

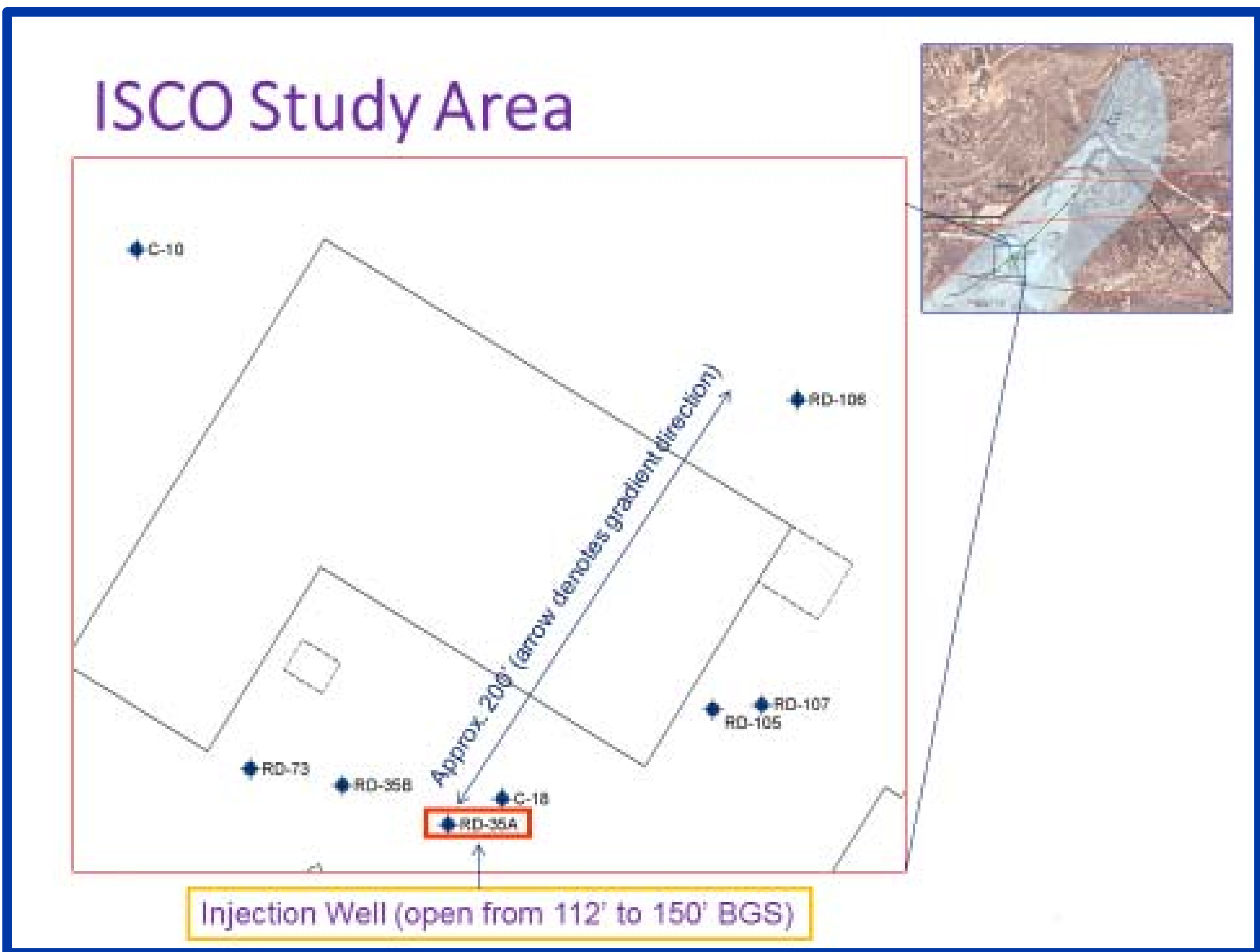


In Situ Chemical Oxidation (ISCO) Pilot Test Project for Groundwater

Boeing Santa Susana Field Laboratory (Feb. 2015 Update)

Project Objective:
Evaluate *Effectiveness* and *Implementability* of ISCO as Long-Term Groundwater Remedy

SEQUENCE OF ACTIVITIES:



1. Use Potassium Permanganate Product



2. Mix with Hydrant Water



3. Inject into RD-35A



4. Sample from Monitoring Wells

Summary of ISCO Injection Events

ISCO INJECTION EVENTS COMPLETED TO DATE								
EVENT	DATES	INJECTATE	FLOW (GPM)	VOLUME (GAL)	CONCENTRATION	MASS (LBS.)	MAX WL RISE (FT)	FINDINGS
ISCO #1	June 9-16, 2014	KMnO ₄ (with KBr as tracer)	2	5,085	20 g/L (2%) KMnO ₄	771 (KBr-115)	4.48	Visible KMnO ₄ in C-18, (Port 3), RD-106 (Port 8)
ISCO #2	July 14-21, 2014	KMnO ₄	2	5,158	20 g/L (2%) KMnO ₄	771	5.24	KMnO ₄ in C-18, (Port 3), RD-106 (Ports 7-9)
ISCO #3	Aug. 18-25, 2014	KMnO ₄	2	5,142	20 g/L (2%) KMnO ₄	771	5.81	KMnO ₄ in C-18, (Port 3), RD-106 (Ports 7-9)
ISCO #4	Sept. 22-29, 2014	KMnO ₄	2	5,199	20 g/L (2%) KMnO ₄	771	5.98	KMnO ₄ in C-18, (Port 3), RD-106 (Ports 7-9)
ISCO #5	Oct. 27-Nov. 3, 2014	KMnO ₄	2	5,092	20 g/L (2%) KMnO ₄	771	5.96	KMnO ₄ in C-18, (Port 3), RD-106 (Ports 7-9)
DTSC APPROVAL FOR HIGHER DOSE INJECTIONS (DEC. 2014)								
ISCO #6	Jan. 12-19, 2015	KMnO ₄	2	5,241	30 g/L (3%) KMnO ₄	1,157	5.98	KMnO ₄ in C-18, (Ports 3, 5), RD-106 (Ports 6-9)
ISCO #7	Jan. 26-Feb. 2, 2015	KMnO ₄	2	5,271	30 g/L (3%) KMnO ₄	1,157	6.38	KMnO ₄ in C-18, (Ports 3, 5), RD-106 (Ports 6-9)

Detects of Tracers & KMnO₄

C-10		C-18		RD-105		RD-107		RD-106	
Port	Depth (ft.)	Port	Depth (ft.)	Port	Depth (ft.)	Port	Depth (ft.)	Port	Depth (ft.)
1	105-135	1	(Now dry)	7	102.5	1	85-100	1	97.5-102.5
2	135-182	2	95-100	8	124	2	112-132	2	107.5-112.5
3	185-205	3	105-120	5	175.5	3	130-135	3	124-131
4	240-250	4	130-135	4	188	4	250-260	4	138-144
5	275-285	5	140-168	5	187.5	5	178-188	5	150-157
6	342-356	6	184-195	2	225	6	218-228	6	170-177
7	378-390	7		1	247.5	7	234-240	7	187-195
8	403-423							8	205-212
9	475-485							9	228-233
10	520-527							10	242-250
11	551-560								
12	575-585								

Legend

- 548 Fluorescein detected with max. concentration shown from 2014 tracer test, lab (ppb)
- 27 Bromide detected with max. concentration through Dec. 2014, lab (ppm)
- 25.0 Visible permanganate detected, with highest concentration through Feb. 5, 2014 (field, ppm)

Note: only those bromide concentrations found at or above reporting limit (RL) of 0.50 ppm are shown.

NEXT STEPS:

1. Continue GW Monitoring (Feb. – Aug. '15)
2. Complete Coreholes to Examine Rock (~Aug. '15)
3. Evaluate Incoming Data (Feb. – Dec. '15)
4. Issue Report (~Jan. '16)