Air Force Civil Engineer Center

FORMER
WILLIAMS AIR FORCE BASE

Site ST012

Former Liquid Fuel Storage Area

BCT Conference Call

17 January 2019

Battle Ready…Built Right!

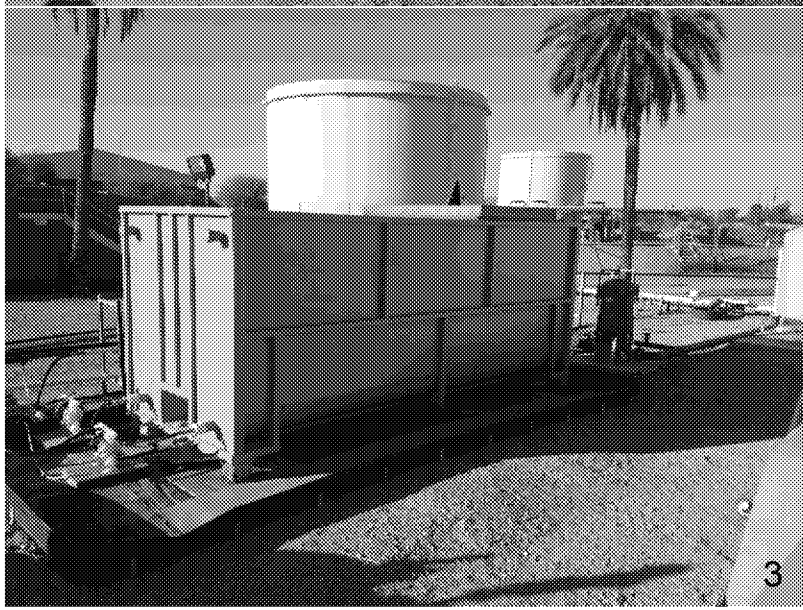
ED_005025_00011247-00001

Site ST012 Outline

- Summary of activities since Dec BCT call
- Update on SVE system (JP-4 equivalent of methane)
- LNAPL monitoring/removal update
- Pilot study extraction/injection update
- Path forward

Site ST012 Activities Since December

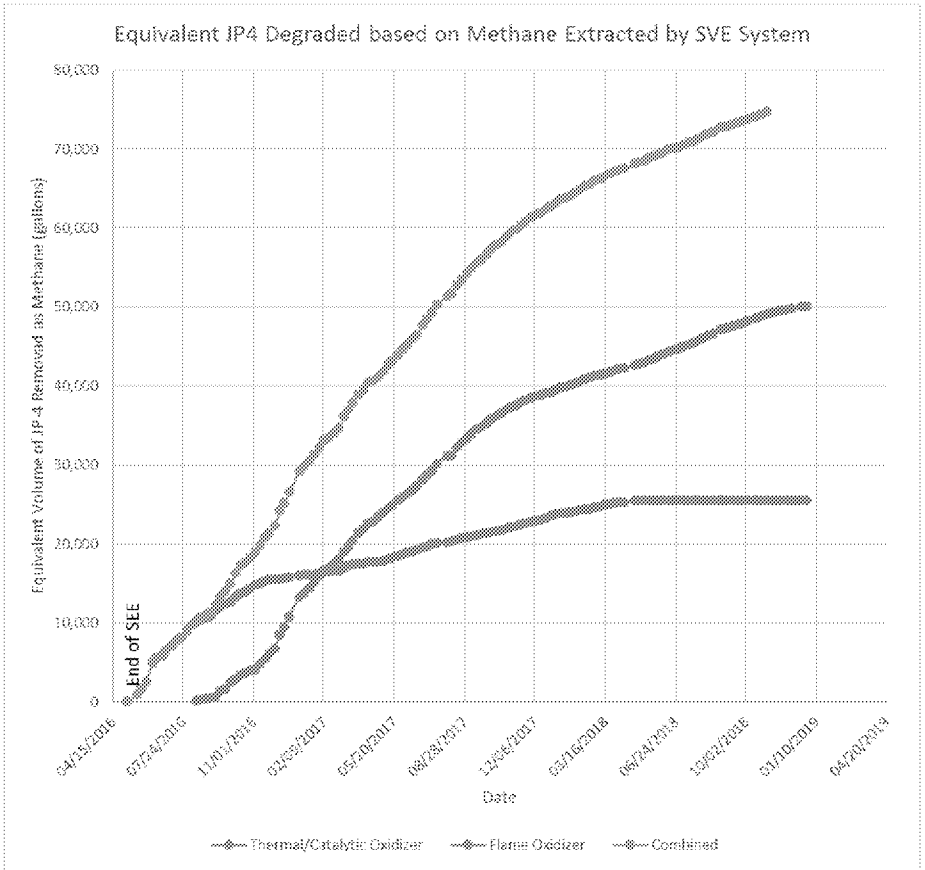
- **Continued SVE operation**
- **Continued LNAPL screening in accessible wells**
- **Operation of Extraction and Treatment**
  - **Additional pumps received**
  - **Pump repairs 10-11 Jan**
    - LSZ51 replacement pump installed
    - CZ07 replacement pump installed, continued VFD error
    - UWBZ21 pulled, airline kink repaired
    - UWBZ27 replacement pump installed
    - CZ21 replacement pump installed
  - **New Motor on Catalytic Oxidizer 18 Dec**
- **Sodium sulfate injections (detail on later slides**
- **Oxidizer move delayed (change in ASU requirements)**

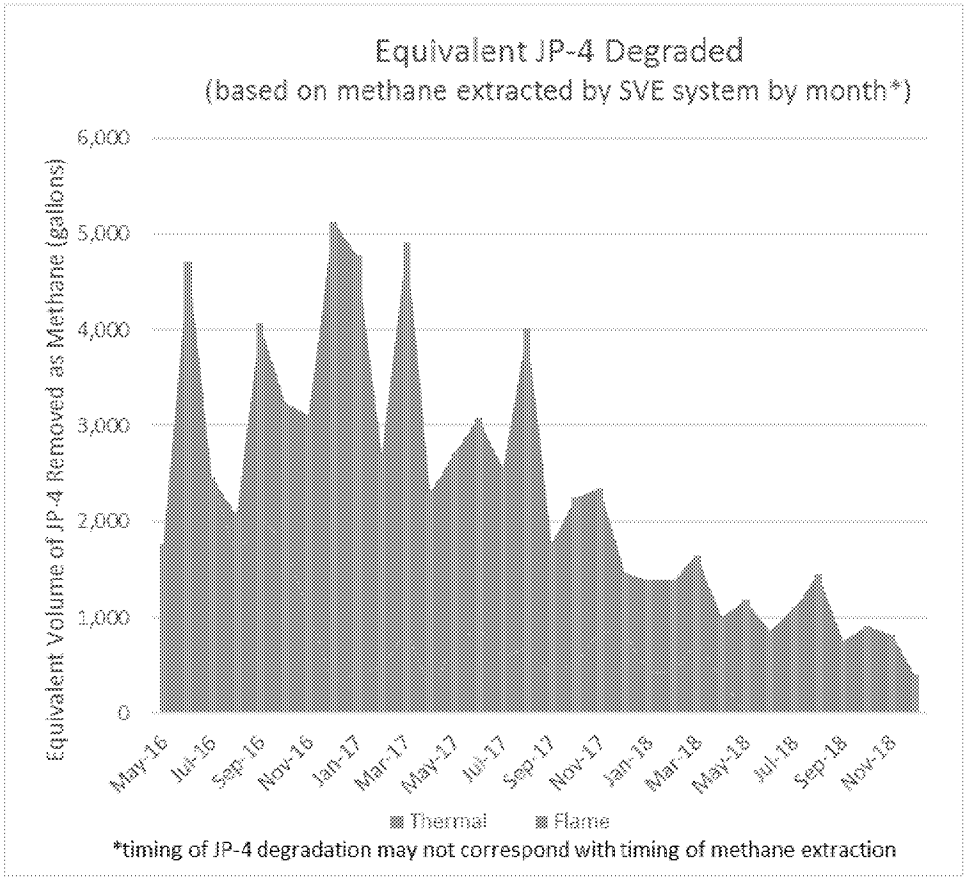


ED_005025_00011247-00003

JP-4 Degradation Based on Methane Removed with SVE (through 4 Jan)

Site ST012 SVE System Equivalent JP-4 Degradation Based on Methane Removed

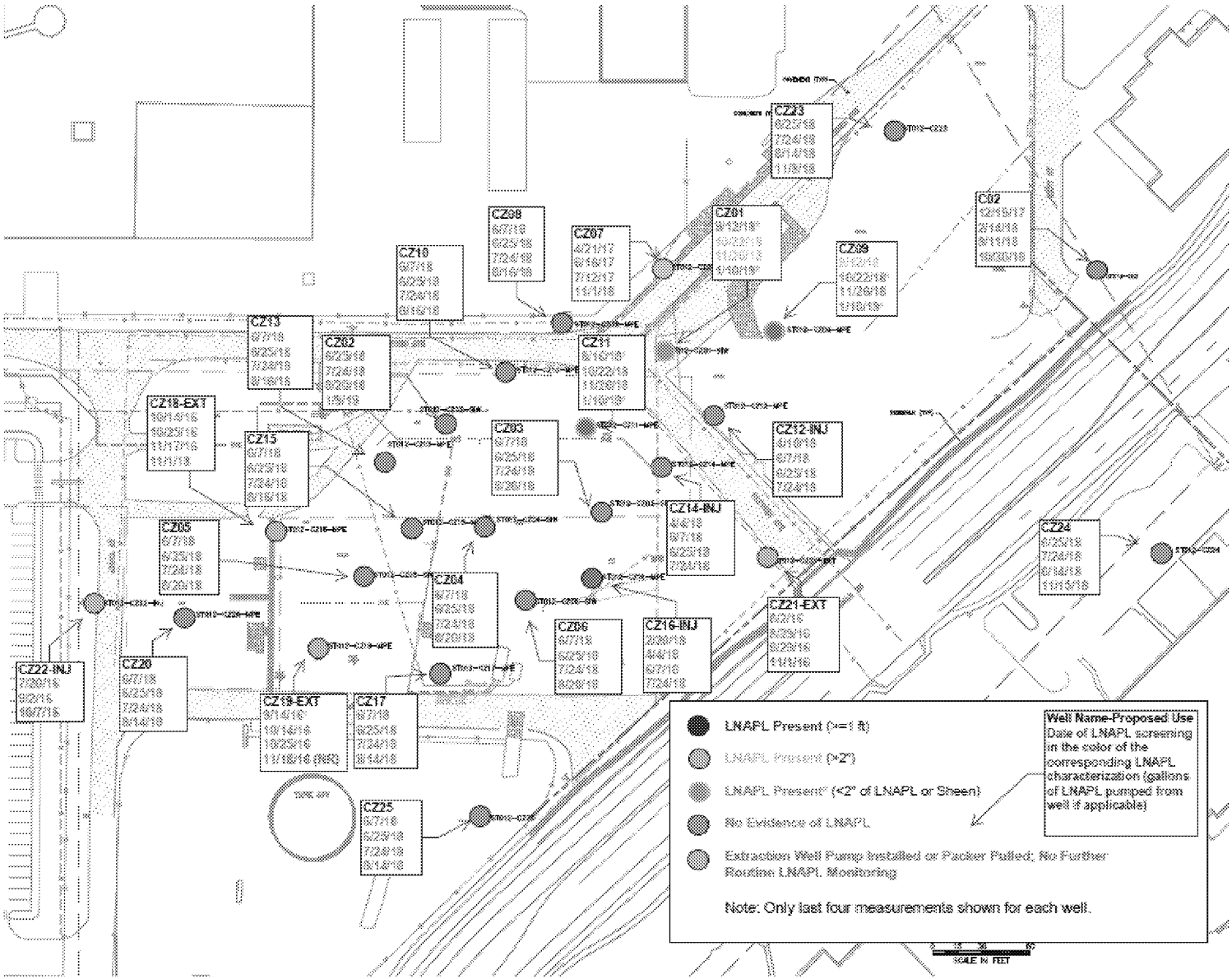




- Estimates through 4 Jan 2019.
- Estimated JP-4 degradation as methane is in addition to JP-4 removal reported for SVE
- Thermal oxidizer changed from SVE to groundwater treatment end of Apr
- Flame oxidizer treating combined SVE and air stripper intermittently since 12 Nov 2018
- Recent equivalent JP-4 degraded ~3,000 pounds per month (~400 gallons per month)

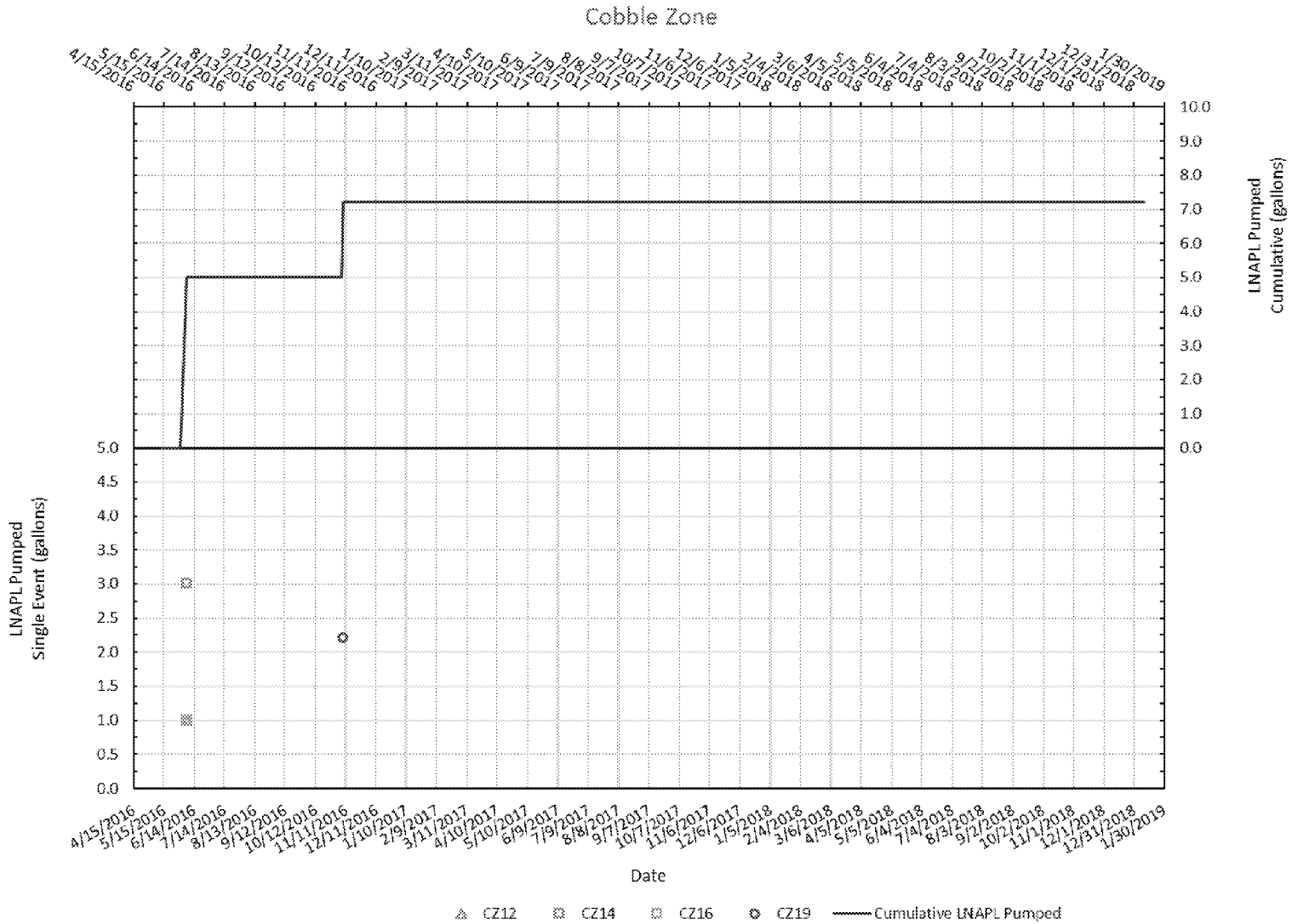
LNAPL Monitoring Update (through 11 Jan)

LNAPL Monitoring/Removal Status
Cobble Zone



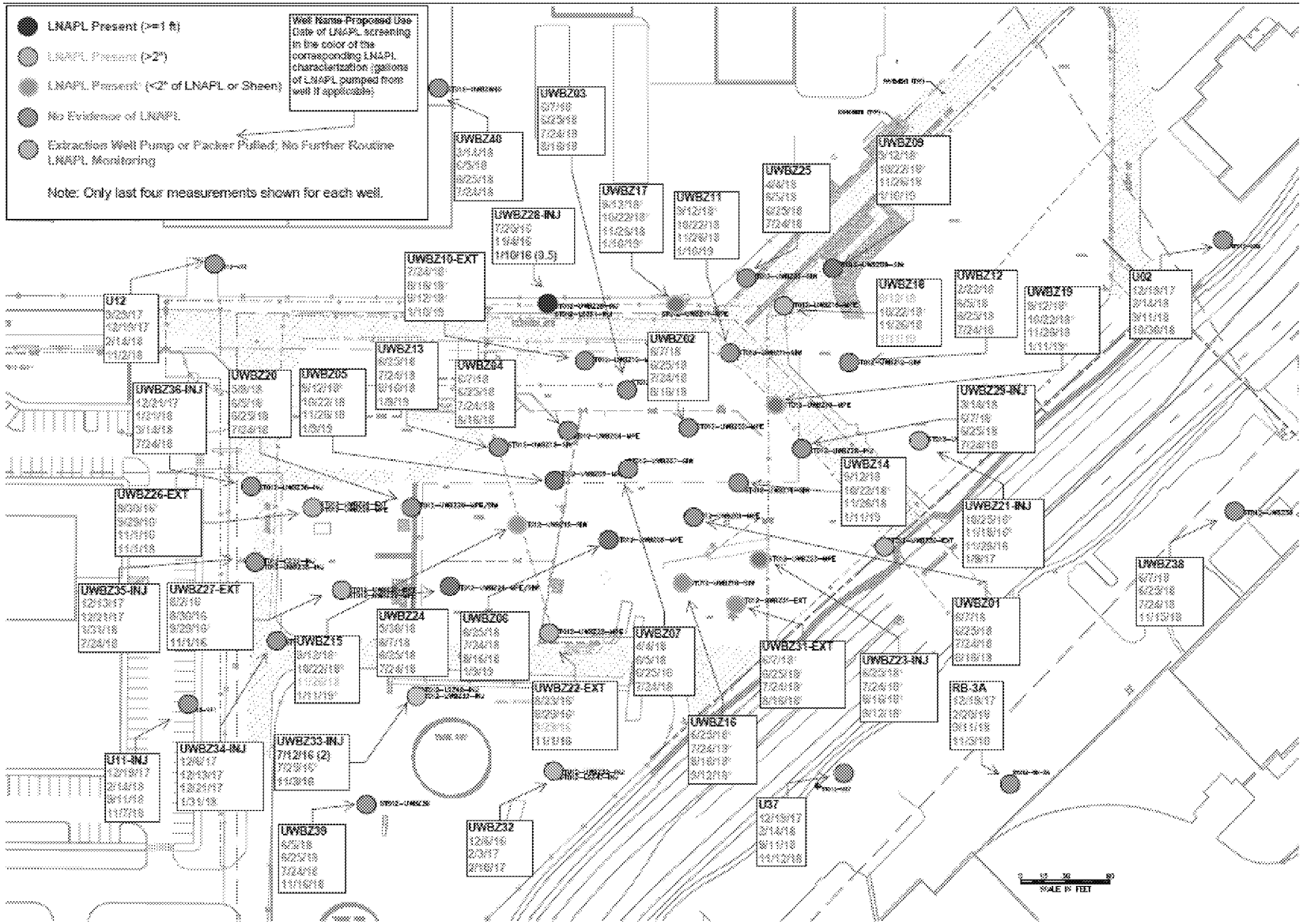
ED_005025_00011247-00007

LNAPL Monitoring/Removal Status
Cobble Zone



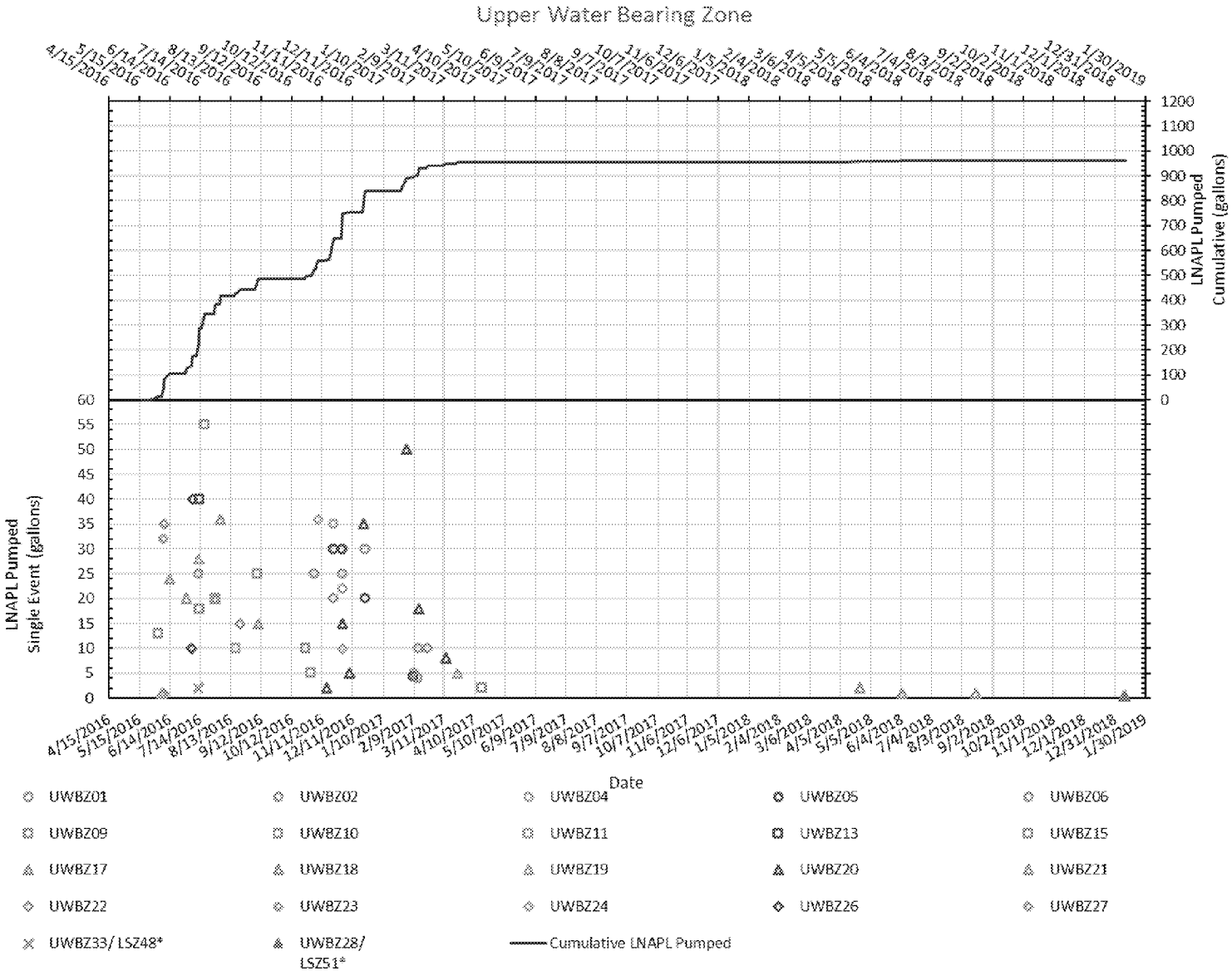
ED_005025_00011247-00008

LNAPL Monitoring/Removal Status
Upper Water Bearing Zone

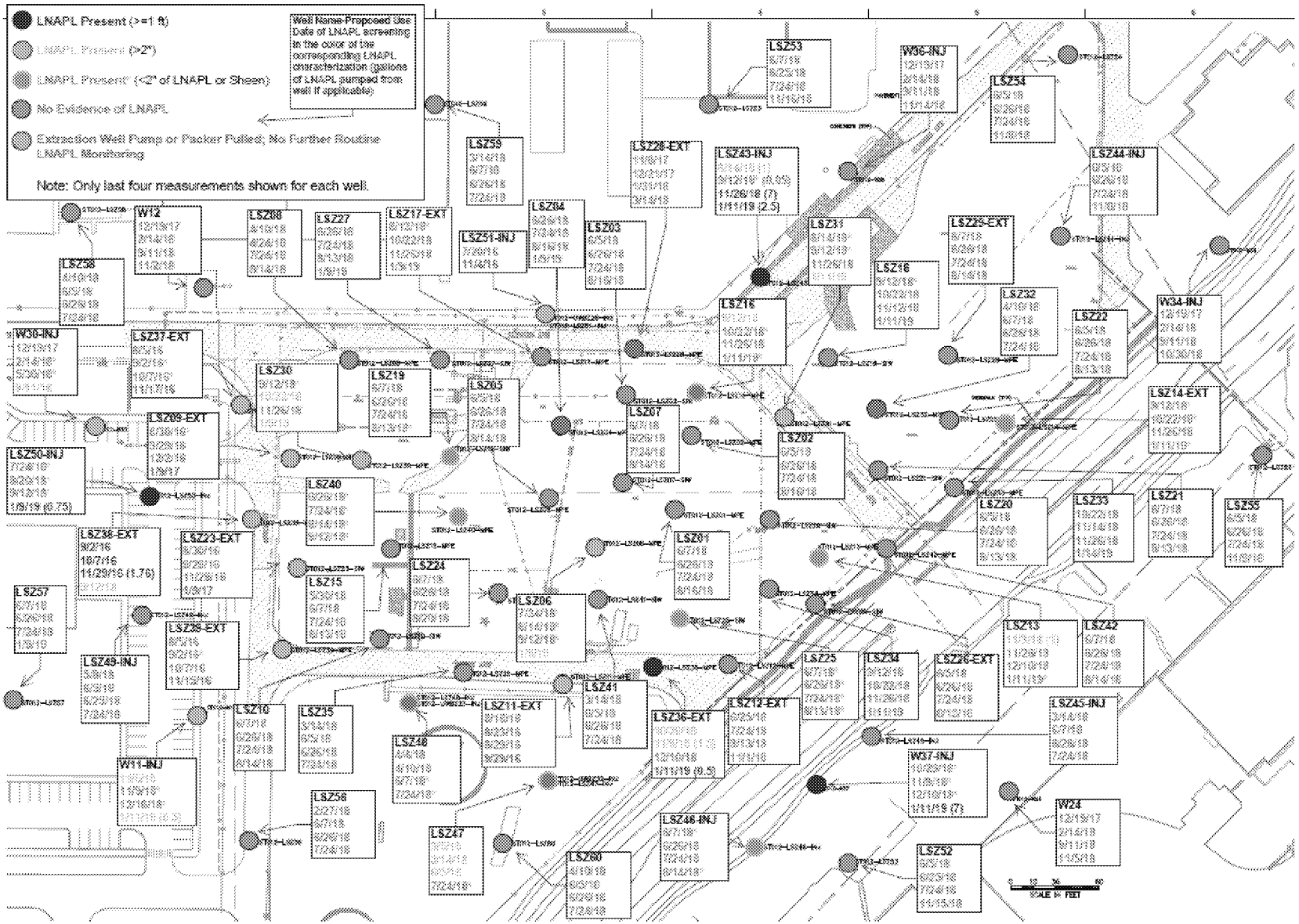


ED_005025_00011247-00009

LNAPL Monitoring/Removal Status Upper Water Bearing Zone

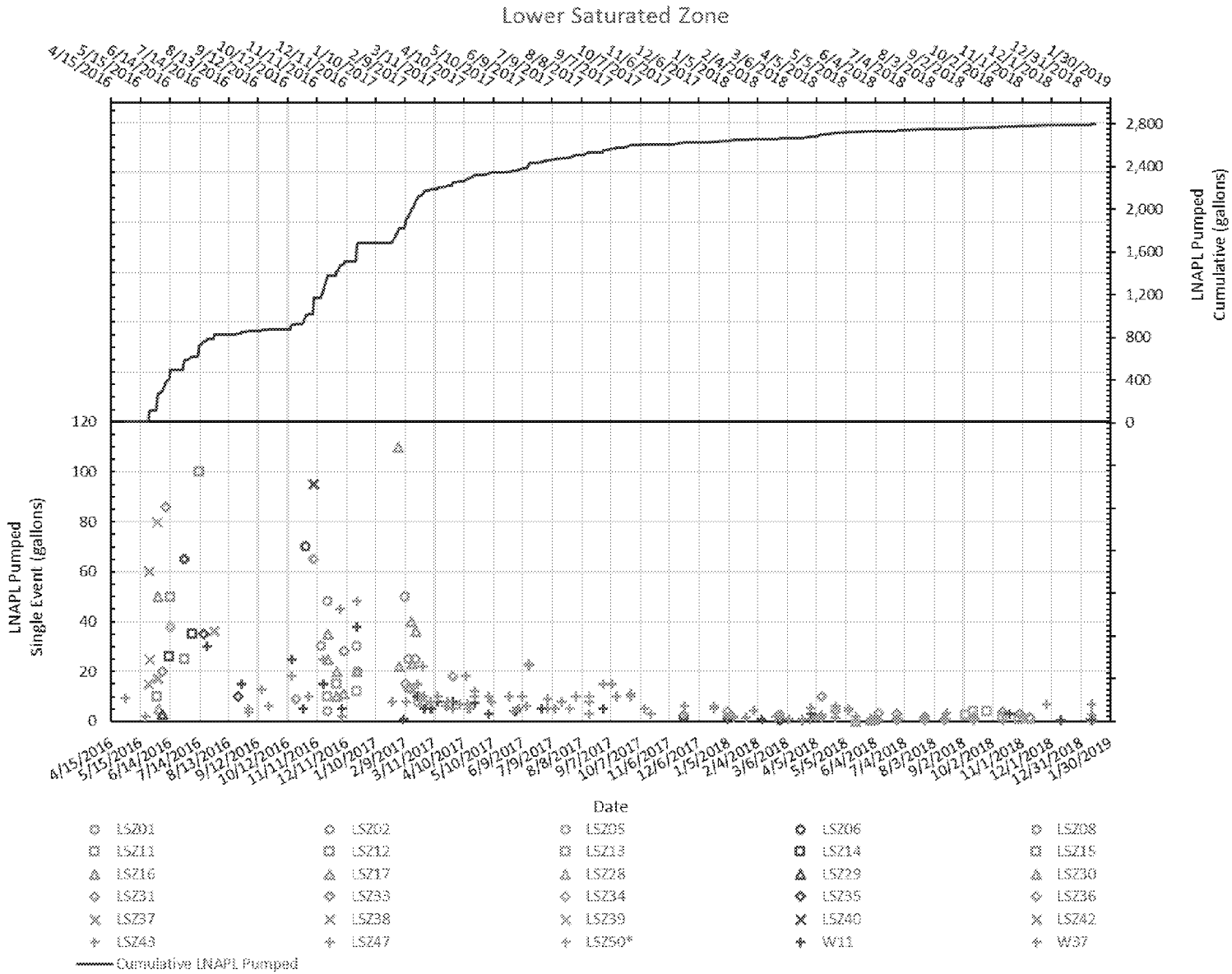


LNAPL Monitoring/Removal Status
Lower Saturated Zone



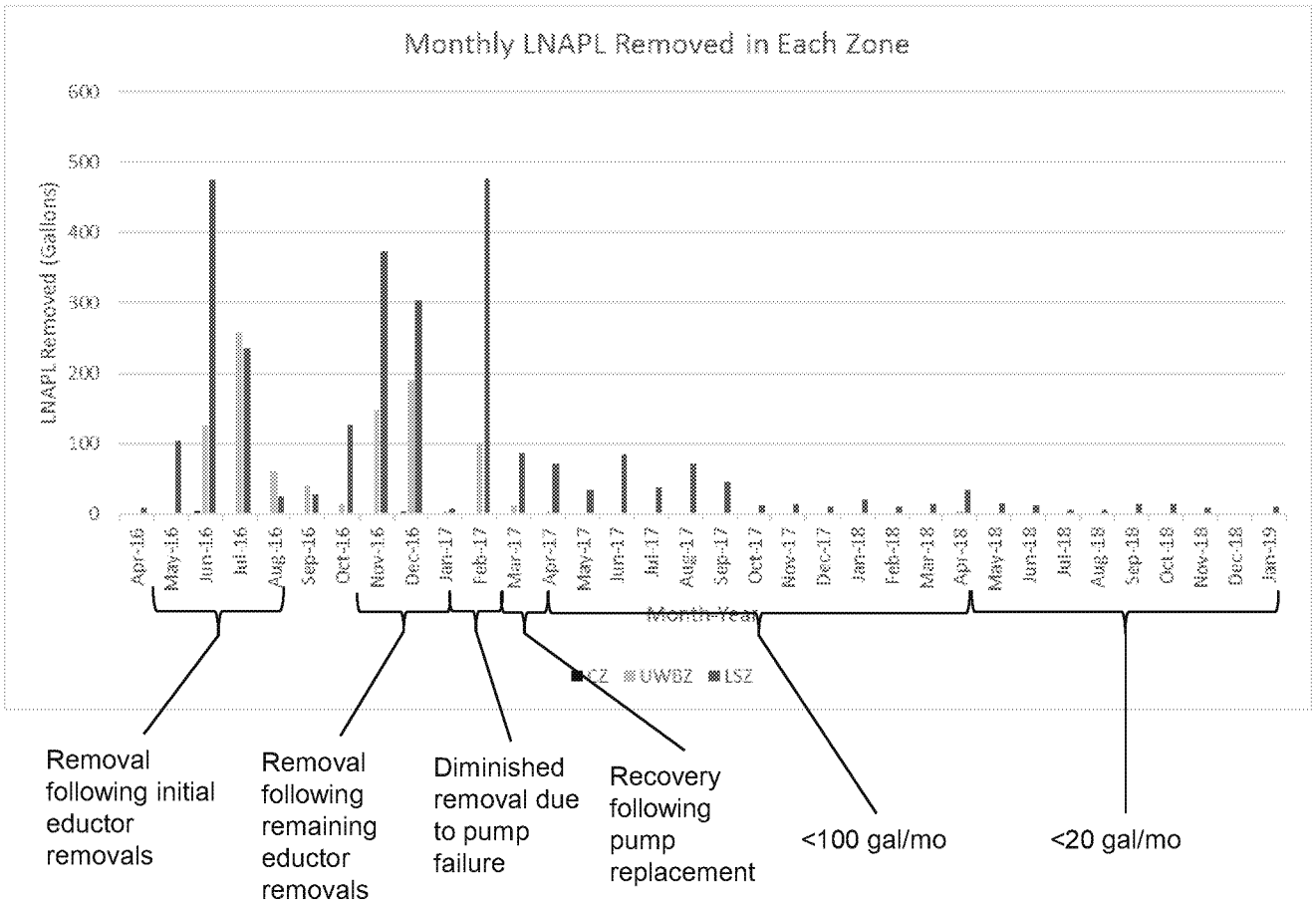
ED_005025_00011247-00011

LNAPL Monitoring/Removal Status
Lower Saturated Zone



ST012 LNAPL Monitoring/Removal Summary

- CZ – 7 gallons of LNAPL removed. None since Nov 2016
- UWBZ - 963 gallons of LNAPL removed. 0.5 gallons removed since Dec update (UWBZ28/LSZ51)
- LSZ - 2,800 gallons of LNAPL removed. 11 gallons removed since Dec update (W11, W37, LSZ36, LSZ43, LSZ50).



ED_005025_00011247-00013

Pilot Study Injection/Extraction Update

Site ST012 Additional Data Requested by ADEQ

- **ADEQ requested additional data to allow the agencies to assess EBR pilot test work plan implementation on 15 Nov 2018**

ED_005025_00011247-00015

Site ST012 Additional Data Requested by ADEQ

- **Extraction flow rate and concentration data**
  - **Individual well extraction rate (gallon per minute) and corresponding individual well operation dates –** estimated cumulative pumped volume provided. Individual well extraction rates are recorded manually but will be variable due to extraction pump level controls
  - **Corresponding individual extraction well analytical data –** available benzene data provided
  - **Air stripper influent contaminant concentration –** benzene concentrations provided
  - **Air stripper influent flow rate (cubic feet per minute) –** cumulative volume pumped and estimated overall benzene and TPH mass removal by extraction provided

ED_005025_00011247-00016

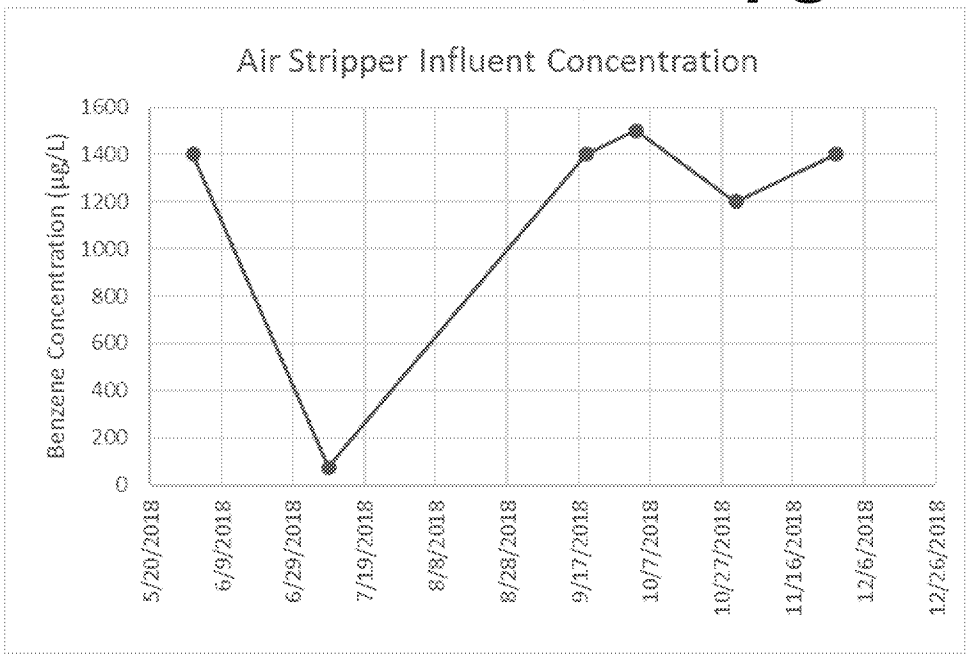
Site ST012 Additional Data Requested by ADEQ

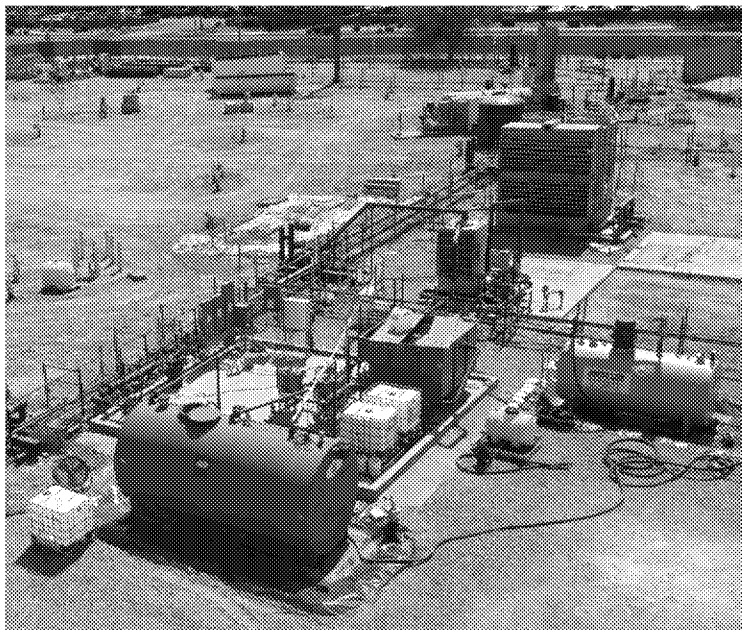
- **Sulfate injection data:**
  - **Individual well operation dates (injection and extraction), individual well injection rate (gallon per minute), and individual well, average daily injected sulfate concentration (grams per liter)**
  - Operation date ranges, estimated daily injection volumes, and daily injection batch sulfate concentrations (field data) will be provided in future BCT updates

ED_005025_00011247-00017

Site ST012 Extraction System Performance

- **No LNAPL has been recovered since extraction started up**
- **Benzene air stripper influent stabilized at ~1,400 µg/L**

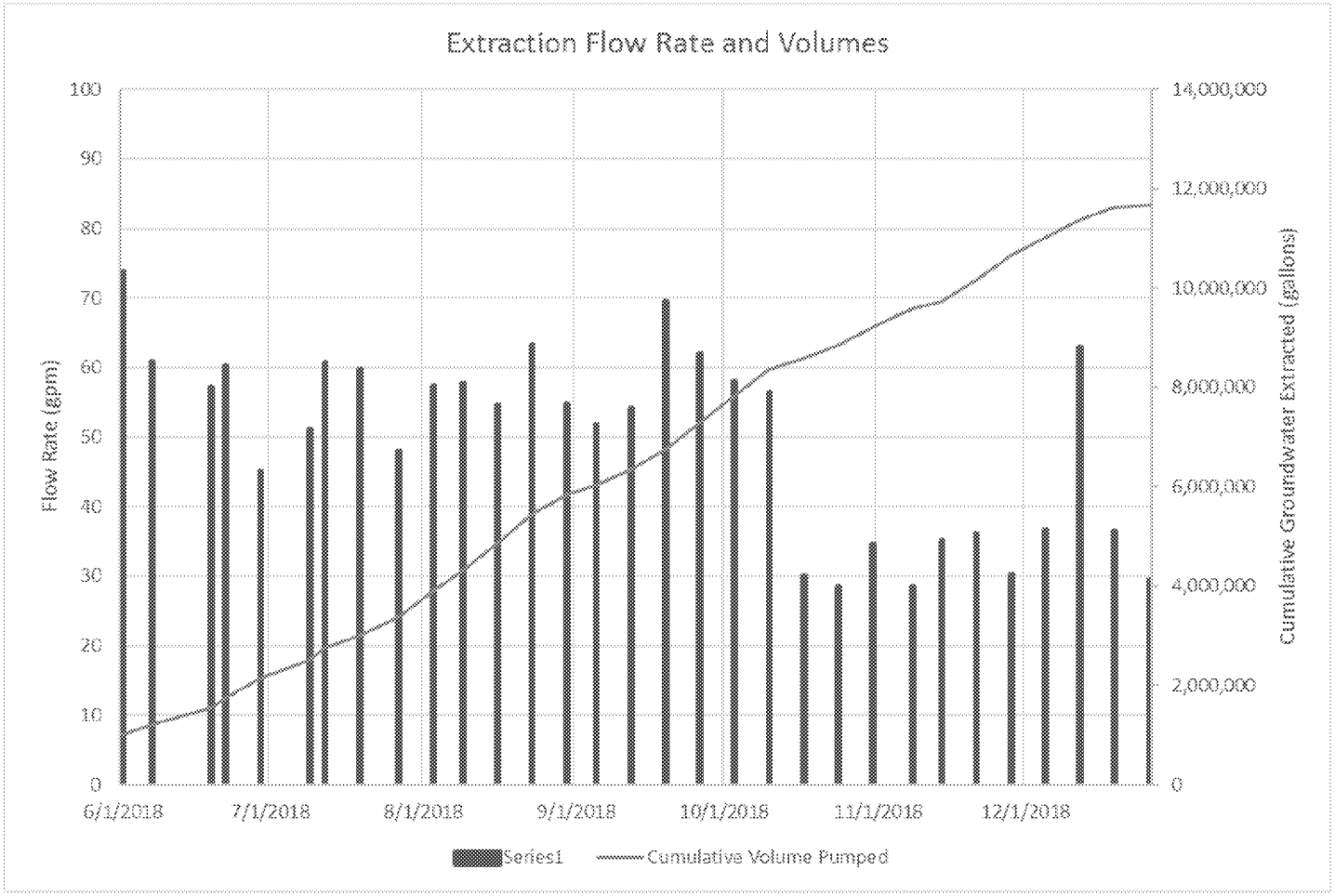




ED_005025_00011247-00018

Site ST012 Extraction System Performance

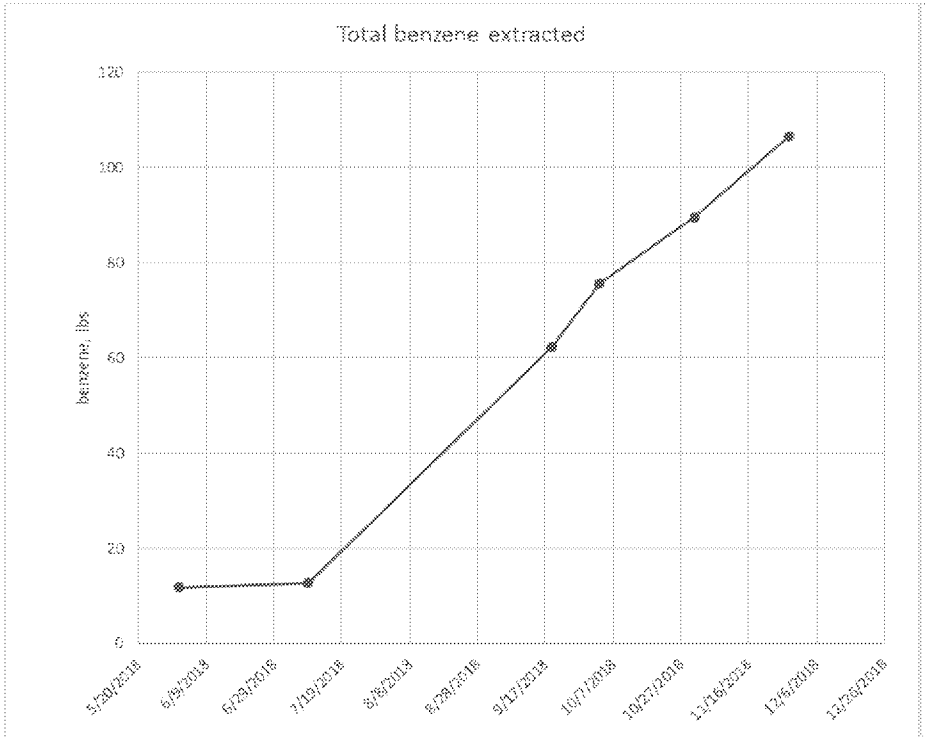
- **Overall Extraction Rates and Cumulative Volume Extracted**

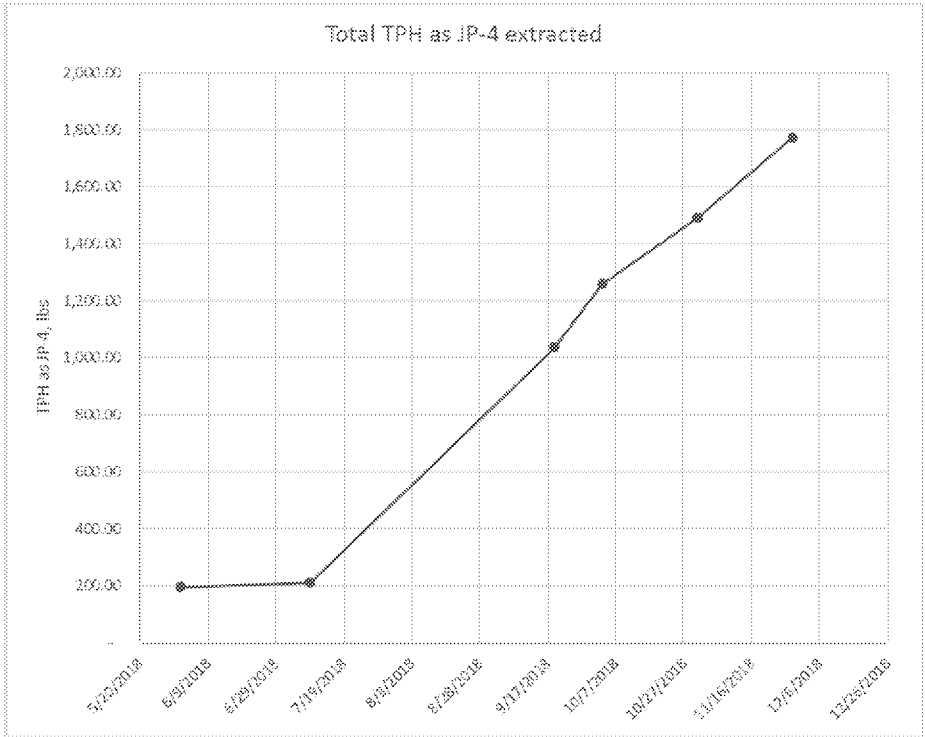


ED_005025_00011247-00019

Site ST012 Extraction System Performance

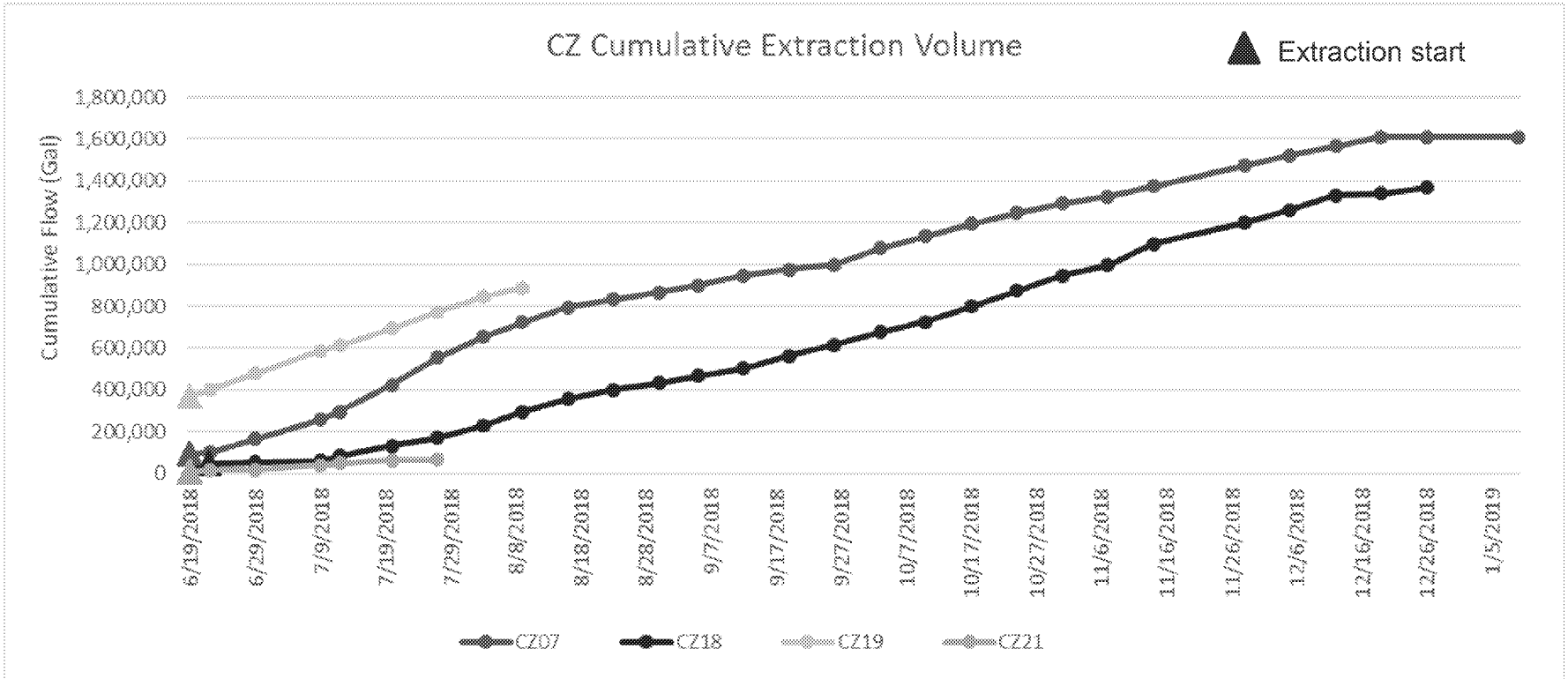
- **Estimated Mass Removal by Extraction**





ED_005025_00011247-00020

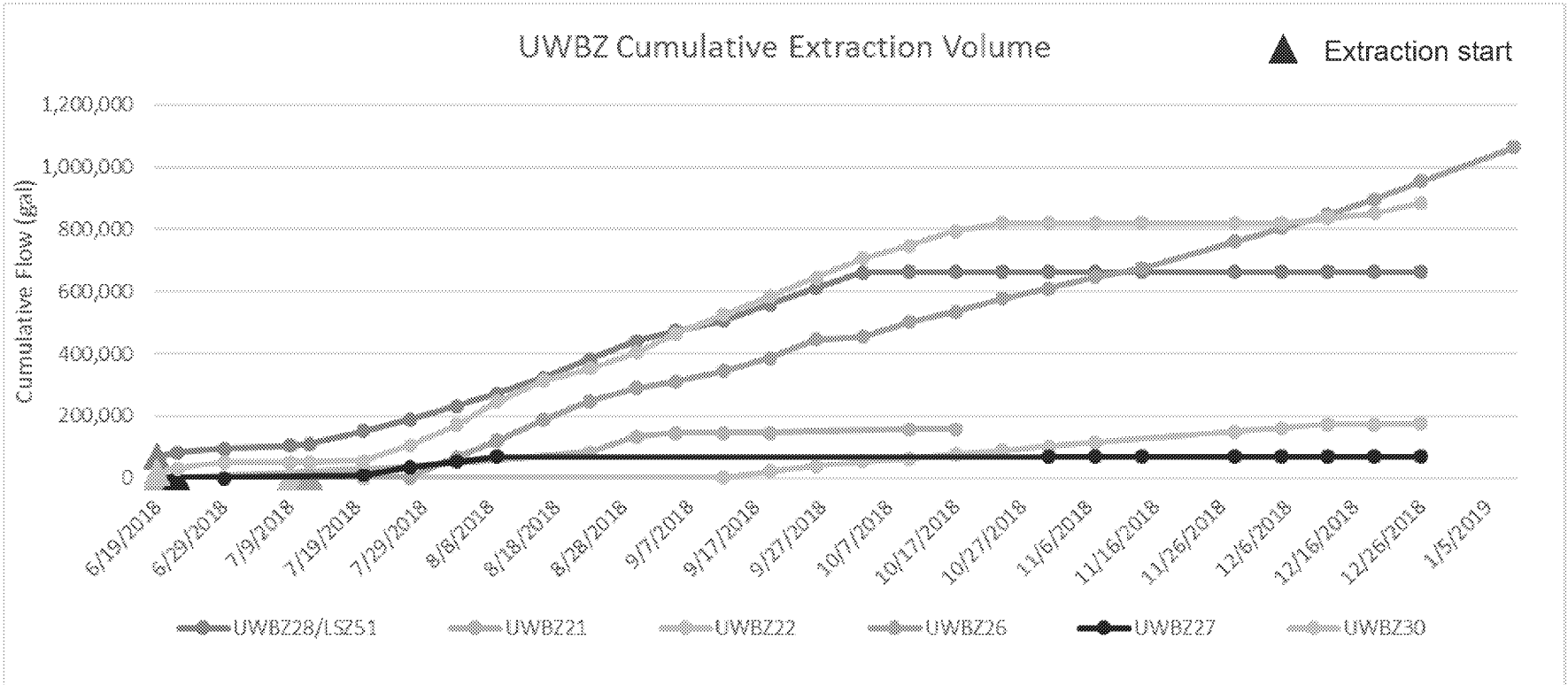
Cumulative Extraction Volume and Analytical Data by Well - Cobble Zone



Well ID	Date Sampled	Benzene Concentration, µg/L
ST012-CZ07	4/30/2018	230
	11/1/2018	600
ST012-CZ18	4/3/2018	1200
	11/1/2018	260
ST012-CZ19	5/9/2018	3.1
ST012-CZ21	4/12/2018	680

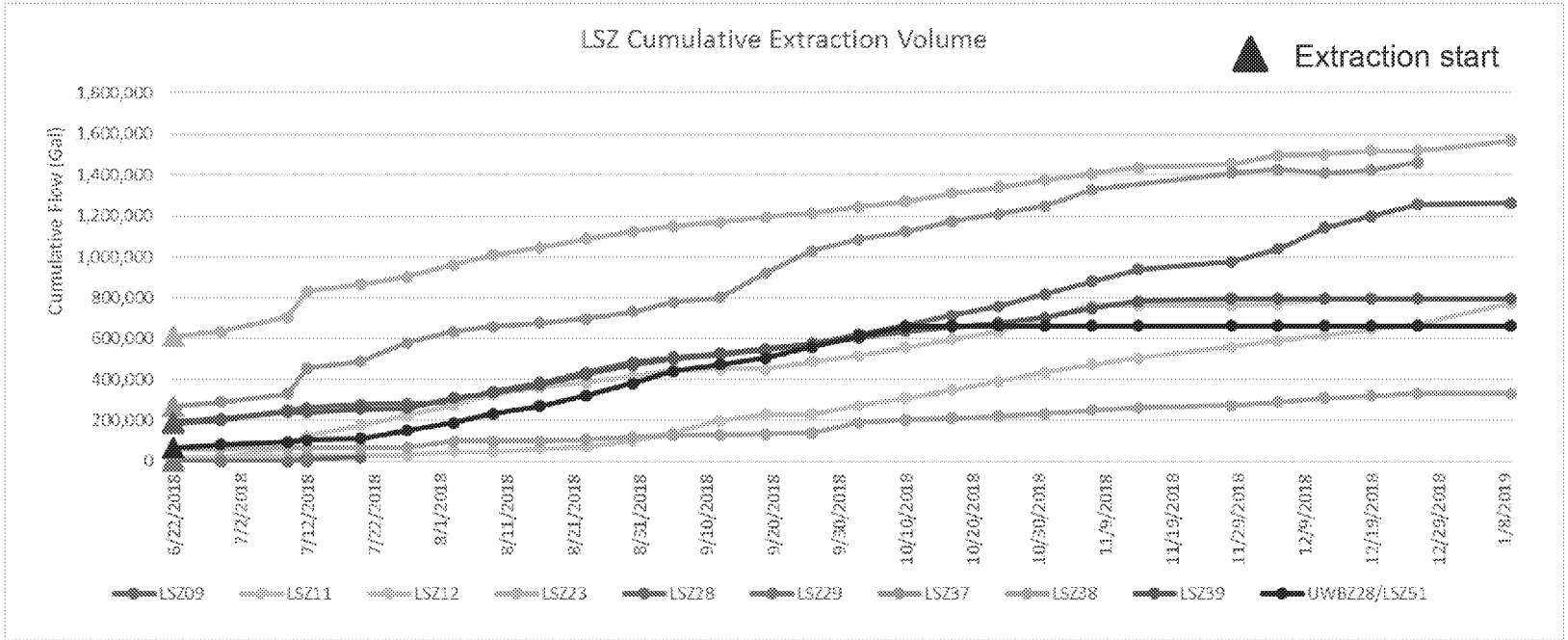
- Most recent baseline and operating (when available) benzene analytical result listed
- Many extraction wells have only had one sample analyzed for the re-baseline event
- Individual well concentrations may be reduced with pumping
- Mass removal estimates by well using the available analytical data overestimates benzene removal compared to overall estimates at the air stripper influent

Cumulative Extraction Volume and Analytical Data by Well - Upper Water Bearing Zone



Well ID	Date Sampled	Benzene Concentration, µg/L
ST012-UWBZ21	8/9/2017	3400
ST012-UWBZ22	5/9/2018	1900
ST012-UWBZ26	4/3/2018	3500
	4/3/2018	3700
ST012-UWBZ27	4/3/2018	1500
ST012-UWBZ28/LSZ51	5/9/2018	1700
ST012-UWBZ30	5/9/2018	6000

Cumulative Extraction Volume and Analytical Data by Well - Lower Saturated Zone



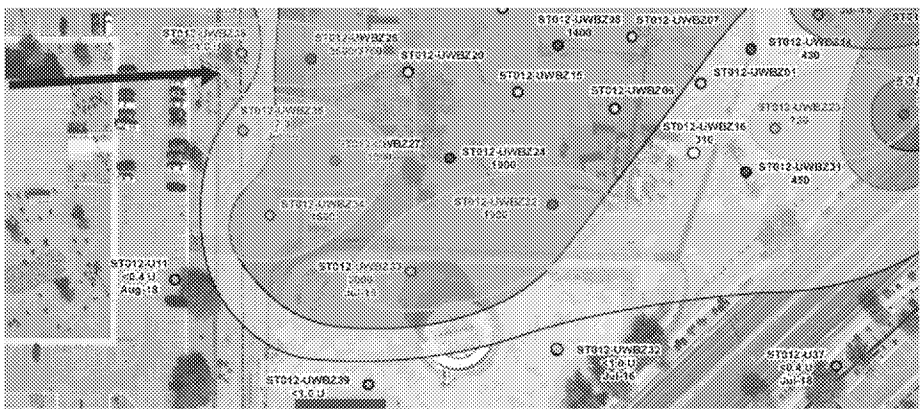
Well ID	Date Sampled	Benzene Concentration, µg/L
ST012-LSZ09	4/3/2018	2100
ST012-LSZ11	5/9/2018	2100
ST012-LSZ12	5/9/2018	1400
	11/1/2018	420
ST012-LSZ23	4/3/2018	1600
ST012-LSZ28	12/1/2016	110
ST012-LSZ29	4/10/2018	2.1
ST012-LSZ37	4/12/2018	2700
ST012-LSZ38	4/3/2018	3000
	11/1/2018	1300
ST012-LSZ39	4/12/2018	3100
ST012-LSZ39	4/12/2018	5500
ST012-UWBZ28/LSZ51	5/9/2018	1700

Site ST012 Injection Progress

- **Injected second batch in ST012-UWBZ33**
  - **8 Jan through 9 Jan**
  - **Injected at lower concentration (~90 g/L)/higher volume due to solubility constraints**
  - **Approximate 8-10 gpm injection rate**
    - Initially estimated from drop in frac tank
    - Replaced turbine flow meter with positive displacement totalizing water meter (similar to residential water meter)
  - **Sodium sulfate spill occurred on 9 Jan**
    - ~150 Gallons
    - Expansion-contraction due to high temperature variations (night-day) suspected in PVC elbow cracking
    - Isolated cracked pipe and repairs in progress (not on critical path for current injections)
    - Reviewed piping system for other potential areas for cracks/wear due to expansion contraction. Will add joints and anchors as necessary

Site ST012 Path Forward Jan-Feb

- **Continued SVE operation**
- **Replace flame oxidizer with oxidizer from ST035 for SVE (schedule TBD)**
- **Pilot Study Implementation**
  - **Continue mixing sulfate batches and inject according to plan (FVM7) Jan – Mar (continuing injection of batches in UWBZ33 this week)**
  - **Next planned injection wells UWBZ36, UWBZ35, UWBZ34**



ED_005025_00011247-00025