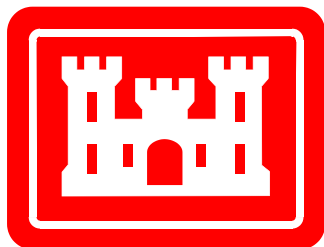


# OU1 2018 Groundwater Monitoring Results and Program Recommendations

Cornhusker Army Ammunition Plant  
Grand Island, NE

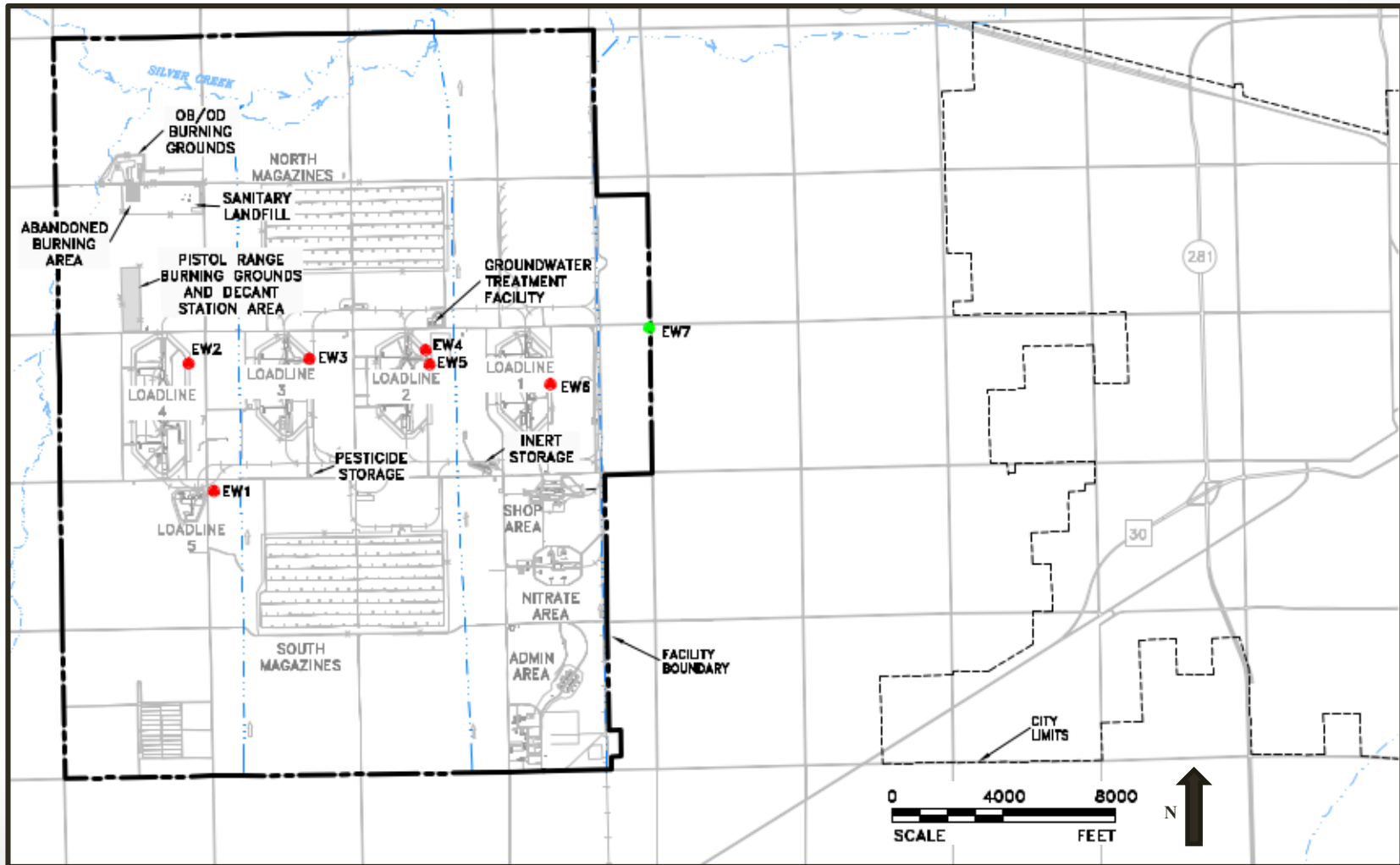
April 11, 2019



# CHAAP Meeting Agenda

- History of CHAAP Groundwater Remediation
- 2018 Groundwater Remediation Overview
- 2018 Groundwater Monitoring Summary
- 2018 OU1 On-post Explosives Plumes
- 2018 OU1 Modeling Scenarios
- 2019 Proposed Rebound Study
- Proposed Activities Schedule (2019-2021)
- 2019 Proposed OU1/OU3 LTM Activities

# History of CHAAP Groundwater Remediation



# History of CHAAP Groundwater Remediation

## Notable Historical Activities for CHAAP and OU1

- Soil excavation/incineration (unlined leach pits and cesspools) (mid '80s)
- OU1 Interim Record of Decision (1994) and OU1 ROD Amendment (2001)
- GWTF and pump and treat system (began in 1998, EW7 added in 2000)
  - Reduction of Pumping Rates
    - EW1, 2, 3 (discontinued in 2000), EW4, 5 (discontinued in 2008), EW6 (discontinued in 2009)
    - EW7 (pumping increased to 500 gpm [2009], reduced to 450 gpm [2015], and reduced to 300 gpm [2017])
- Subsurface Injections
  - Voluntary action completed by USACE to expedite RAO (2007 to 2016)
    - RDX and TNT reductions (1000s  $\mu\text{g/L}$  to 10s  $\mu\text{g/L}$  and nondetect)
    - Direct Push sampling identified areas for injection treatments, evaluated injection performances, and areas needing permanent well locations
- Annual OU1 LTM program (on- and off-post wells); institutional controls

# March 2007 – Plume Extent



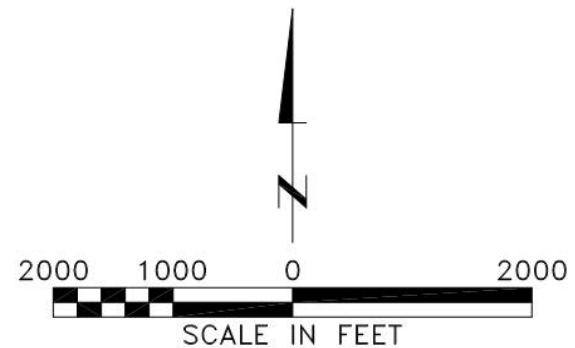
RDX+TNT >2 µg/L



RDX+TNT >20 µg/L



RDX+TNT >200 µg/L



# 2018 Groundwater Remediation Overview

## 2018 OU1 Tasks Completed

- GWTF (year-round)
  - Extraction and treatment of explosives-contaminated groundwater (OU1) at one active extraction well (EW7). Quarterly NPDES sampling events.
- Groundwater Monitoring Program (March 2018)
  - Monitoring explosives plume concentrations and migration trends over time
    - Direct Push Groundwater Investigation Sampling Event (20 samples)
    - Annual OU1 LTM Sampling Event (73 on-post wells, 19 off-post wells)
- Annual Reporting (February 2019)
  - Draft Annual Report
    - Presented results of GWTF, groundwater monitoring activities, Groundwater Flow and Contaminant Fate and Transport modeling and explosives mass estimates, and provides conclusions and recommendations for 2019.
  - Draft Final Technical Memorandum
    - Presented results of 2018 OU1 groundwater monitoring events and the program recommendations (i.e., temporary discontinuation of EW7, Rebound Study, Subsurface Injection treatments).

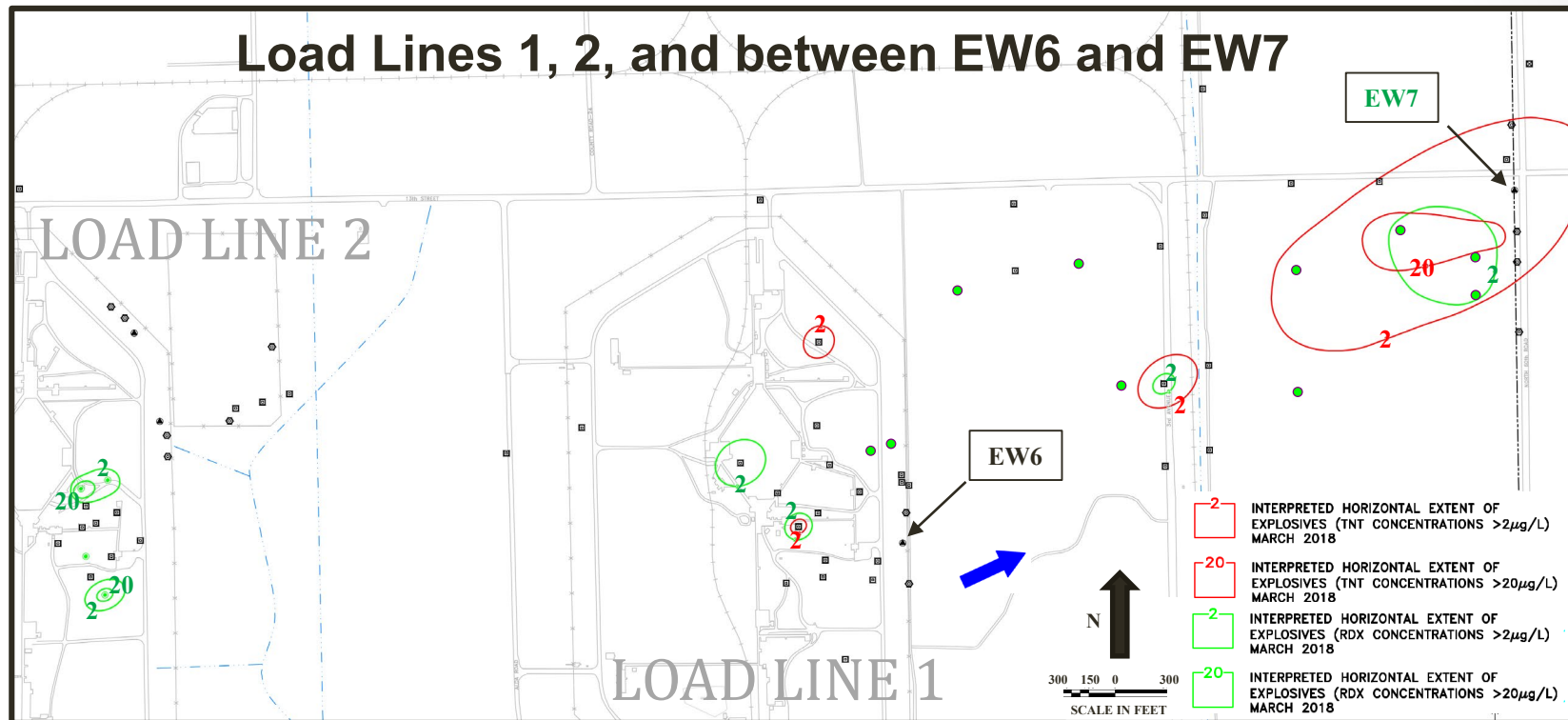
# 2018 OU1 Groundwater Monitoring Summary

- RDX and TNT concentrations continue to decrease steadily over time
- Groundwater extraction system continues to contain the on-post groundwater explosives plume
- Significant denitrification is occurring in the feedlot area and in subsurface injection treatment areas (explosives degradation products present)

Explosives Mass Estimations: 2007 / 2018						
Explosives Parameter(s)	March 2007			March 2018		
	Load Line Treatment Areas (mass in pounds)	Area Between EW6 and EW7 (mass in pounds)	Total Area (mass in pounds)	Load Line Treatment Areas (mass in pounds)	Area Between EW6 and EW7 (mass in pounds)	Total Area (mass in pounds)
RDX	28.28	156.66	184.94	1.09	0.69	1.78
TNT	157.19	419.69	576.88	0.20	39.87	40.06
RDX+TNT	185.47	576.35	761.82	1.29	40.56	41.85

- Since 2014, all off-post wells remain below the explosives cleanup goals (< 2 µg/L)
- Water levels show increasing trend in past 4 years. In 2018, no rebounding effects identified in source area treatment locations completed in 2014 through 2016 (LL1 and LL2).
- Since 2014, annual Contaminant Fate & Transport modeling scenarios continue to show no off-site plume migration (if EW7 turned off in 2019)
  - Concentrations of RDX (max of 1.8 µg/L) and TNT (max of 17 µg/L) low at facility boundary

# OU1 On-Post Explosives Plume March 2018



- Explosives concentrations in 2018 continued to show decreasing trends and remain low due to RAO (pump and treat system) and past subsurface injections.
- Direct Push and Annual LTM sampling verified 2018 explosives plume extent.



# 2018 OU1 Modeling Scenarios

2018 model used to predict long-term contaminant transport conditions

## No change:

- Years 1-20 (2018-2037): treatment effects from 2016 injections, EW7 on @ 300 gpm

## Scenario 1:

- Year 1 (2018): treatment effects from 2016 injections, EW7 on @ 300 gpm
- Years 2-17 (2019-2034): no further injection effects and EW7 off

## Scenario 2 (Proposed Rebound Study):

- Year 1 (2018): treatment effects from 2016 injections, EW7 on @ 300 gpm
- Years 2-5 (2019-2022): treatment effects from 2019 and 2020 injections, EW7 off
- Years 6-10 (2023-2027): no further injection effects and EW7 off

	EW7 Pumping at 300 gpm (Years)	Treatment Effects (Years)	Concentrations below HALs at EW7 (Years)	Concentrations below HALs Site-wide (Years)	Off-site Migration
	<b>Based on 2018 conditions</b>				
<b>No change</b>	20	1	7	20	No
<b>Scenario 1</b>	1	1	12	17	No
<b>Scenario 2</b>	1	5	6	10	No

# 2019 Proposed Rebound Study

Based on current explosives concentrations and modeling results, USACE recommends a 'temporary' shutdown of EW7, performing a Rebound Study, and completing subsurface injections near the former facility boundary (upgradient of EW7).

1. Temporary Shutdown of GWTF and EW7 (November 2019)
2. Rebound Study Monitoring (Baseline October 2019 through 2021)
3. Subsurface Injections (November 2019 / November 2020)

## Rebound Study Benefits

- Subsurface injections will establish reducing conditions for explosives degradation (EW7 off);
- Verify if off-post explosives migration occurs with evaluation of injection performance and nature and extent of concentrations;
- On- and off-post Institutional Controls and drilling restrictions continue;
- EW7 and GWTF will remain in 'standby' status for resuming, if necessary.

# 2019 Proposed Rebound Study

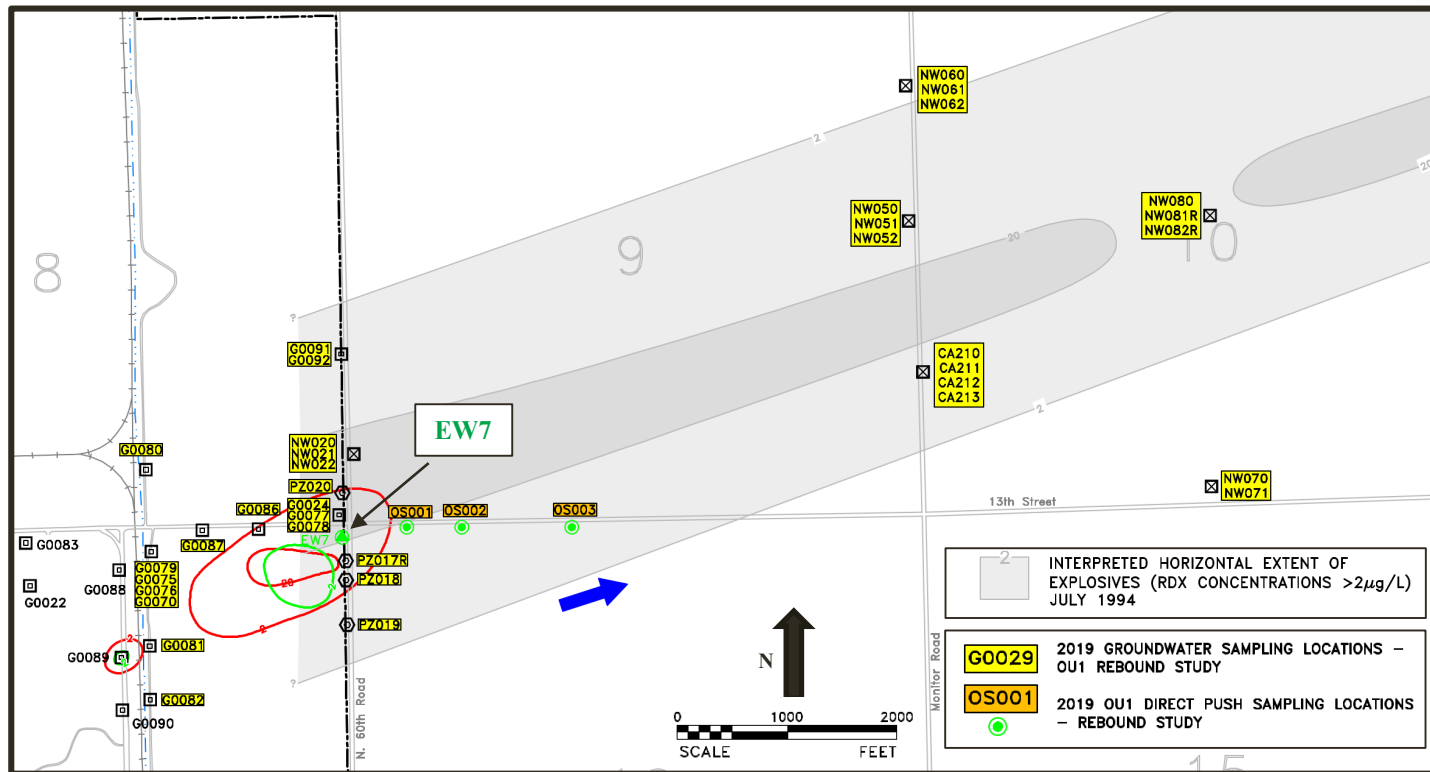
## 1. Temporary Shutdown of GWTF and EW7 (November 2019)

- Pump and treat system set to 0 gpm in 'stand-by' condition
  - Winterize GWTF and EWs, maintain routine O&M (i.e., mowing/snow removal, pest control, inspections and security)

## 2. Rebound Study Monitoring (October 2019 through 2021)

- Monitoring Events (8 sampling events: 1- baseline event prior to EW7 shutdown, 7- subsequent quarterly events)
  - Baseline (prior to EW7 shutdown)
    - 36 select wells (Explosives and MNA analysis)
      - Add 15 off-post wells back to LTM program (removed in 2013, 2016)
    - Direct push sampling (Explosives analysis only)
      - Off-post sample locations to verify clean zone off-site
      - Vertical profile sampling
  - Data Reporting
    - Summarize field activities, present data analysis and extent of explosives and migration, and analysis of statistical trends

# 2019 Proposed Rebound Study



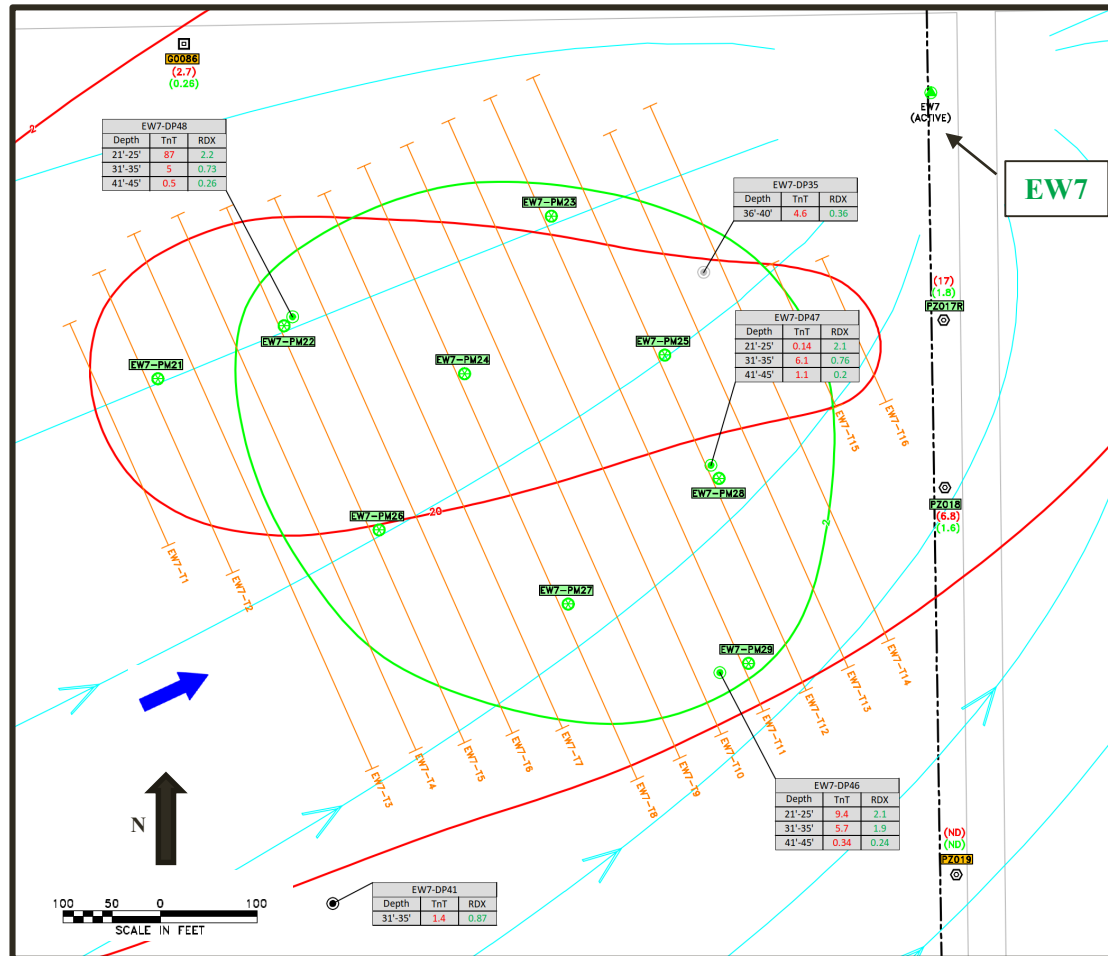
- Baseline monitoring well sampling: Determine baseline conditions and verify plume extent prior to EW7 shutdown.
- Direct push locations: Define plume extent directly downgradient from EW7 where no wells exist. Locations will be directly south of feedlot (due to access restrictions).

# 2019 Proposed Rebound Study

## 3. Subsurface Injections (November 2019 / November 2020)

- Two events of subsurface injections (600 points each)
  - Complete outside of crop season (November – April)
  - 2019 Subsurface Injections focus upgradient of EW7/facility boundary (with EW7 off)
  - 2020 Subsurface Injections focus on LL1 and LL2 areas and retreatment of EW7/facility boundary area, if necessary
    - Similar injection designs successful in past (direct push, horizontal spacing, vertical intervals, amendment and mixture, low injection pressures)
    - Use food-grade carbon amendment (custom blend Wesblend<sup>®</sup> 66-10) successful in past years
    - Performance Monitoring (including baseline)

# 2019 Proposed Rebound Study



- Proposed Injection and Performance Monitoring Locations 2019: Focus on RDX plume  $>2 \mu\text{g/L}$  and TNT plume  $>20 \mu\text{g/L}$ . Injection depths between 17 and 37 feet bgs

# Proposed Activities Schedule 2019 through 2021

## Annual OU1 and OU3 LTM (May 2019-2021)

- Conduct annual sampling (coinciding with Rebound Study activities)
- Annual Reporting and Stakeholder Meetings

## GWTF and EW7 (November 2019)

- Continue Pump and Treat operations through October (EW7 @ 300 gpm), NPDES sampling, O&M activities, CIH inspection, reporting
- Prepare GWTF/EWs for 'standby' status and continue necessary O&M

## Rebound Study (October 2019-2021)

- Conduct 8 monitoring events (including baseline) with event reporting

## Subsurface Injections (November 2019 / November 2021)

- 2019- Complete 600 injection points upgradient of EW7 (off)
- 2020- Complete 600 injection points at LL1, LL2, near EW7 (if needed)
- Quarterly Performance Monitoring for both events
- Summary and recommendations provided in Annual Reporting

# Proposed Activities Schedule 2019 through 2021

Date	GWTF LTO	Rebound Study	LTM	Injection
Jan-19	Operation			
Feb-19	Operation			
Mar-19	Operation			
Apr-19	Operation			
May-19	Operation		Complete LTM	
Jun-19	Operation			
Jul-19	Operation			
Aug-19	Operation			
Sep-19	Operation			
Oct-19	Operation	Q-1 (baseline)		PM-1 (baseline)
Nov-19	Standby O&M			Complete Injections (600 points)
Dec-19	Standby O&M			
Jan-20	Standby O&M			
Feb-20	Standby O&M	Q-2		PM-2
Mar-20	Standby O&M			
Apr-20	Standby O&M			
May-20	Standby O&M	Q-3	Complete LTM	PM-3
Jun-20	Standby O&M			
Jul-20	Standby O&M			
Aug-20	Standby O&M	Q-4		PM-4
Sep-20	Standby O&M			
Oct-20	Standby O&M			PM-1 (baseline)
Nov-20	Standby O&M	Q-5		Complete Injections (600 points)
Dec-20	Standby O&M			
Jan-21	Standby O&M			
Feb-21	Standby O&M	Q-6		PM-2
Mar-21	Standby O&M			
Apr-21	Standby O&M			
May-21	Standby O&M	Q-7	Complete LTM	PM-3
Jun-21	Standby O&M			
Jul-21	Standby O&M			
Aug-21	Standby O&M	Q-8		PM-4

**Notes:**

- Meeting with EPA presenting Rebound Study = April 11, 2019
- Anticipated Funding: LTM 2019 = May 2019, Rebound Study and Injections = October 2019
- Rebound Study (8 events) includes using 2 LTM events



# 2019 Proposed OU1/OU3 LTM Activities

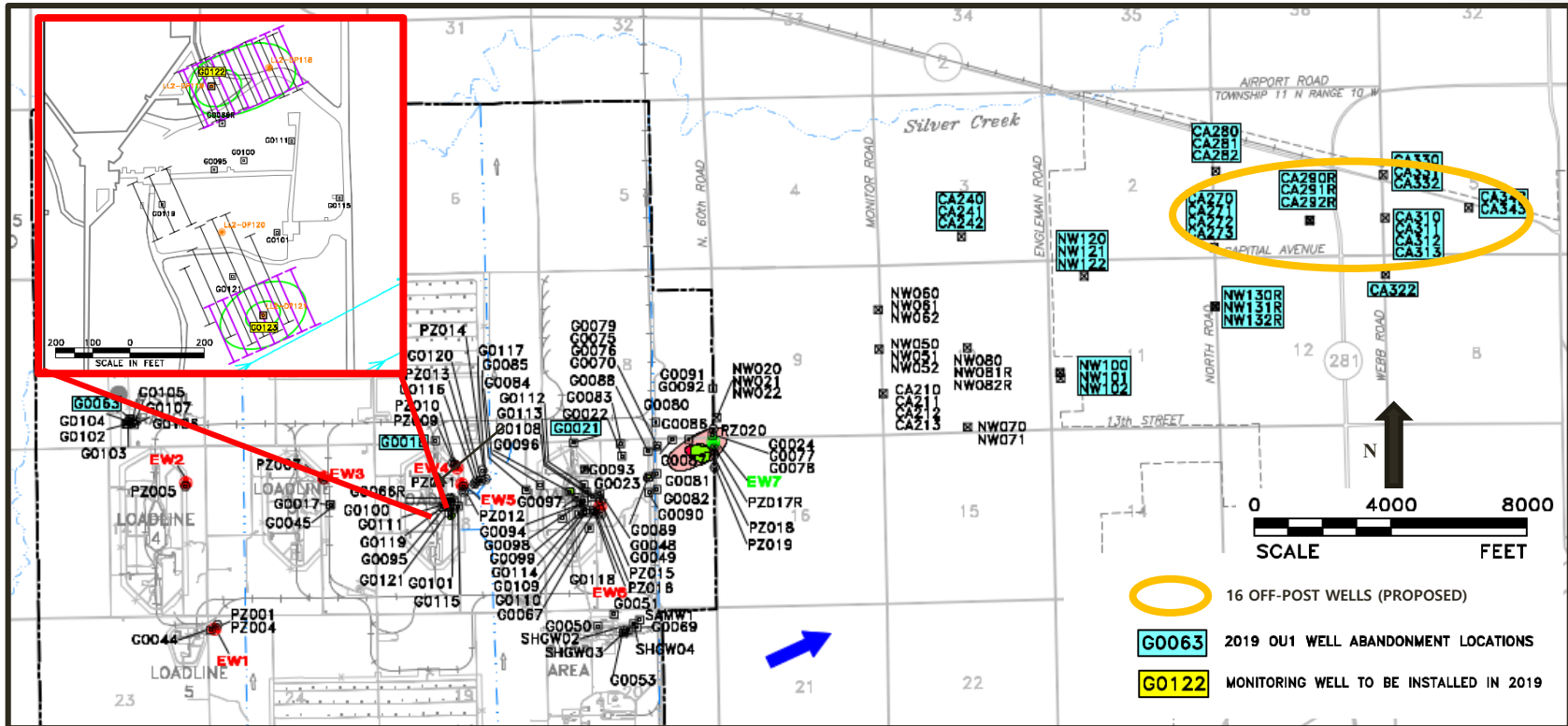
## Annual OU1 and OU3 LTM (May 2019)

- Complete site-wide groundwater level measurement round
- OU1 – Sample 3 off-post monitoring wells (for explosives only) and 74 on-post monitoring wells and piezometers for explosives and natural attenuation parameters
- OU3 – Sample 6 Shop Area monitoring wells for VOCs and natural attenuation parameters (VOC plume observed in March 2018)
- Annual Report: Evaluate plume concentrations, migration trends, institutional controls, EW7 capture zone analysis, model predicted remediation timeframes, and recommendations.
- Continue Groundwater Monitoring Program optimization efforts
  - In 2018, recommending removal of remaining 16 off-post wells (distal end) from OU1 LTM Program (< HALs 5 years or longer)

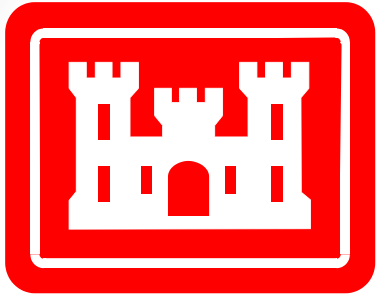
## OU1 Well Installations and Abandonments (Summer/Fall 2019)

- Complete two (2) well installations (at LL2) based on 2018 Direct Push sampling results and proposed subsurface injections (November 2020)
- Complete 35 well abandonments (3 on-post, 32 off-post). Of the 35 wells, 19 are part of remaining OU1 wells removed from program in 2013.

# 2019 Proposed OU1/OU3 LTM Activities



- 2019 Annual OU1/OU3 Report: Summarizing all 2019 OU1/OU3 activities, data results, statistical evaluation of OU1 observed trends, groundwater modeling, and providing conclusions and recommendation for subsequent year activities
- 2019 Monitoring Well Installation and Abandonment Letter Report: Summarizing all 2019 well installation and abandonment activities and required NDNR forms



# Questions?

