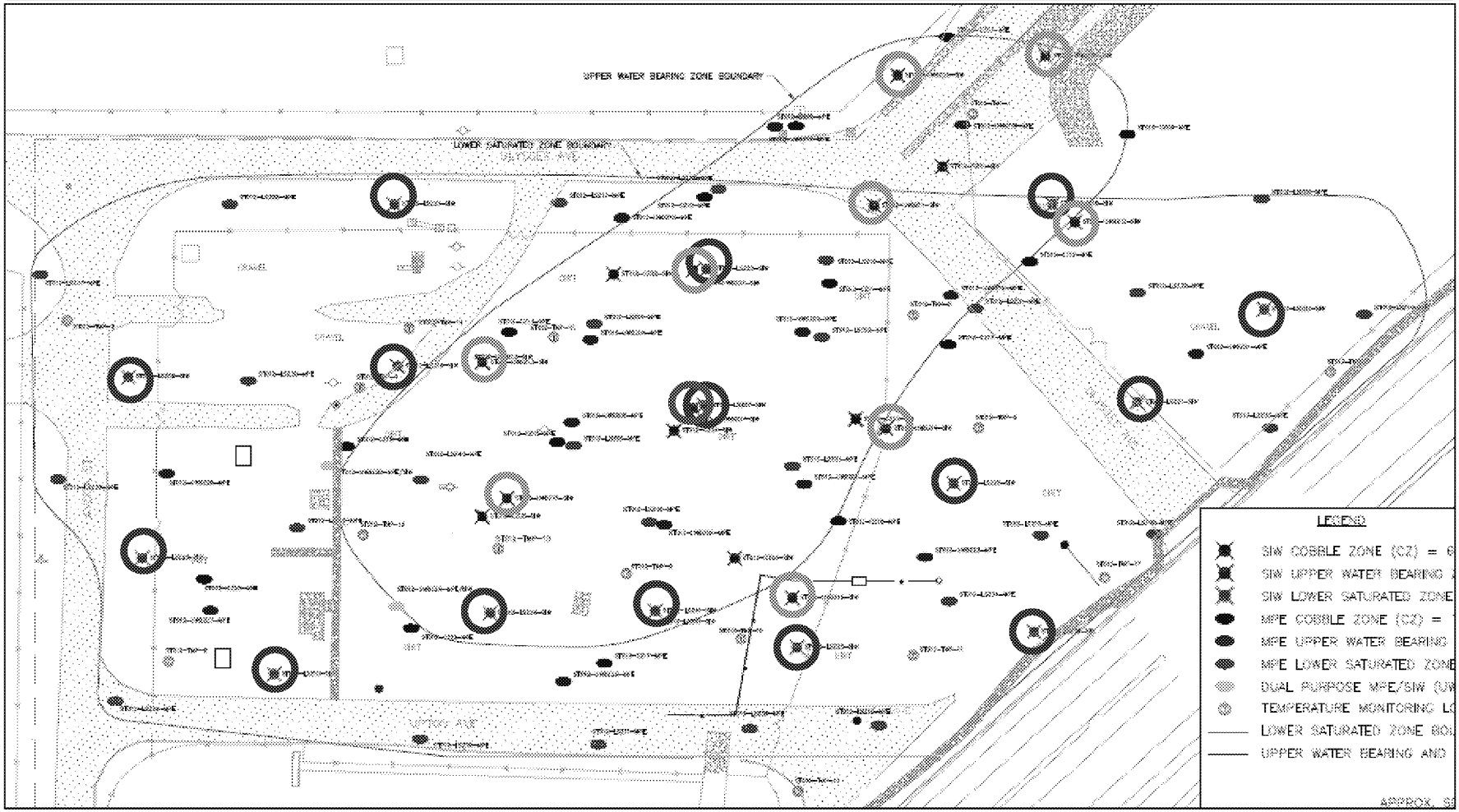
ST012 Steam Injection Status

ED_005025_00004680-00008

ST012 SEE OPERATIONAL PROGRESS

- **SEE System Operations** — **24 Feb – 23 Mar**
  - Average liquid extraction rate of 86 gpm
  - Typically four eductor skids were online at a time – eductor skid 6 (primarily servicing the down gradient edge of the treatment zone) has been operated continuously
  - Average steam injection rates of 15,600 lbs per hour in the LSZ and 4,900 lbs per hour in the UWBZ
  - Twenty-one steam wells are currently online – injection rates at wells have varied due to boiler issues and due to MPE transition piece preventative replacement
- **SEE System Operations** — **23 Mar – 23 April**
  - Average liquid extraction rate of 126 gpm
  - Typically five eductor skids were online at a time – eductor skids 4 and 6 have been operated continuously
  - Average steam injection rates of 18,100 lbs per hour in the LSZ and 8,800 lbs per hour in the UWBZ
  - Twenty-five steam wells are currently online (see next slide) – injection rates at wells have varied due to boiler issues
- **SEE System Operations** — **23 April - 18 May**
  - Average liquid extraction rate of 122 gpm
  - Typically five eductor skids were online at a time – eductor skids 4 and 6 have been operated continuously
  - Average steam injection rates of 23,200 lbs per hour in the LSZ and 11,700 lbs per hour in the UWBZ
  - Twenty-four steam wells are currently online (see next slide) – injection rates at wells have varied due to boiler issues , adjustments to control steam migration (TMP-10), and surface dampness (UWBZ07 and LSZ07).

ST012 STEAM INJECTION WELLS ONLINE



LSZ wells online (15) UWBZ wells online (9) UWBZ well offline (1)

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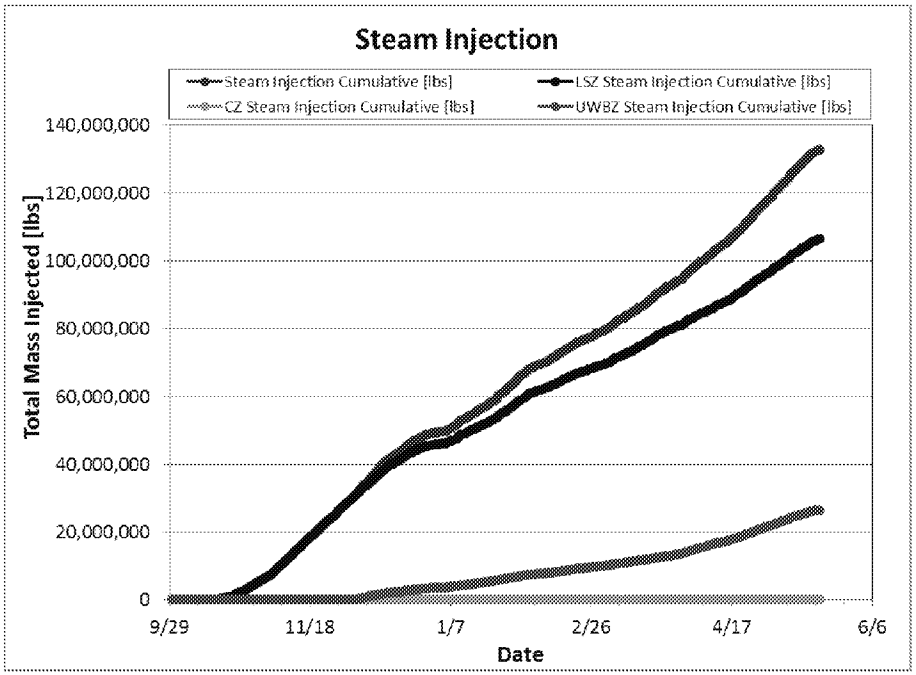
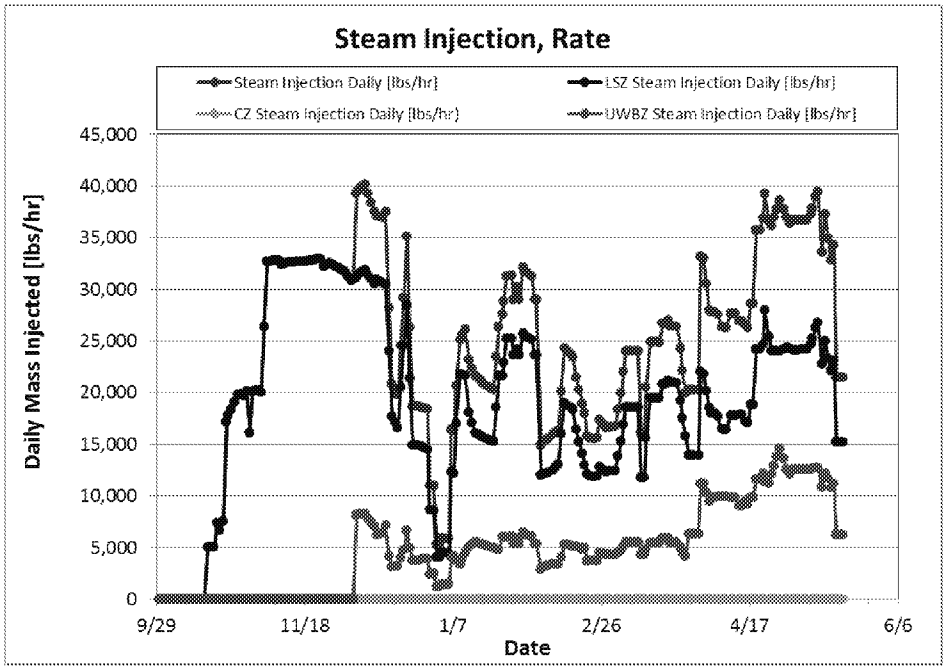
ST012 SEE STEAM INJECTION





- **Current average steam injection (not including a short shutdown to replace a pressure transducer):**
  - UWBZ 10,700 lbs/hr ~ 21 gpm as water
  - LSZ 23,000 lbs/hr ~ 46 gpm as water
- **Total steam injection rate equivalent to 67 gpm of water**

ST012 SEE DISCHARGE COMPLIANCE

- We continue to collect weekly samples of carbon influent, midfluent, and effluent to monitor for breakthrough. In addition, midfluent is sampled twice per week for pesticides.
- We continue to operate both air strippers, manage biomass layers in the T102 tank that feeds the air strippers and GAC, and monitor closely for breakthrough at the GAC midfluent.
- April GAC sampling indicated a beta-BHC detection. Following evaluation of the analytical the detection may be a false positive detection. Additionally, re-evaluation of the December 22, 2014 beta-BHC detection indicates a potential false positive result. In both cases, the potential beta-BHC false positive detection is likely the result of interference with other petroleum hydrocarbon compounds.
- If such a detection is reported again based on EPA Method 8081, then a high resolution mass spectrometry method (EPA Method 1699) will be performed to aid in compound detections.

ST012 Steam Injection Influence at Temperature Monitoring Points

ED_005025_00004680-00013

ST012 TEMPERATURE MONITORING POINTS

TMP-01
TMP-02
TMP-03
TMP-04
TMP-05
TMP-06
TMP-07
TMP-08
TMP-09
TMP-10
TMP-11
TMP-12
TMP-13
TMP-14
TMP-15
TMP-16
TMP-17

Legend
Temperature Monitoring Point

APPROX. SCALE
0 20 40 60 80 FT

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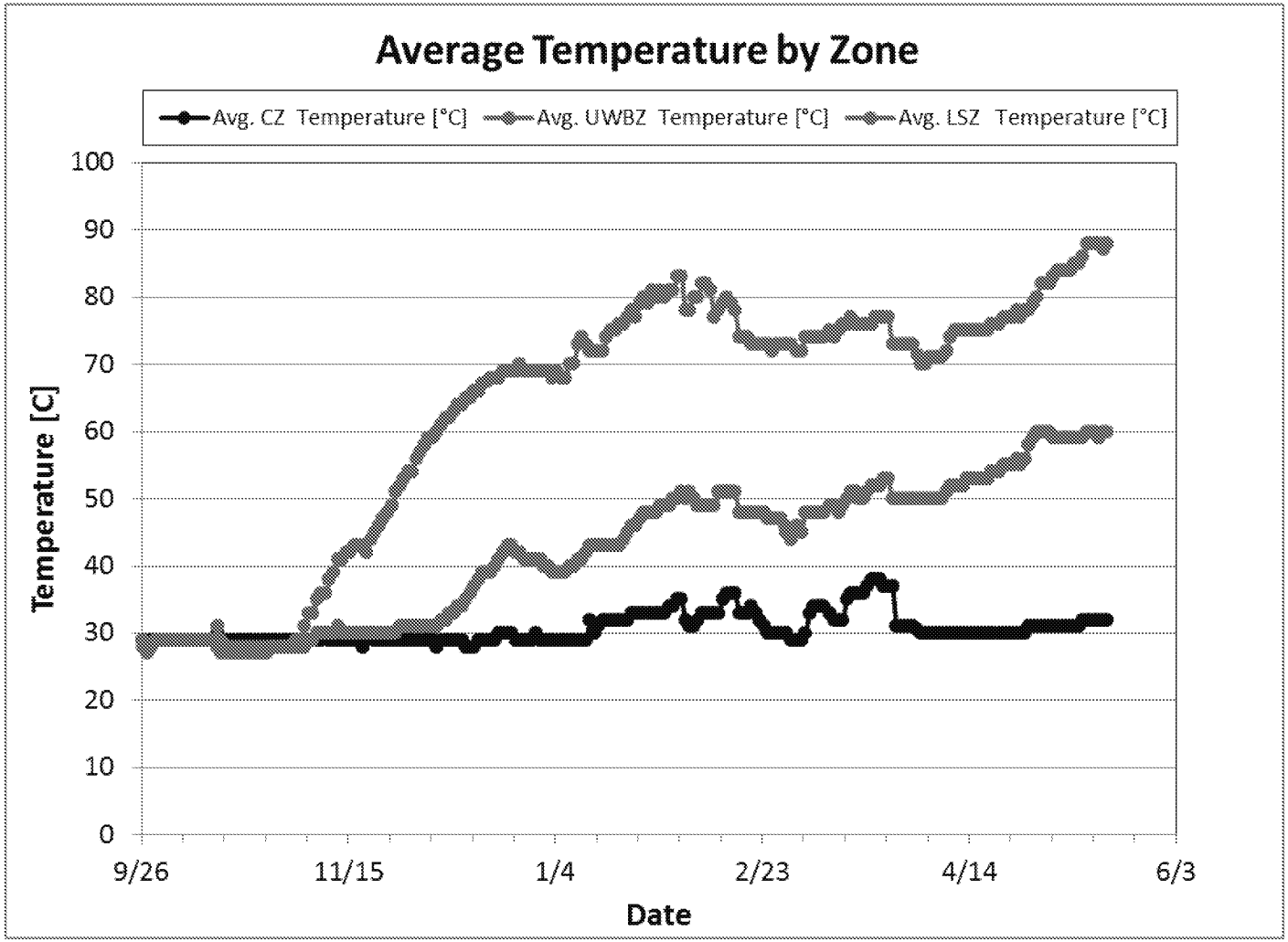
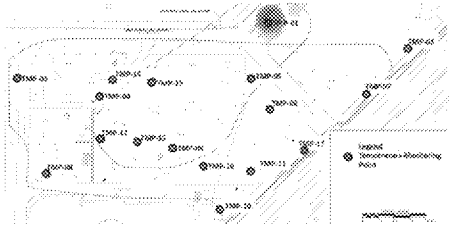
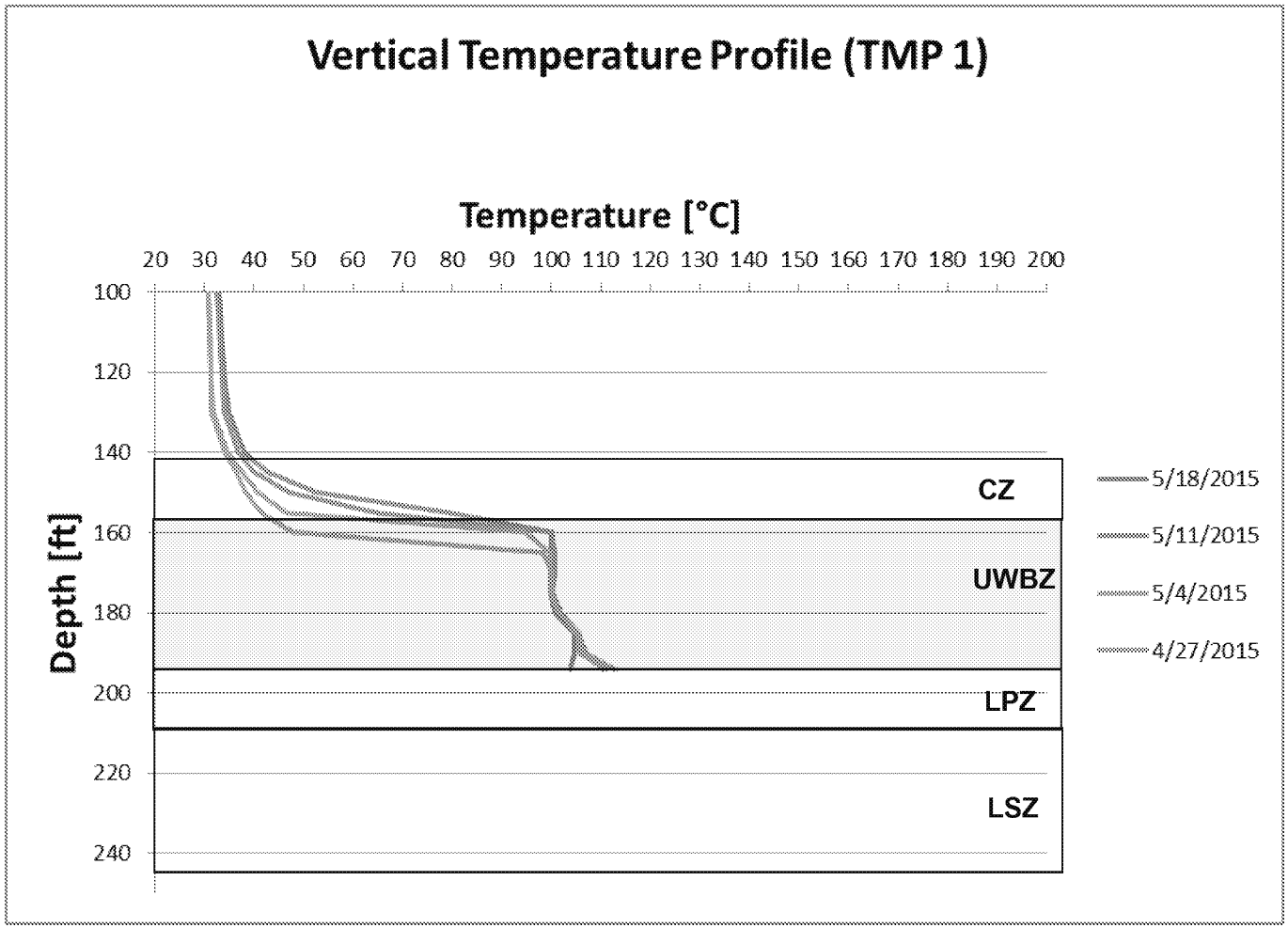
TMPs show boiling temperatures

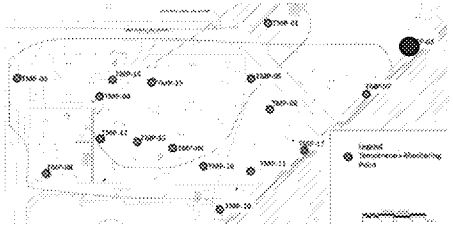
TMPs requiring repair

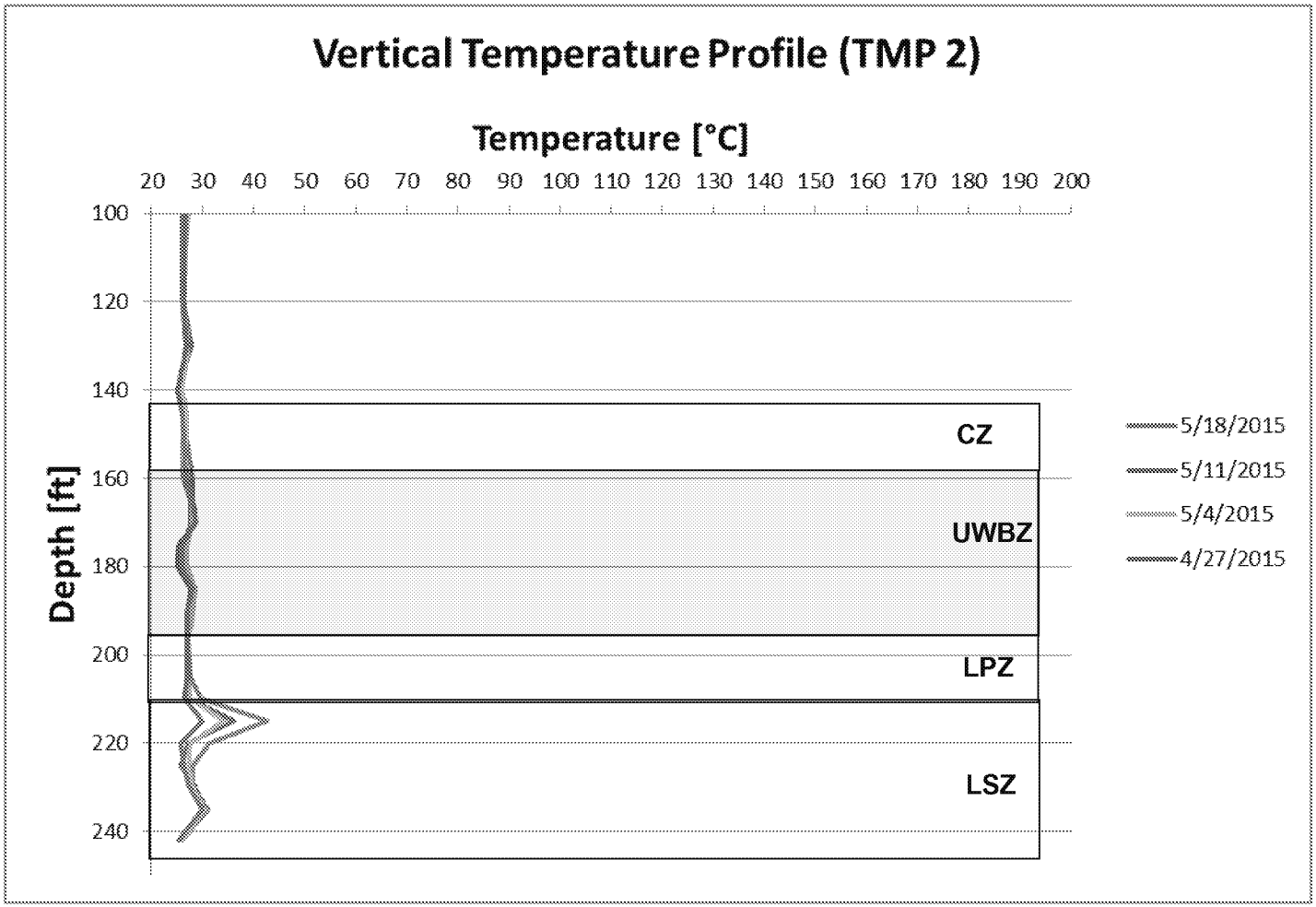
ST012 SEE COLLOCATED TEMPERATURES AT EXTRACTION WELLS BY ZONE






Vertical Temperature Profile (TMP 1)
Temperature [°C]
20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Depth [ft]
100
120
140
160
180
200
220
240
CZ
UWBZ
LPZ
LSZ
5/18/2015
5/11/2015
5/4/2015
4/27/2015





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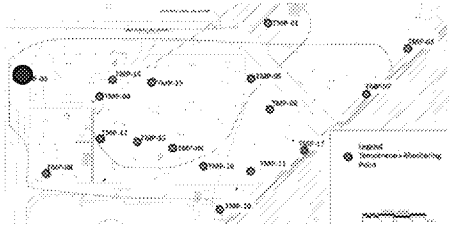
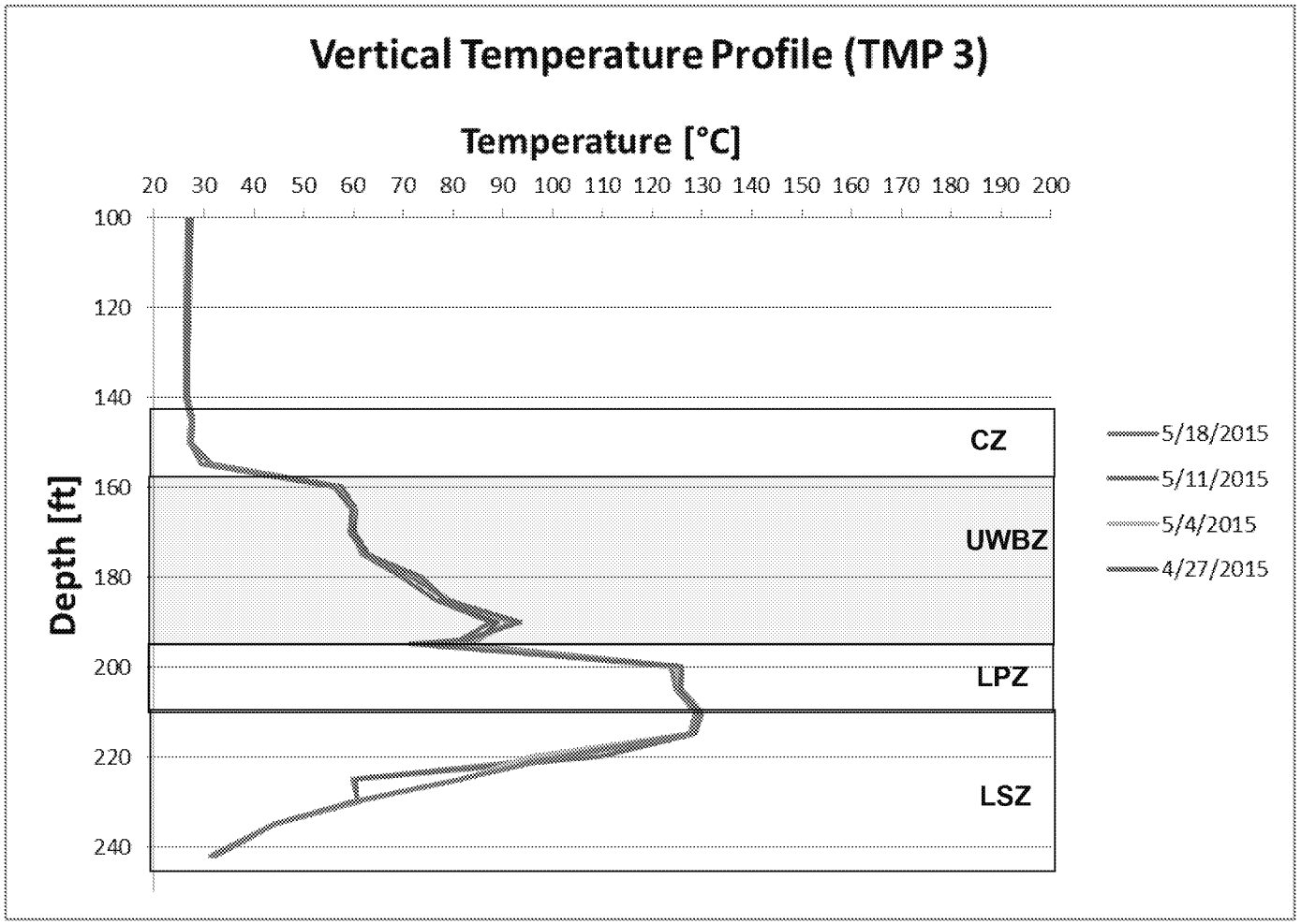
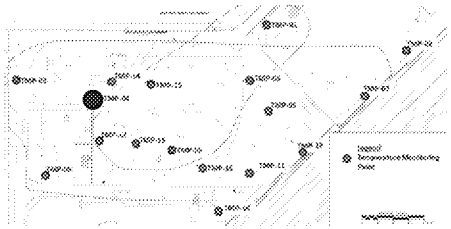
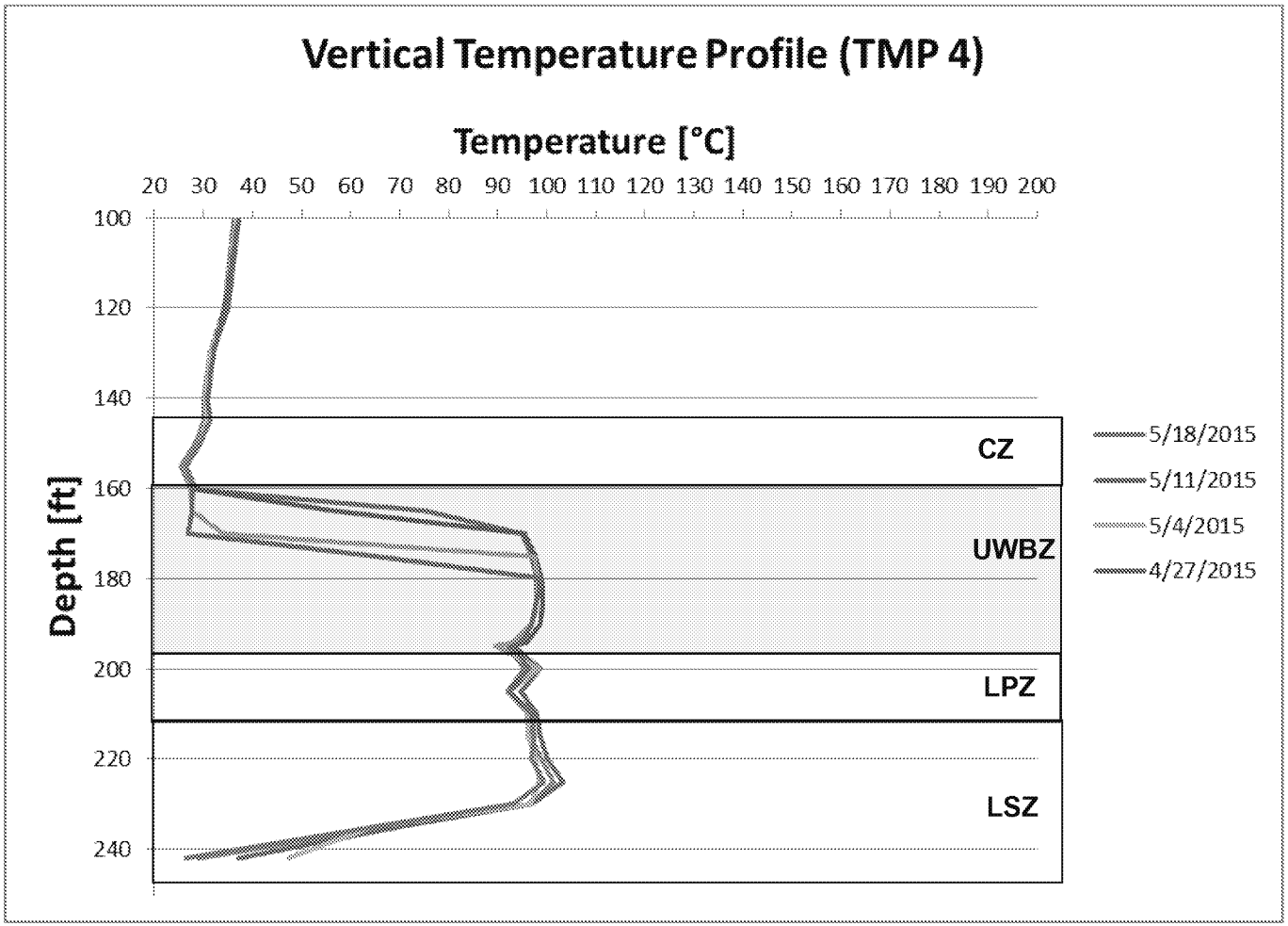



Vertical Temperature Profile (TMP 3)
Temperature [°C]
20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Depth [ft]
100
120
140
160
180
200
220
240
CZ
UWBZ
LPZ
LSZ
5/18/2015
5/11/2015
5/4/2015
4/27/2015





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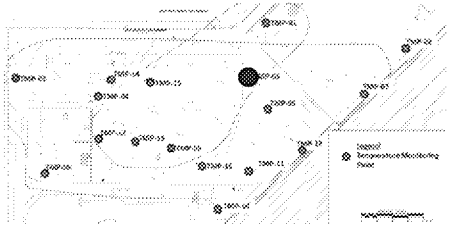
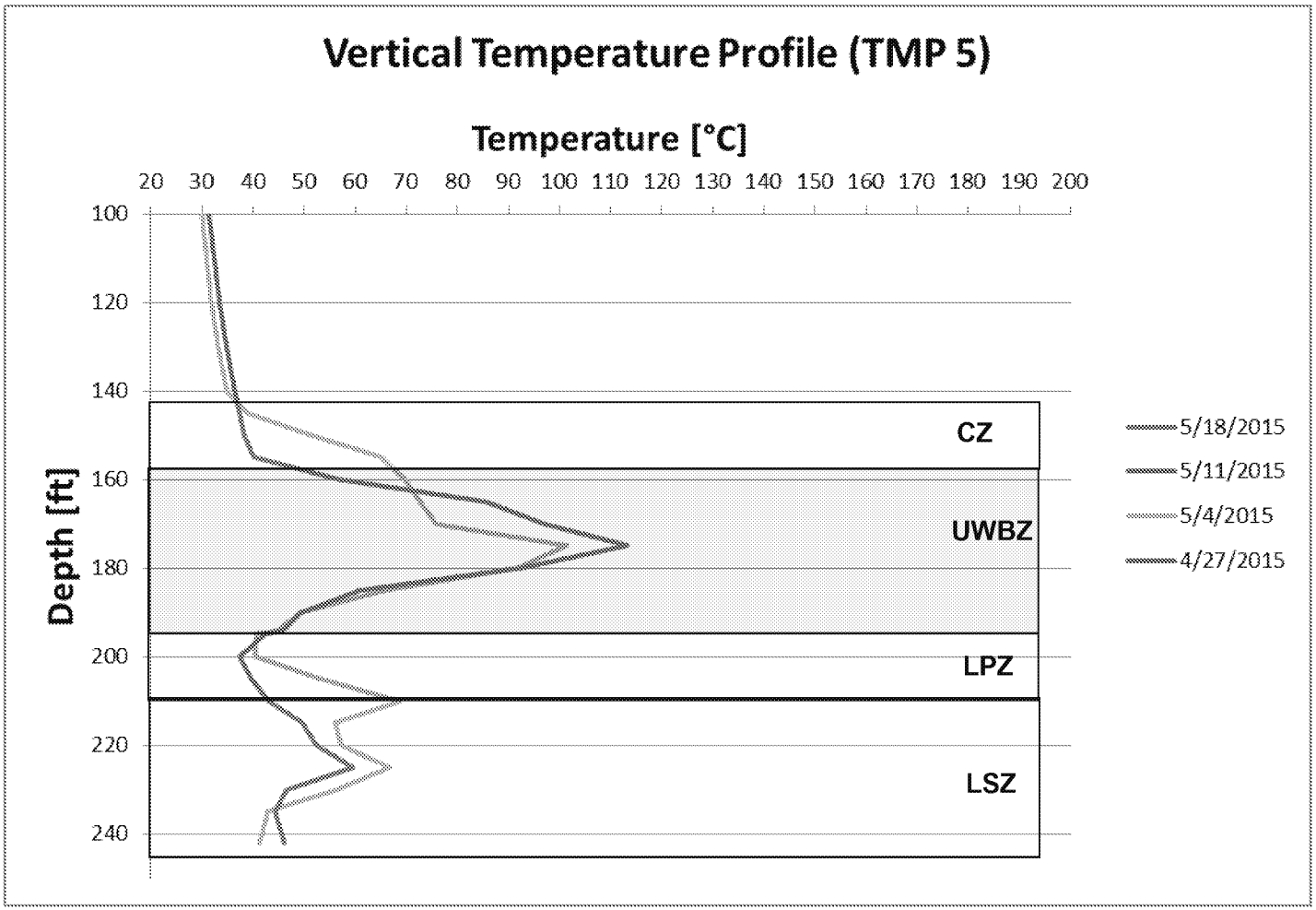
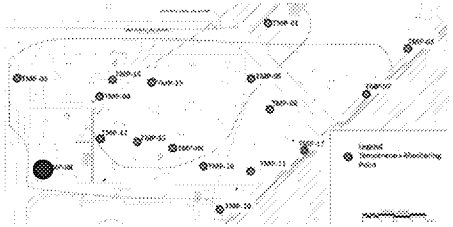
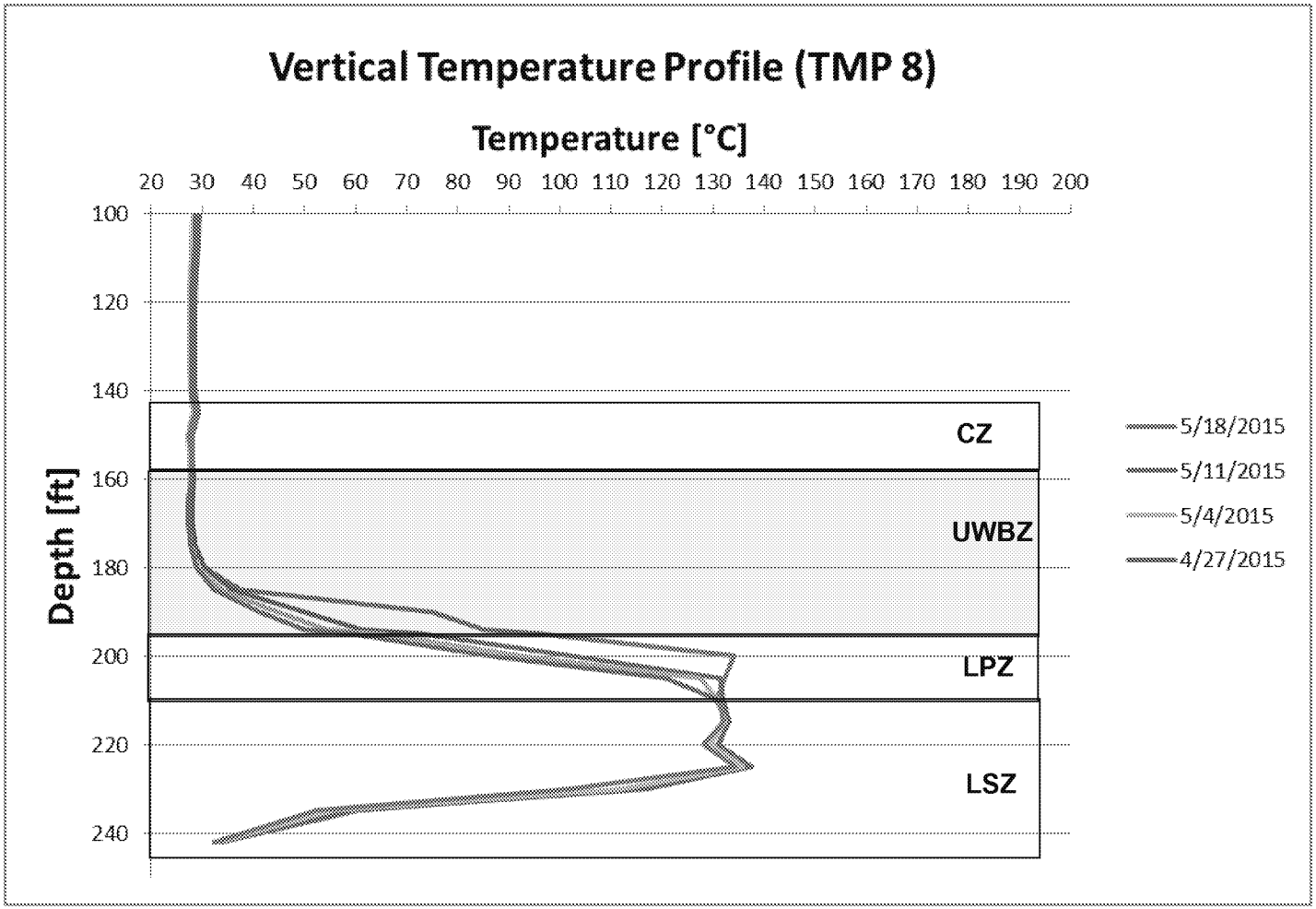
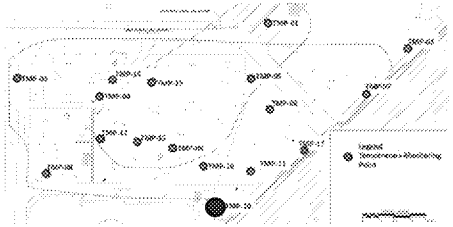
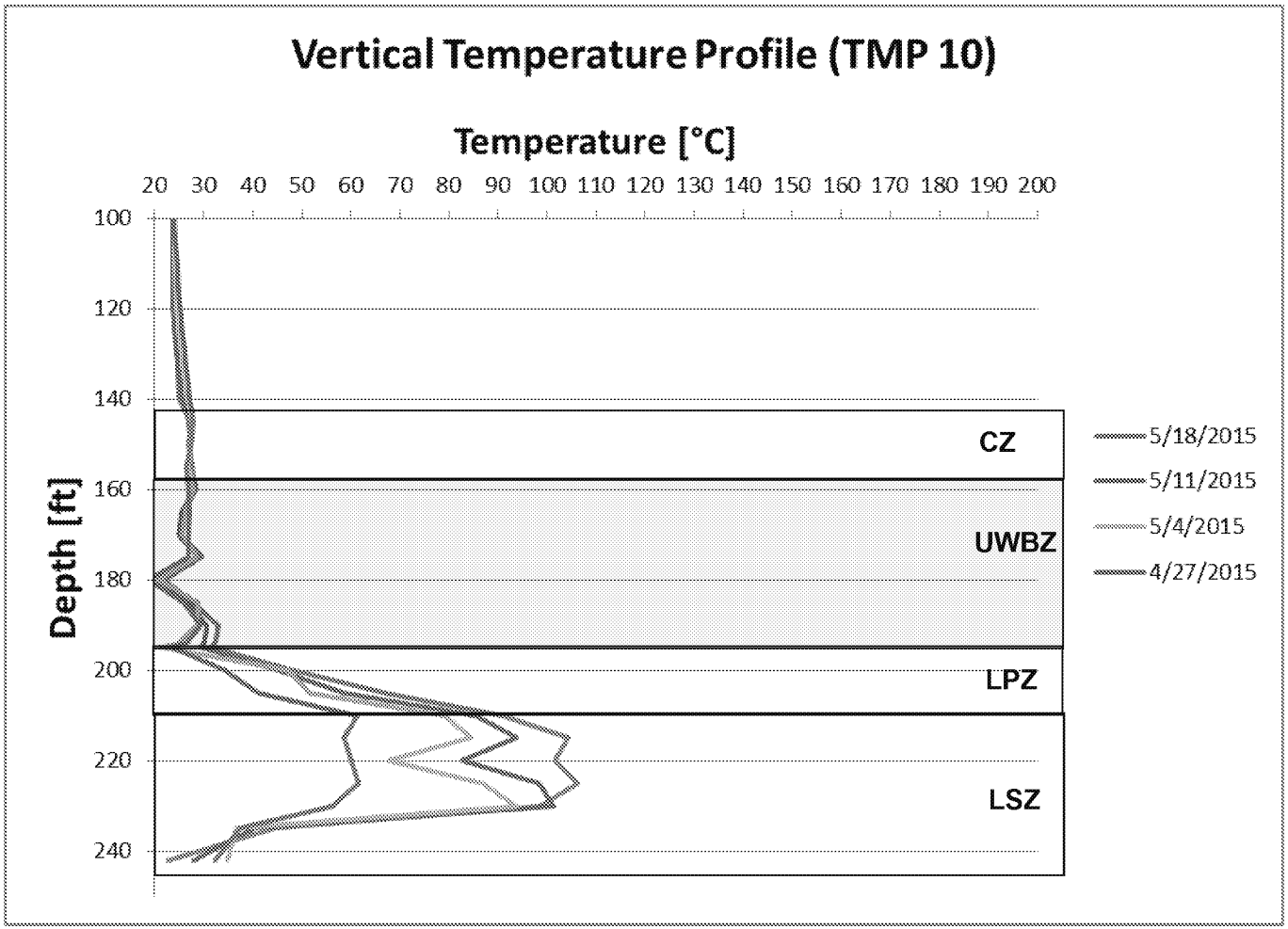


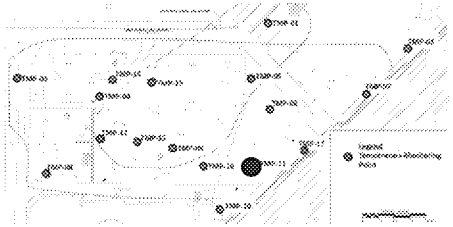

Vertical Temperature Profile (TMP 5)
Temperature [°C]
20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Depth [ft]
100
120
140
160
180
200
220
240
CZ
UWBZ
LPZ
LSZ
5/18/2015
5/11/2015
5/4/2015
4/27/2015

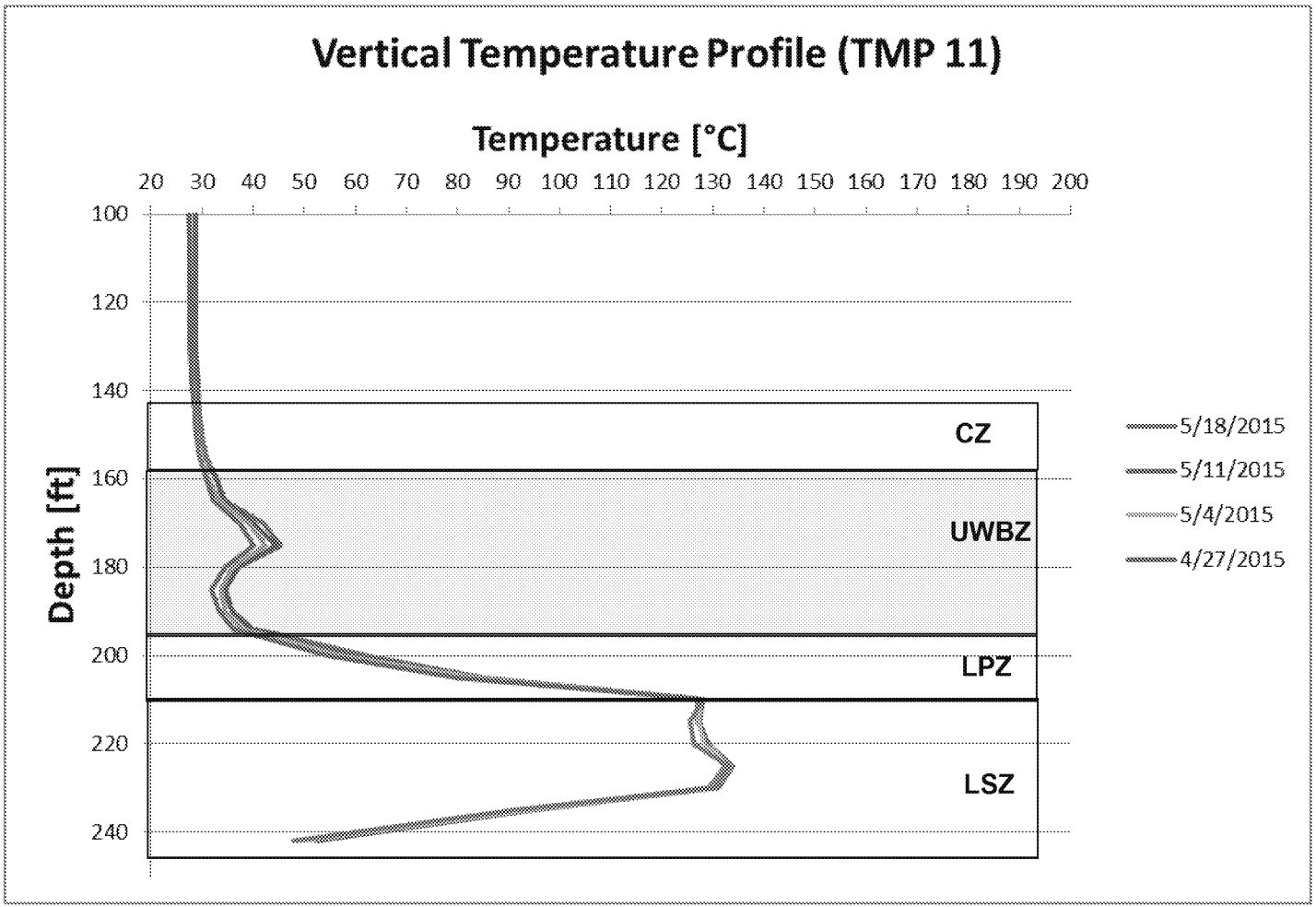


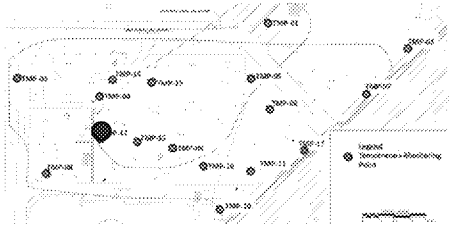

Vertical Temperature Profile (TMP 8)
Temperature [°C]
20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Depth [ft]
100
120
140
160
180
200
220
240
CZ
UWBZ
LPZ
LSZ
5/18/2015
5/11/2015
5/4/2015
4/27/2015

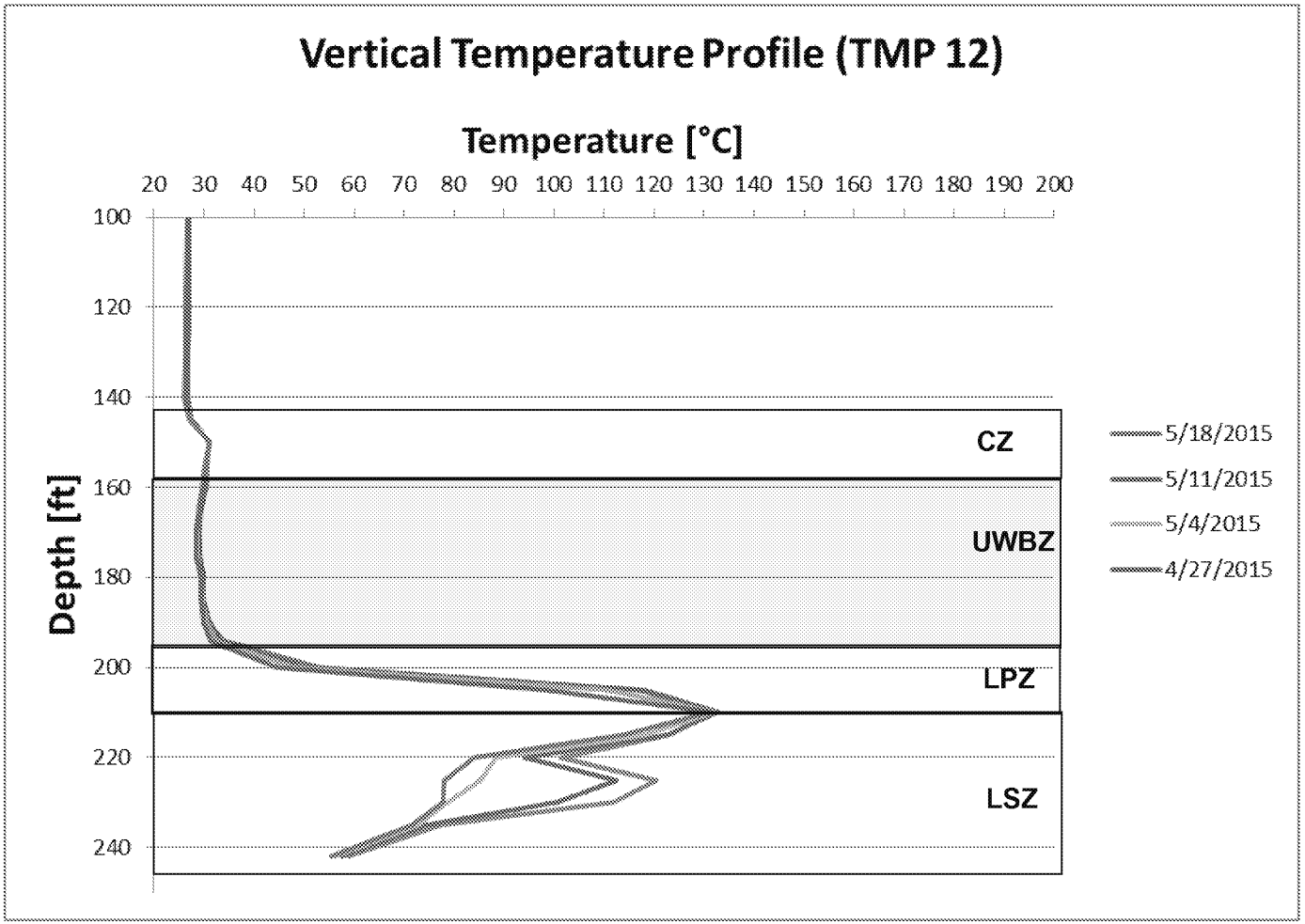


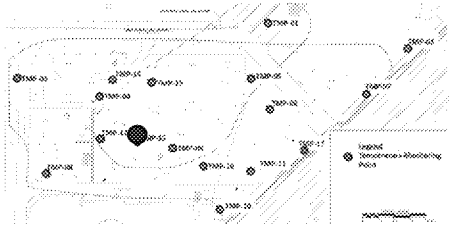

Vertical Temperature Profile (TMP 10)
Temperature [°C]
20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Depth [ft]
100
120
140
160
180
200
220
240
CZ
UWBZ
LPZ
LSZ
5/18/2015
5/11/2015
5/4/2015
4/27/2015

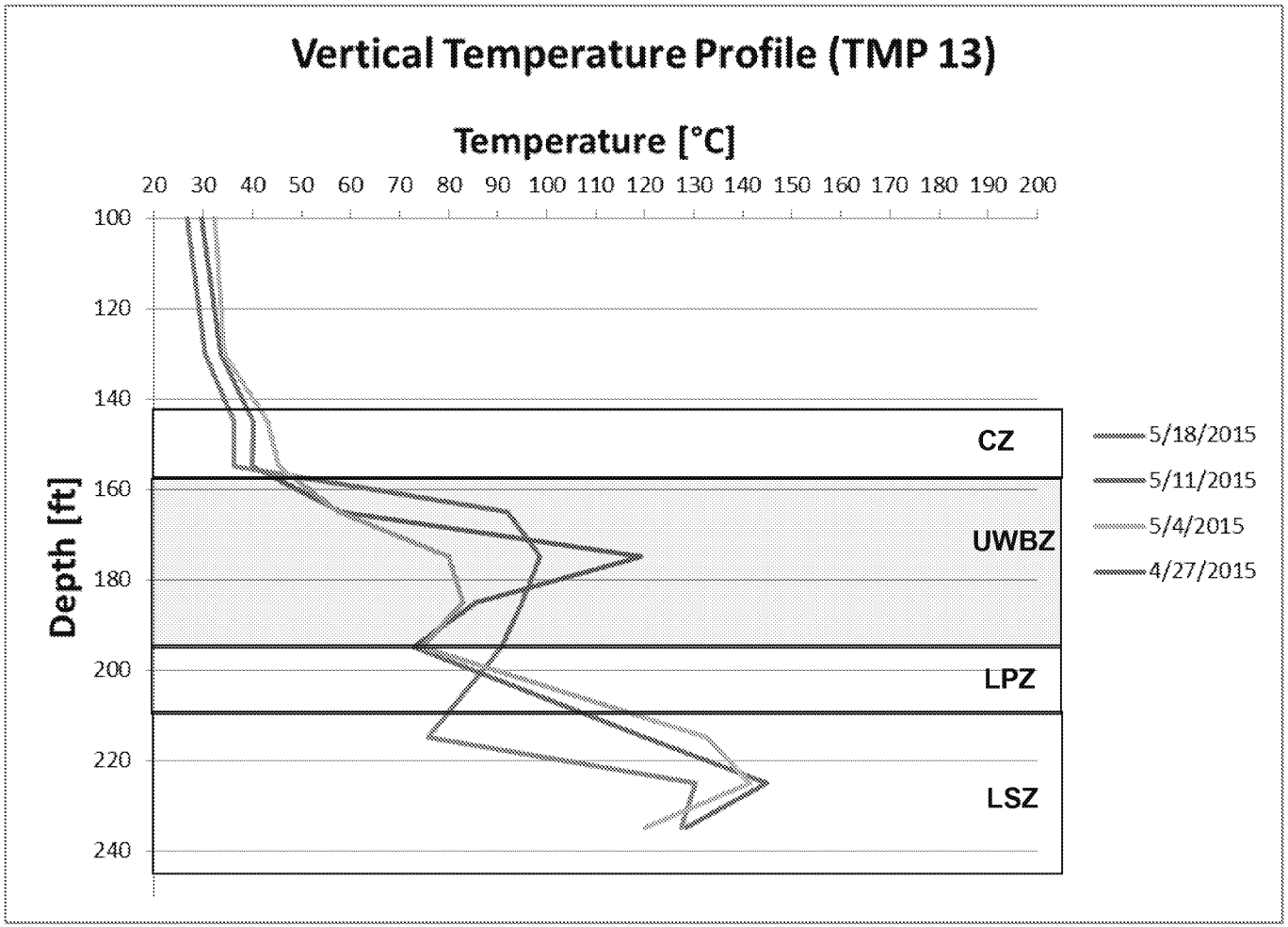



Vertical Temperature Profile (TMP 11)
Temperature [°C]
20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Depth [ft]
100
120
140
160
180
200
220
240
CZ
UWBZ
LPZ
LSZ
5/18/2015
5/11/2015
5/4/2015
4/27/2015




Vertical Temperature Profile (TMP 12)
Temperature [°C]
20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Depth [ft]
100
120
140
160
180
200
220
240
CZ
UWBZ
LPZ
LSZ
5/18/2015
5/11/2015
5/4/2015
4/27/2015





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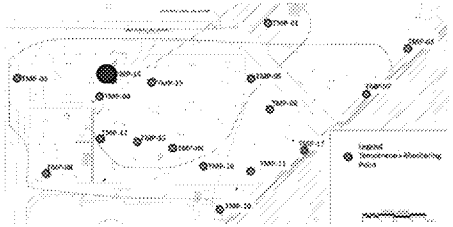

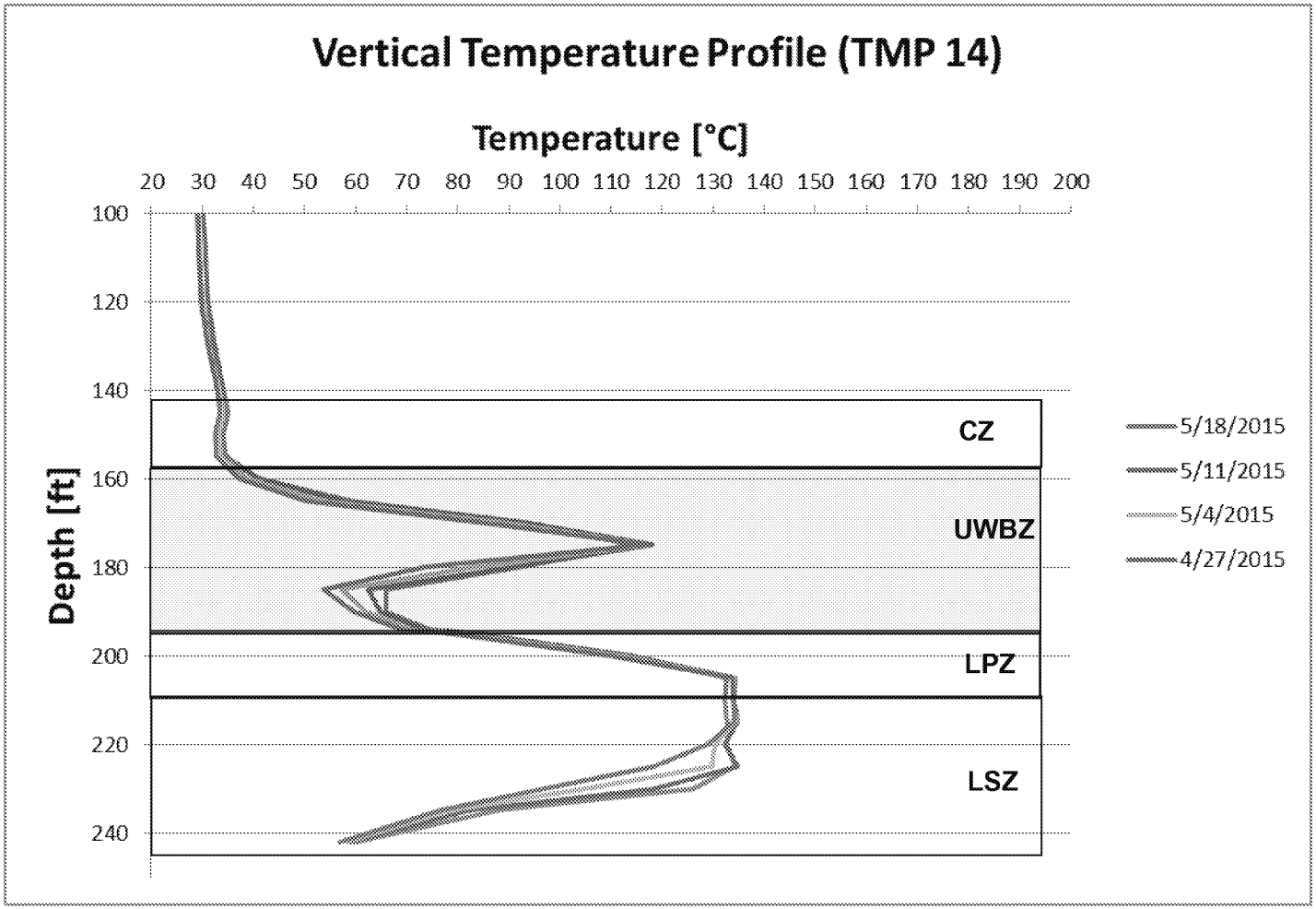

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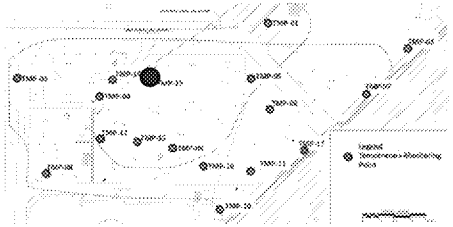

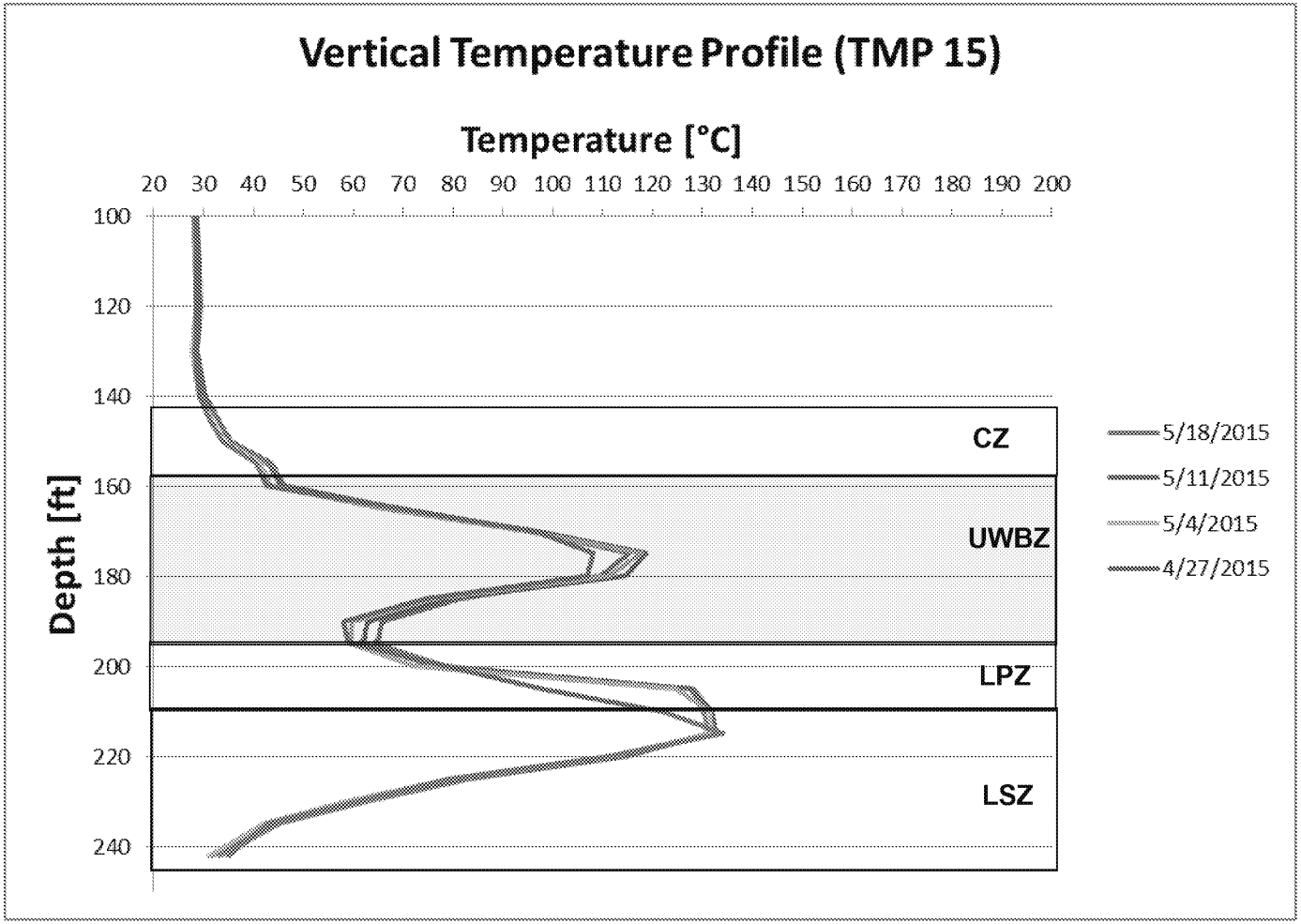

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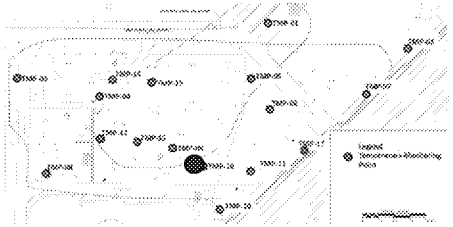

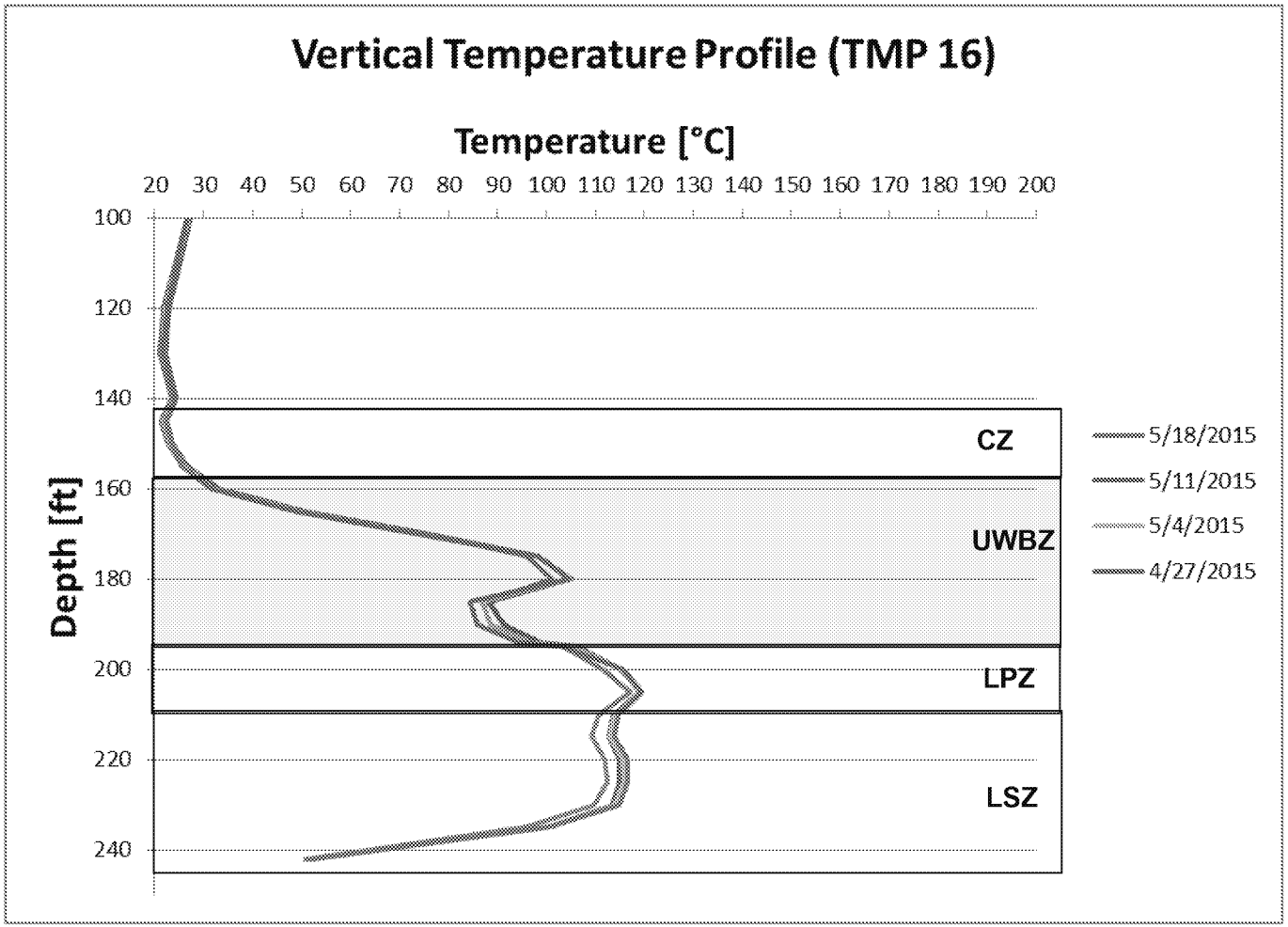

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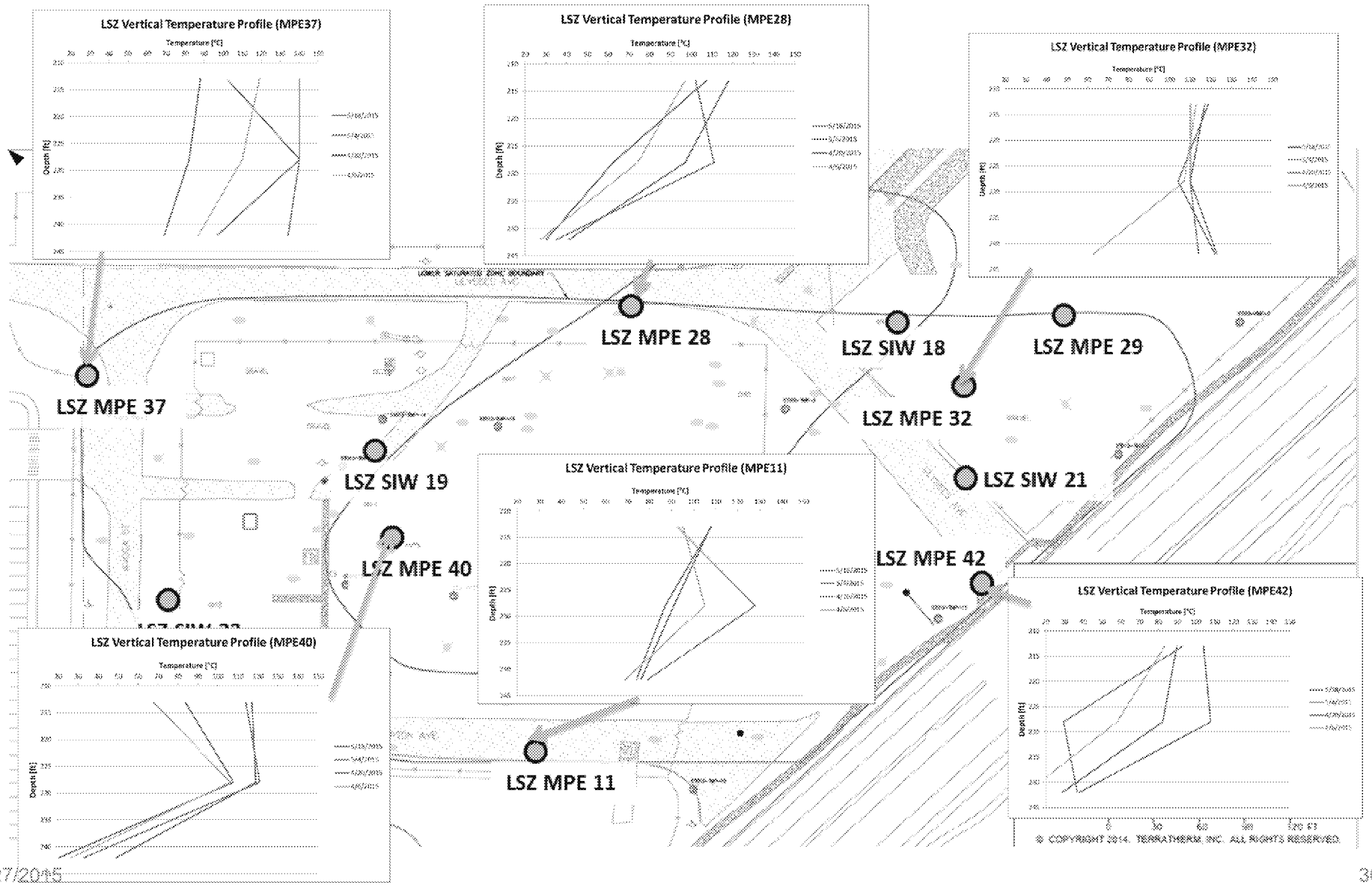
Subsurface Heat up Progression Measured at Collocated Extraction Well Thermocouples

ST012 SEE CO-LOCATED TEMPERATURES AT LSZ EXTRACTION WELLS: 4/6-5/18



ST012 Injection/Extraction Balance Status

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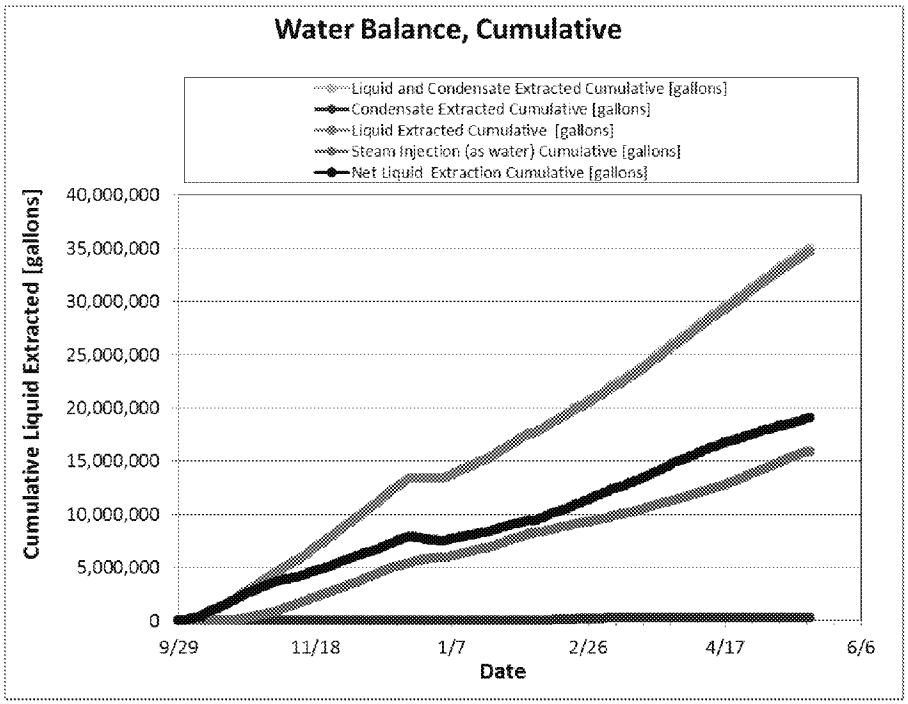
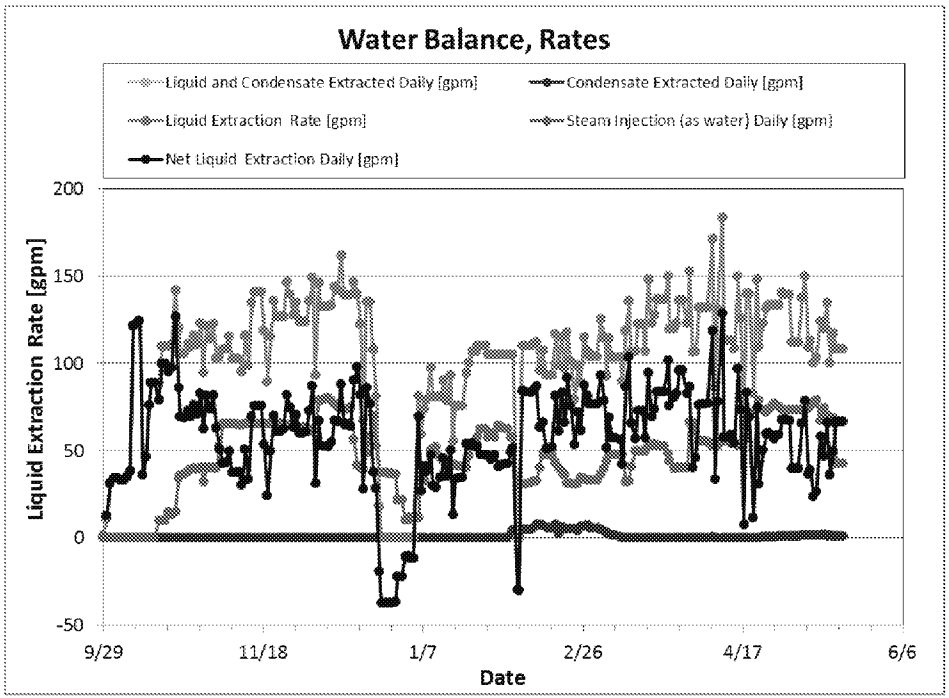
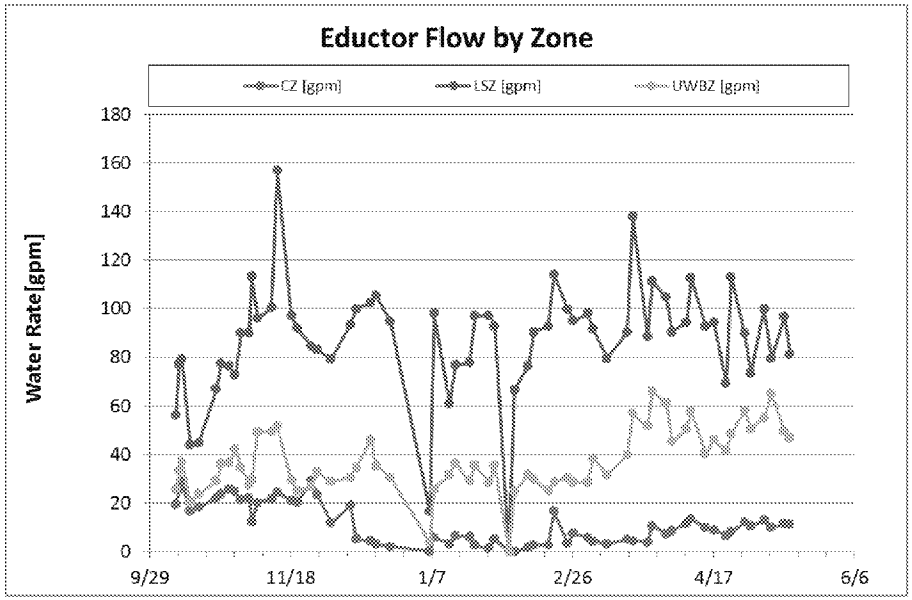
ST012 SEE SYSTEM WATER BALANCE

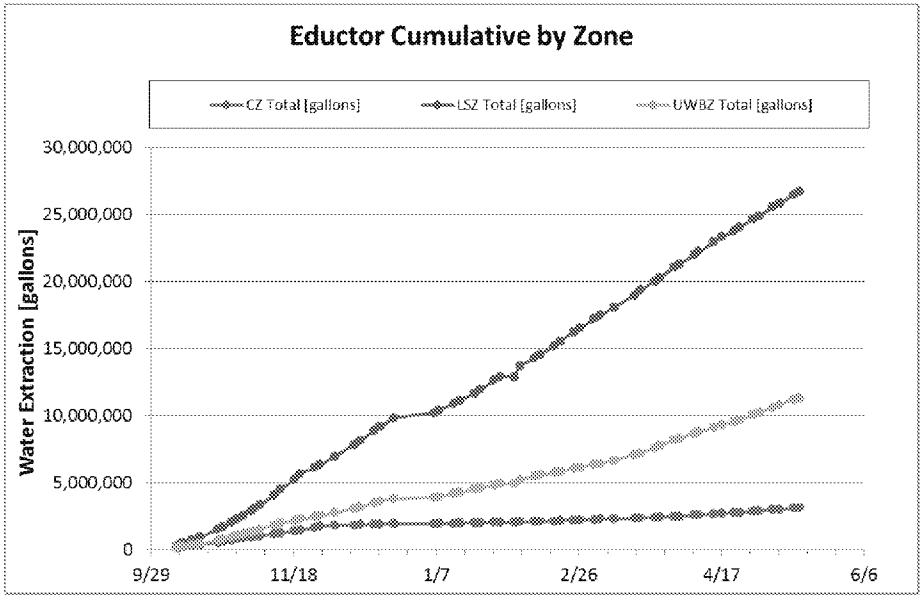




- **Condensate production started picking back up mid April Currently, the condensate production rate is ~1.0 gpm**

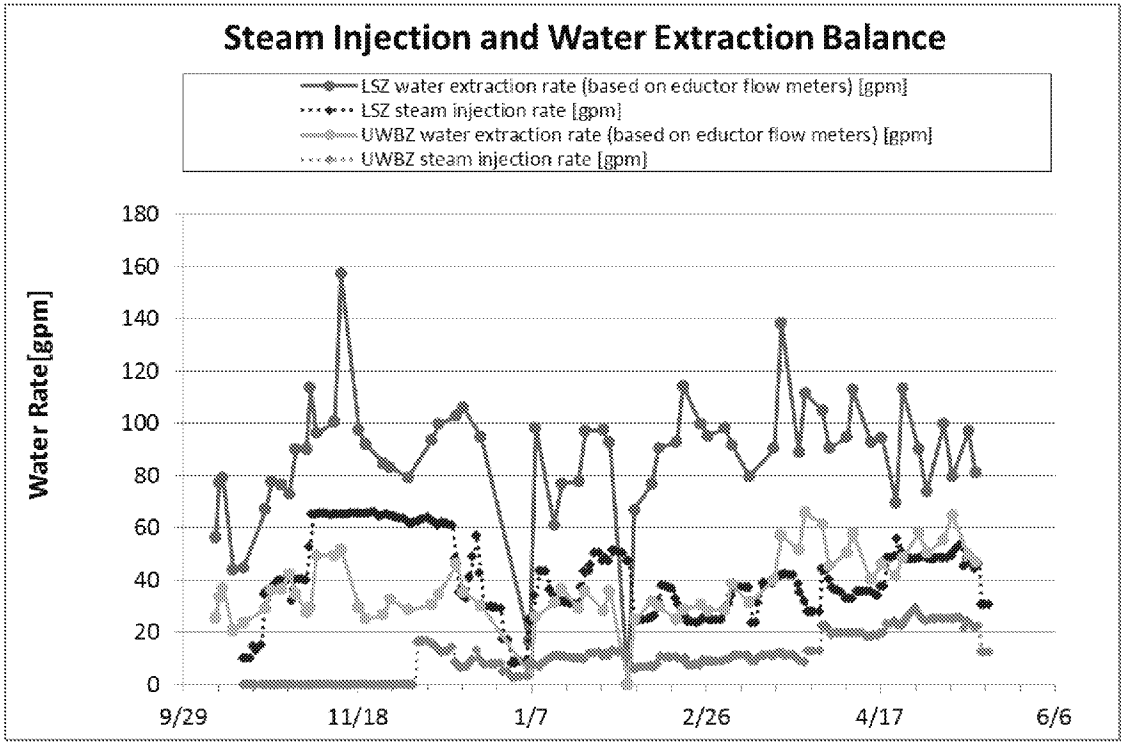
ST012 SEE SYSTEM WATER EXTRACTION BY ZONE





- **Eductor extraction rates per zone are based on individual eductor feed and return meters**

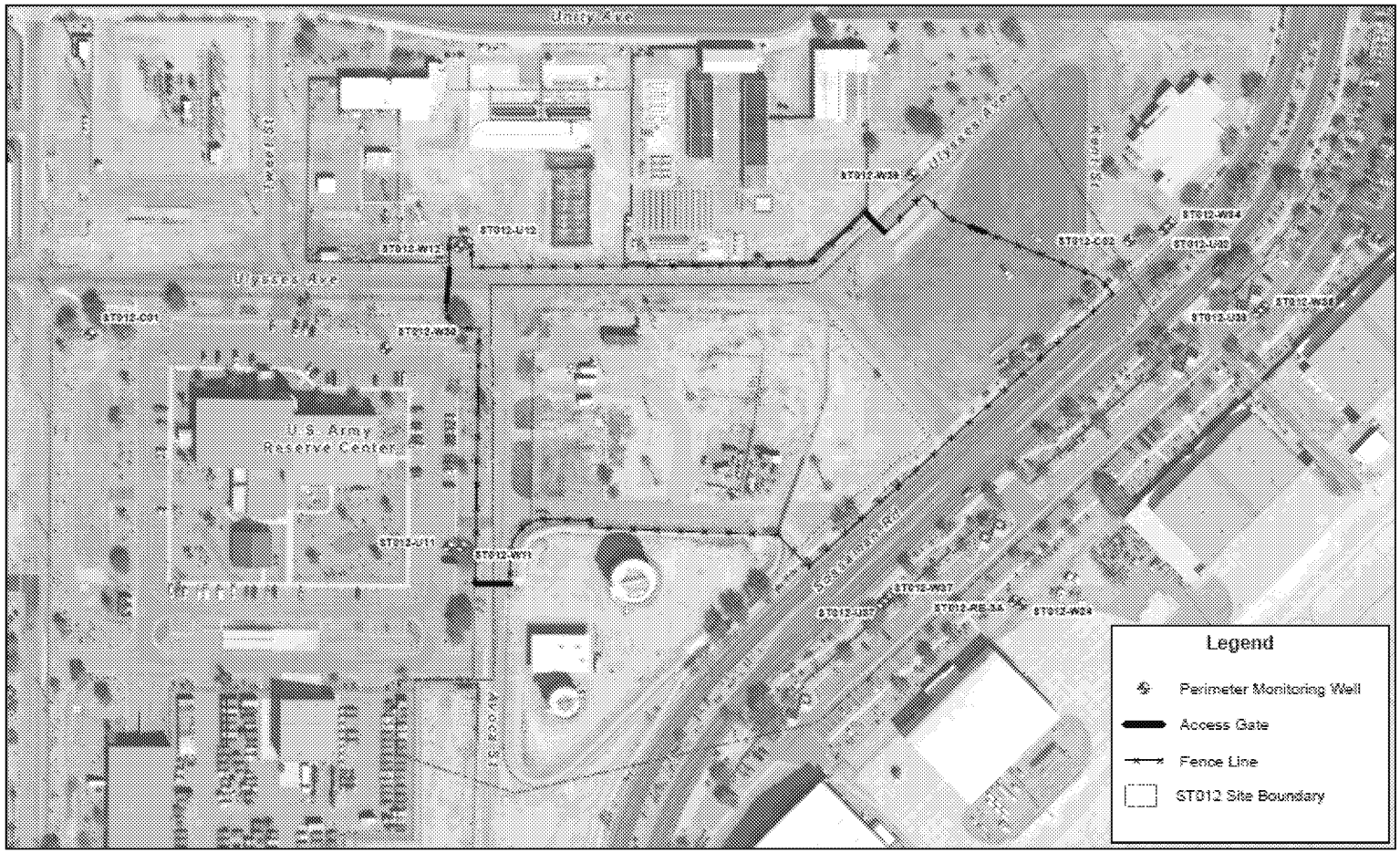
ST012 SEE SYSTEM INJECTION/EXTRACTION BALANCE



	CZ [gallons]	UWBZ [gallons]	LSZ [gallons]
Water extracted	3,119,000	11,319,000	26,725,000
Water injected (as steam)	0	3,177,000	12,766,000
Net extraction	3,119,000	8,142,000	13,959,000

- **Note: water extracted to date per zone is based on individual eductor meters**

ST012 SEE PERIMETER GROUNDWATER MONITORING WELLS



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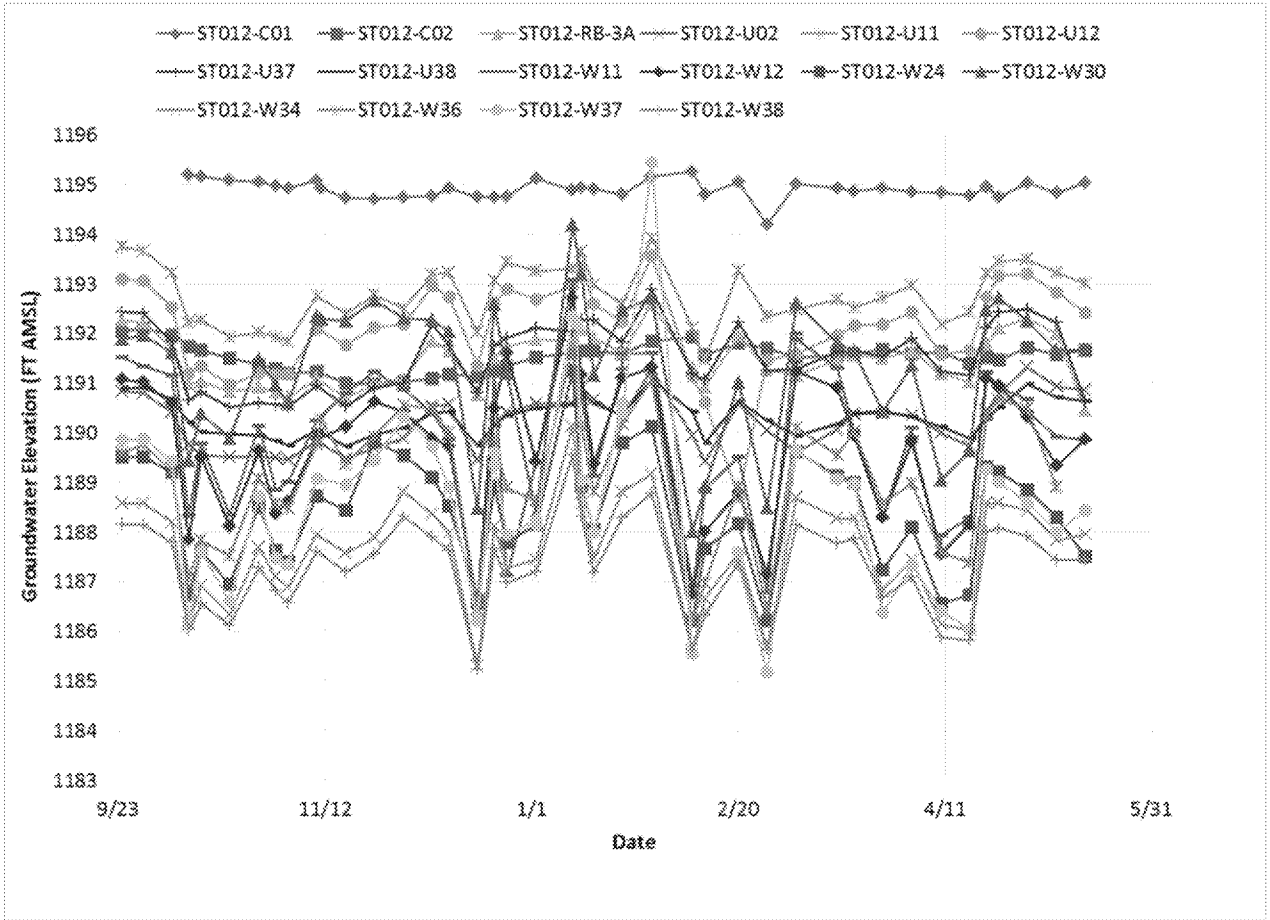
ST012 SEE PERIMETER GROUNDWATER LEVEL DATA

Monitoring Well	5/1/2015		5/8/2015		5/15/2015	
	Change from Baseline	Change from Previous	Change from Baseline	Change from Previous	Change from Baseline	Change from Previous
CZ/UWBZ Wells						
ST012-C01	-0.23	0.32	-0.43	-0.17	-0.24	0.22
ST012-C02	-0.33	0.27	-0.47	-0.11	-0.39	0.11
UWBZ Wells						
ST012-RB-3A	0.04	0.23	-0.28	-0.29	-1.80	-1.49
ST012-U02	0.48	0.56	0.10	-0.35	0.02	-0.05
ST012-U11	-0.24	0.06	-0.52	-0.25	-0.73	-0.18
ST012-U12	0.10	0.06	-0.28	-0.35	-0.70	-0.39
ST012-U37	0.05	0.09	-0.21	-0.23	-1.81	-1.57
ST012-U38	0.09	0.49	-0.17	-0.23	-0.25	-0.05
LSZ Wells						
ST012-W11	-1.09	-0.25	-1.60	-0.48	-0.70	-0.03
ST012-W12	-0.74	-0.60	-1.74	-0.97	-1.20	0.57
ST012-W24	-0.67	-0.33	-1.22	-0.52	-2.01	-0.76
ST012-W30	0.37	-0.43	-0.23	-0.57	-0.23	0.03
ST012-W34	-0.14	-0.12	-0.75	-0.58	-0.62	0.16
ST012-W36	0.88	-0.17	-0.71	-1.56	#N/A	#N/A
ST012-W37	-1.26	-0.39	-1.85	-0.56	-1.41	0.47
ST012-W38	-0.23	-0.13	-0.71	-0.45	-0.71	0.03

Note: W36 was not measured due to water line construction activities by the City of Mesa in the vicinity of the well.

ST012 SEE PERIMETER GROUNDWATER ELEVATIONS



- **Water level increases are temporary**

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ST012 SEE PERIMETER LNAPL THICKNESSES (FT)

Monitoring Well	5/1/2015		5/8/2015		5/15/2015	
CZ/UWBZ Wells	Before bailing	After Bailing	Before bailing	After Bailing	Before bailing	After Bailing
ST012-C01	0.00	0.00	0.00	0.00	0.00	0.00
ST012-C02	0.00	0.00	0.00	0.00	0.00	0.00
UWBZ Wells						
ST012-U02	0.00	0.00	0.00	0.00	0.00	0.00
ST012-U11	0.00	0.00	0.00	0.00	0.00	0.00
ST012-U12	0.00	0.00	0.00	0.00	0.00	0.00
ST012-U37	0.00	0.00	0.00	0.00	0.00	0.00
ST012-U38	0.00	0.00	0.00	0.00	0.00	0.00
ST012-RB-3A	0.00	0.00	0.00	0.00	0.00	0.00
LSZ Wells						
ST012-W11	19.17	0.91	45.90	0.55	78.38	5.61
ST012-W12	0.00	0.00	0.00	0.00	0.00	0.00
ST012-W24	0.00	0.00	0.00	0.00	0.00	0.00
ST012-W30	0.00	0.00	0.00	0.00	0.00	0.00
ST012-W34	0.00	0.00	0.00	0.00	0.00	0.00
ST012-W36	0.00	0.00	0.00	0.00	0.00	0.00
ST012-W37	31.23	4.86	32.93	4.92	28.41	5.70
ST012-W38	0.00	0.00	0.00	0.00	0.00	0.00

ST012 SEE OPERATIONAL CHALLENGES UPDATE

- Iron Fouling Status- Under control, minor adjustments to chemicals and dosing being made to optimize
- Bio Fouling Status- Under control, bio-mat is gone as a result of a combination of change in chemicals and higher inlet temperatures
- Perimeter Water Levels- Continuing to monitor to maintain hydraulic control
- TMP/Thermocouple Repair/Maintenance- Repairs scheduled to be complete by 12 June

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ST012 SEE OPERATIONAL CHALLENGES UPDATE

- Boiler Maintenance- Major repairs complete
- Heat Response at TMP10 and TMP02- Monitoring and adjusting injection rates in the vicinity of TMP2 to achieve stability
- Product at ST012-W37 and ST012-W11- W37 LNAPL level stabilizing. Installing Pump at W11 in June
- Increasing Temperatures at SVE01M – Disconnected from SVE system. May be related to leak discovered in UWBZ07. Will be connected into SEE system for continued vapor extraction.

ST012 SEE OPERATIONAL PLAN

Operational Plan through June

- Achieve steam breakthrough in the UWBZ and LSZ
  - Fifteen LSZ steam wells are operating
  - Nine UWBZ steam wells are operating
  - Increase steam injection to an average of 80 gpm (40,000 lbs/hr)
  - Balance flows to maintain an acceptable water balance
  - Increase and optimize injection and extraction rates
- Bring CZ and two dual-purpose wells online
  - Keep current 24 steam injection wells online
  - Reduce injection and start steam cycling when data support this change
  - Bring CZ wells online
  - Bring two dual-purpose UWBZ wells online when data support this change
  - Injection rates will continue to be balanced across the wellfield to maintain an acceptable water balance. Desired water balance is a minimum of 1.25 to 1.5:1 or higher.