



October 7, 2019

Mr. Jacob Evans
Noble Energy, Inc.
2115 117th Avenue
Greeley, CO 80631

**Vertical Definition Proposal
Wells Ranch AE 32 Econode
Flow Line Release
40.4440 / -104.3552
SW¼ NW¼ SEC.32 T6N R62W 6PM
Weld County, Colorado
Remediation # 12140**

Dear Mr. Evans:

Eagle Environmental Consulting, Inc. (EAGLE) is pleased to provide Noble Energy, Inc. (Noble) with this Vertical Definition Proposal for the above-referenced site.

1.0 SITE BACKGROUND

1.1 Site Description

The Wells Ranch AE 32 Econode site is located within the southwest quarter of the northwest quarter of Section 32, Township 6 North, Range 62 West, of the 6th Prime Meridian, in Weld County, Colorado. The flow line release associated with the site was located at latitude: 40.4440 and longitude: -104.3552. A topographic site location map is presented as Figure 1.

1.2 Site Hydrogeology

The soil lithology observed beneath the release location consists of road base from the ground surface to approximately 2 feet below ground surface (bgs), underlain by dense to very dense, clayey sand from approximately 2 feet bgs to 17 feet bgs and stiff sandy clay from approximately 17 feet bgs to 35 feet bgs. Groundwater was not observed during assessment activities. Soil boring logs and well completion diagrams are included in Attachment A.

1.3 Previous Assessment Activities

During production, a produced water dump line unintentionally released at the Wells Ranch AE 32 Econode. On May 9, 2018, EAGLE was requested by Noble to perform subsurface assessment activities in response to potential petroleum hydrocarbon (PHC) impacts associated with the flow line release. Upon arrival, EAGLE collected soil samples (SS-01 through SS-09) around the flow line release area to identify any petroleum hydrocarbon impacts above Colorado Oil and Gas Conservation Commission (COGCC) Table 910-1 regulatory limits. Based on soil analytical results, additional assessment activities were coordinated to laterally and vertically define PHC soil impacts above COGCC Table 910-1

regulatory limits. Initial assessment soil analytical results are presented in Figure 2 and summarized in Table 1.

Due to health and safety concerns regarding the current infrastructure at the site, additional assessment activities were completed utilizing a hydrovac operated by 1888 and a stainless-steel hand auger. On January 17, 2019, EAGLE and Noble utilized 1888 to advance eight (8) potholes (PH-01 through PH-08) adjacent to previously identified soil impacts above COGCC Table 910-1 regulatory limits. Hand auger refusal was encountered, at the time, between 10 and 15 feet bgs. Based on field observations and PID readings, 16 soil samples were submitted for lateral and vertical definition of petroleum hydrocarbon impacts observed during the initial assessment. Based on laboratory analytical results, the full extent of PHC impacts at the site were not defined. Pothole assessment soil analytical results are presented in Figure 3 and summarized in Table 1.

Vertical and lateral definition of the soil impacts is limited due to overall health and safety concerns at the site. Based on the location of adsorbed petroleum hydrocarbon impacts at the site relative to on-going oil and gas (O&G) operations (above-ground and below-ground utilities and/or infrastructure), soil vapor extraction (SVE) is proposed to address residual soil impacts.

In April 2019, EAGLE installed five (5) SVE remedial wells at the site. Soil samples collected from SVE-01 through SVE-05 did not contain concentrations of benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, or total petroleum hydrocarbons (TPH) exceeding applicable COGCC Table 910-1 regulatory limits. SVE soil analytical results are presented in Figure 4 and summarized in Table 1. In July 2019, EAGLE completed SVE pilot test activities to determine if SVE remedial technology feasibility at the site. The mobile SVE unit consisted of a Tuthill, 15-horse power (HP) positive displacement blower. Based on field observations, SVE remedial technology does appear feasible at the site.

2.0 PROPOSED ASSESSMENT ACTIVITIES

In order to vertically define PHC impacts at the site, EAGLE proposes additional hydrovac and hand auger assessment activities. Due to health and safety concerns regarding the current infrastructure at the site, assessment activities will be completed utilizing a hydrovac and a stainless-steel hand auger. Four (4) locations are proposed for assessment to vertically define residual PHC impacts observed in previously collected soil samples PH-01@14-15', PH-03@14-15', PH-04@12-13', and SS-09@6'.

A hydrovac, utilizing a 4" poly-vinyl chloride (PVC) stinger with additional extensions, will advance each location to approximately 25 feet bgs, or until vertical definition is observed. EAGLE will then utilize a stainless-steel hand auger with the necessary attachments to collect confirmation soil samples for laboratory analysis. Each soil sample will be submitted for laboratory analysis of BTEX, naphthalene, total petroleum hydrocarbons – gasoline range organics (TPH-GRO) following Environmental Protection Agency (EPA) Method 8260D and total petroleum hydrocarbons – diesel range organics (TPH-DRO) by EPA Method 8015D.

A proposed assessment map with vertical definition assessment locations is presented in Figure 5.

3.0 RECOMMENDATIONS

Based on the information presented in this report, EAGLE recommends the following:

- Complete vertical definition assessment activities at the site to delineate residual adsorbed PHC impacts at the site;
- Complete remedial design following additional soil analytical results.


EAGLE sincerely appreciates the opportunity to provide our services. If you have any questions or require further information, please contact us at (303) 433-0479.

Sincerely,

EAGLE ENVIRONMENTAL CONSULTING, INC.



Andrew Newberry
Project Geologist



Robin Lockwood
Project Scientist

FIGURES

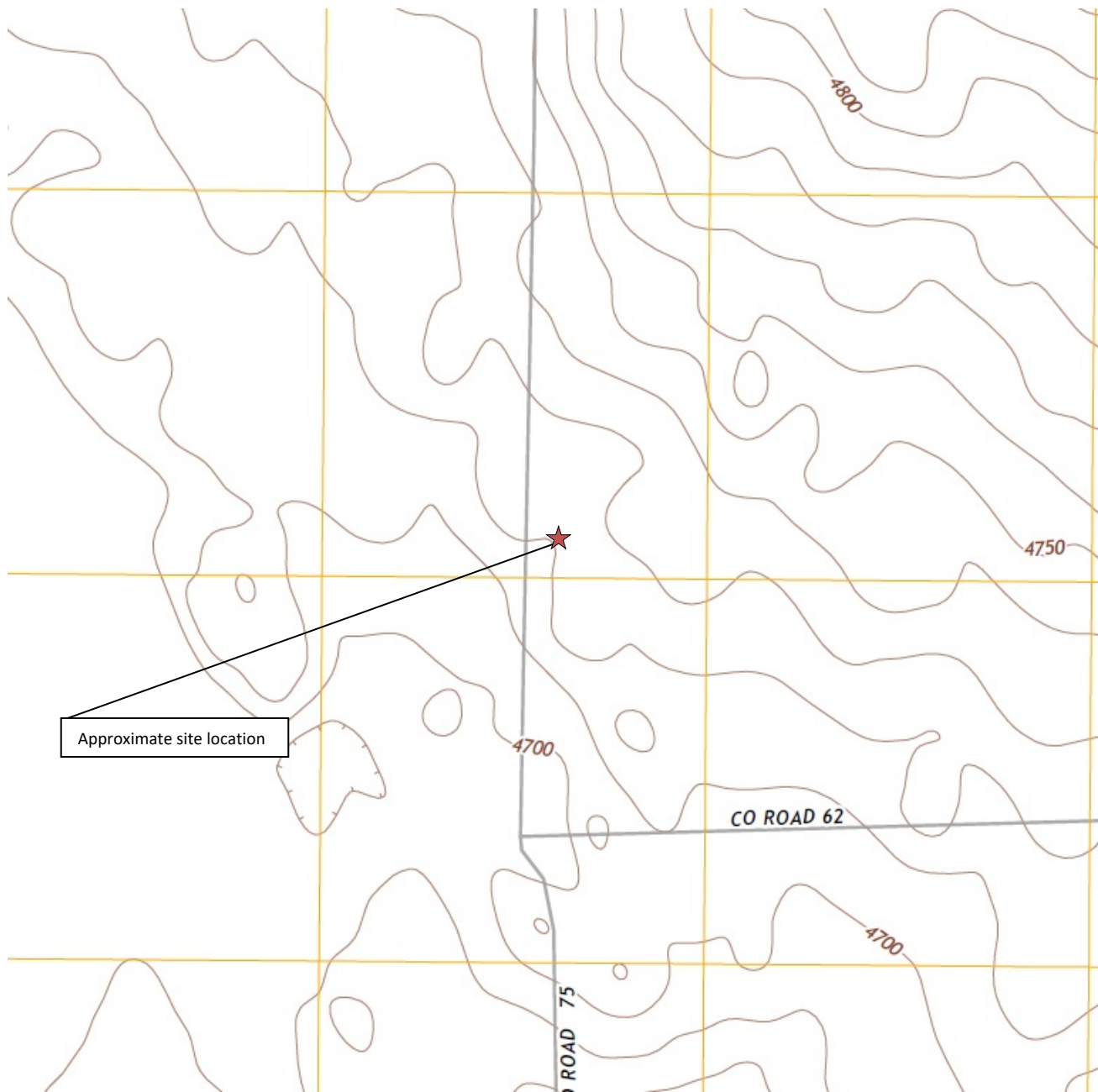
Figure 1: Topographic Site Location Map

Figure 2: Initial Assessment Soil Analytical Map

Figure 3: Pothole Assessment Map

Figure 4: SVE Soil Analytical Map

Figure 5: Proposed Assessment Map



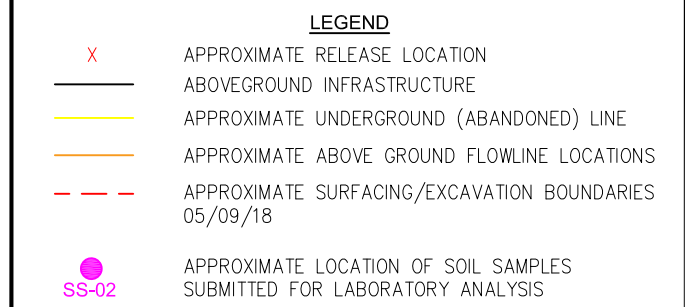
Topographic Site Location Map
 Wells Ranch AE32 Ecnode
 Flow Line Release
 40.4440 / -104.3552
 SW¼ NW¼ SEC.32 T6N R62W 6PM
 Weld County, Colorado
 Remediation # 12140



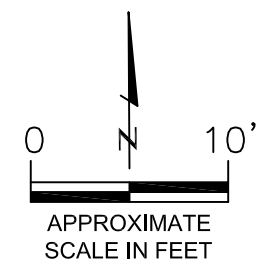
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 ENVIRONMENTAL
 CONSULTING, INC.

Source: USGS 7.5 Minute Topographic
 Map, Point of Rocks, CO Quadrangle
 2013

Figure 1



SOIL SAMPLE LOCATION
DATE
DEPTH (FEET)
B = BENZENE (mg/kg)
T = TOLUENE (mg/kg)
E = ETHYLBENZENE (mg/kg)
X = TOTAL XYLENES (mg/kg)
N = NAPHTHALENE (mg/kg)
G = TPH—GRO (mg/kg)
D = TPH—DRO (mg/kg)

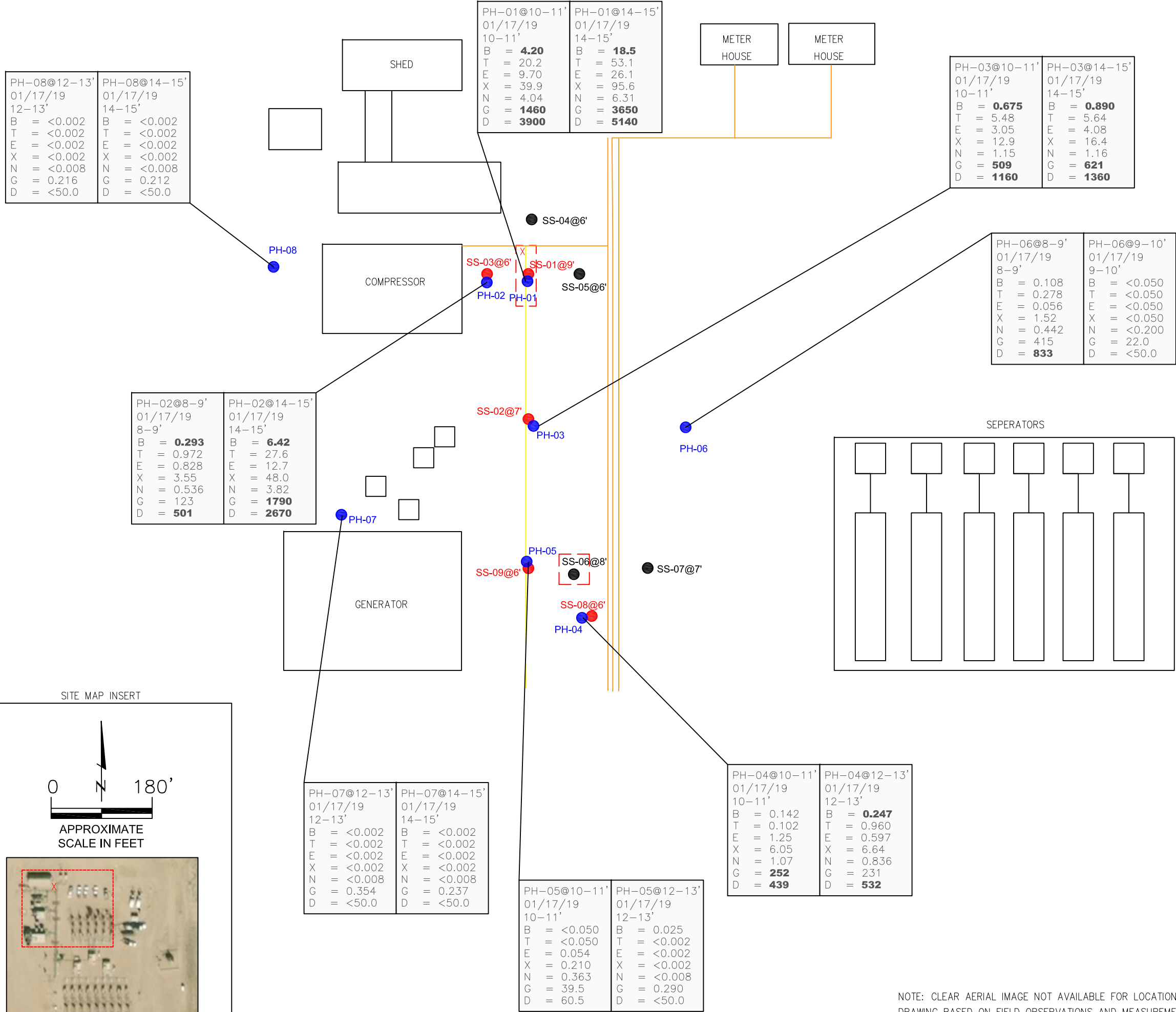
COGCC - COLORADO OIL AND GAS CONSERVATION
COMMISSION

NOTE: CLEAR AERIAL IMAGE NOT AVAILABLE FOR LOCATION.
DRAWING BASED ON FIELD OBSERVATIONS AND MEASUREMENTS



EAGLE
ENVIRONMENTAL
CONSULTING, INC.

4101 INCA STREET, DENVER, CO 80211
Ph: 303-433-0479 • F: 303-325-5449



- LEGEND**
- X APPROXIMATE RELEASE LOCATION
 - ABOVEGROUND INFRASTRUCTURE
 - APPROXIMATE UNDERGROUND (ABANDONED) LINE
 - APPROXIMATE ABOVE GROUND FLOWLINE LOCATIONS
 - APPROXIMATE SURFACING/EXCAVATION BOUNDARIES 05/09/18
 - SS-02 APPROXIMATE LOCATION OF INITIAL SOIL SAMPLES BELOW COGCC TABLE 910-1 REGULATORY LIMITS
 - SS-02 APPROXIMATE LOCATION OF INITIAL SOIL SAMPLES **ABOVE** COGCC TABLE 910-1 REGULATORY LIMITS
 - APPROXIMATE POTHOLE ASSESSMENT LOCATIONS

PARAMETERS

SOIL SAMPLE LOCATION
DATE
DEPTH (FEET)
B = BENZENE (mg/kg)
T = TOLUENE (mg/kg)
E = ETHYLBENZENE (mg/kg)
X = TOTAL XYLENES (mg/kg)
N = NAPHTHALENE (mg/kg)
G = TPH-GRO (mg/kg)
D = TPH-DRO (mg/kg)

mg/kg = MILLIGRAMS PER KILOGRAM

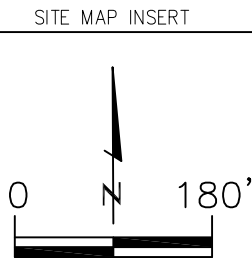
TPH-GRO = TOTAL PETROLEUM HYDROCARBONS - GASOLINE RANGE ORGANICS

TPH-DRO = TOTAL PETROLEUM HYDROCARBONS - DIESEL RANGE ORGANICS

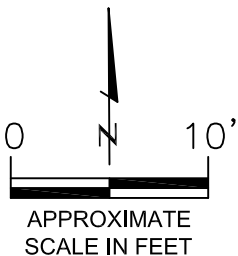
NOTE: VALUES PRESENTED WITH A LESS THAN SYMBOL (<) DID NOT CONTAIN CONCENTRATIONS AT OR ABOVE LABORATORY DETECTION LIMITS

VALUES IN **BOLD** EXCEED COGCC TABLE 910-1 REGULATORY LIMITS.

COGCC - COLORADO OIL AND GAS CONSERVATION COMMISSION



APPROXIMATE SCALE IN FEET



POTHOLE ASSESSMENT MAP
WELLS RANCH AE32 ECONODE
FLOW LINE RELEASE
40.4440 / -104.3552
SW1/4 NW1/4 SEC.32 T6N R62W 6PM
WELD COUNTY, COLORADO
REMEDATION # 12140

DATE
01/22/19

FIG. NO.
3

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amn



NOTE: CLEAR AERIAL IMAGE NOT AVAILABLE FOR LOCATION.
DRAWING BASED ON FIELD OBSERVATIONS AND MEASUREMENTS

SVE-01@22.5-25'
04/18/19
22.5-25'
B = 0.008
T = 0.011
E = <0.002
X = <0.002
N = <0.008
G = 0.215
D = <50.0

SHED

METER
HOUSE

METER
HOUSE

SVE-05@22.5-25'
04/18/19
22.5-25'
B = 0.020
T = 0.043
E = 0.010
X = 0.043
N = <0.008
G = 0.430
D = <50.0

SVE-01

COMPRESSOR

SS-03@6'
PH-02@8-9'
SS-01@9'
PH-01@10-11'
PH-01@14-15'

SVE-05

SVE-04

SEPERATORS

SVE-04@27.5-30'
04/18/19
27.5-30'
B = 0.056
T = 0.068
E = 0.011
X = 0.049
N = <0.008
G = 0.529
D = <50.0

PH-06

SS-02@7'
PH-03@10-11'
PH-03@14-15'

SVE-02
(DES)

GENERATOR

SS-09@6'
SS-08@6'
PH-04@10-11'
PH-04@12-13'

SVE-03

SVE-03@32.5-35'
04/18/19
32.5-35'
B = 0.080
T = 0.436
E = 0.236
X = 0.953
N = <0.200
G = 156
D = 32.3

LEGEND

- X APPROXIMATE RELEASE LOCATION
- ABOVEGROUND INFRASTRUCTURE
- APPROXIMATE UNDERGROUND (ABANDONED) LINE
- APPROXIMATE ABOVE GROUND FLOWLINE LOCATIONS
- APPROXIMATE SURFACING/EXCAVATION BOUNDARIES 05/09/18

SS-02 APPROXIMATE LOCATION INITIAL SOIL SAMPLES
ABOVE COGCC TABLE 910-1 REGULATORY LIMITS

APPROXIMATE SOIL VAPOR EXTRACTION (SVE)
WELL LOCATIONS

DESTROYED (DES) SVE WELL LOCATION

PARAMETERS

SOIL SAMPLE LOCATION
DATE
DEPTH (FEET)
B = BENZENE (mg/kg)
T = TOLUENE (mg/kg)
E = ETHYLBENZENE (mg/kg)
X = TOTAL XYLENES (mg/kg)
N = NAPHTHALENE (mg/kg)
G = TPH-GRO (mg/kg)
D = TPH-DRO (mg/kg)

mg/kg = MILLIGRAMS PER KILOGRAM

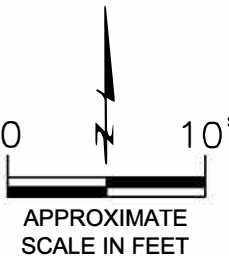
TPH-GRO = TOTAL PETROLEUM HYDROCARBONS - GASOLINE
RANGE ORGANICS

TPH-DRO = TOTAL PETROLEUM HYDROCARBONS - DIESEL
RANGE ORGANICS

NOTE: VALUES PRESENTED WITH A LESS THAN SYMBOL (<)
DID NOT CONTAIN CONCENTRATIONS AT OR ABOVE
LABORATORY DETECTION LIMITS

VALUES IN **BOLD** EXCEED COGCC TABLE 910-1 REGULATORY
LIMITS.

COCGCC - COLORADO OIL AND GAS CONSERVATION
COMMISSION



SVE SOIL ANALYTICAL MAP
WELLS RANCH AE32 ECONODE
FLOW LINE RELEASE
40.4440 / -104.3552
SW1/4 NW1/4 SEC.32 T6N R62W 6PM
WELD COUNTY, COLORADO
REMEDATION # 12140

DATE
07/19/19

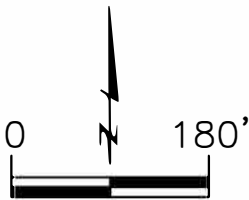
FIG.
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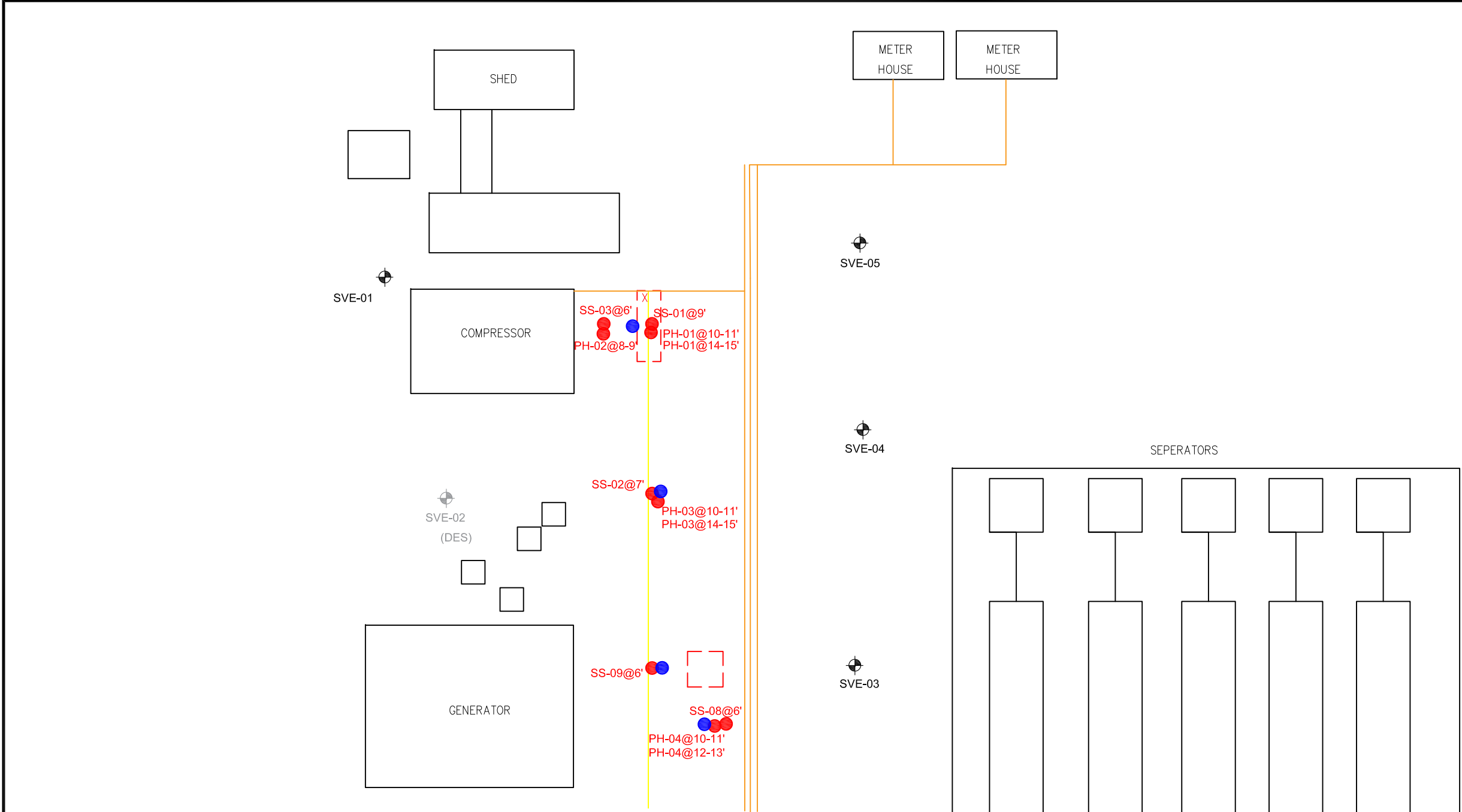
NOTE: CLEAR AERIAL IMAGE NOT AVAILABLE FOR LOCATION.
DRAWING BASED ON FIELD OBSERVATIONS AND MEASUREMENTS

SITE MAP INSERT



APPROXIMATE
SCALE IN FEET



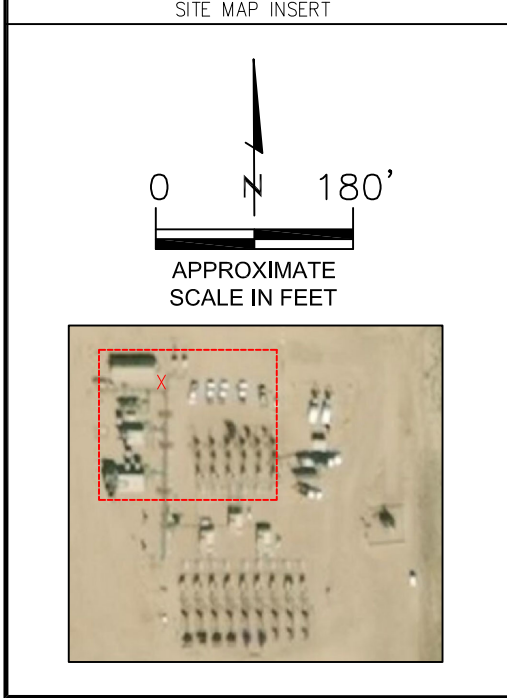


- LEGEND**
- X

APPROXIMATE RELEASE LOCATION
- ABOVEGROUND INFRASTRUCTURE
- APPROXIMATE UNDERGROUND (ABANDONED) LINE
- APPROXIMATE ABOVE GROUND FLOWLINE LOCATIONS
- - -

APPROXIMATE SURFACING/EXCAVATION BOUNDARIES 05/09/18
- SS-02

APPROXIMATE LOCATION INITIAL SOIL SAMPLES
ABOVE COGCC TABLE 910-1 REGULATORY LIMITS
- APPROXIMATE SOIL VAPOR EXTRACTION (SVE) WELL LOCATIONS
- DESTROYED (DES) SVE WELL LOCATION
- PROPOSED ASSESSMENT LOCATIONS



0

N

180'

APPROXIMATE SCALE IN FEET

0

N

10'

APPROXIMATE SCALE IN FEET

PROPOSED ASSESSMENT MAP

WELLS RANCH AE32 ECONODE

FLOW LINE RELEASE

40.4440 / -104.3552

SW1/4 NW1/4 SEC.32 T6N R62W 6PM

WELD COUNTY, COLORADO

REMEDATION # 12140

DATE

10/03/19

FIG. NO.

5

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EAGLE

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NOTE: CLEAR AERIAL IMAGE NOT AVAILABLE FOR LOCATION.
DRAWING BASED ON FIELD OBSERVATIONS AND MEASUREMENTS

TABLES

Table 1: Soil Analytical Results Summary

TABLE 1
SOIL ANALYTICAL RESULTS SUMMARY
WELLS RANCH AE 32 ECONODE
FLOW LINE RELEASE
40.4440 / -104.3552
SW1/4 NW1/4 SEC.32 T6N R62W 6PM
WELD COUNTY, COLORADO
REMEDATION # 12140

Sample Location (Latitude/Longitude)	Date	Approximate Depth (feet)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	Naphthalene (mg/kg)	TPH-GRO (mg/kg)	TPH-DRO (mg/kg)
COGCC Table 910-1 Regulatory Limits (mg/kg)			0.17	85	100	175	23	500	
SS-01 @ 9' (40.443805782 / -104.355188906)	05/09/18	9	10.1	50.5	9.35	65.6	5.27	3540	6320
SS-02 @ 7' (40.443773212 / -104.355184696)	05/09/18	7	9.80	79.0	30.3	113	5.08	3530	8080
SS-03 @ 6' (40.443814348 / -104.355200477)	05/09/18	6	19.6	90.0	30.0	115	5.97	3520	6090
SS-04 @ 6' (40.443824696 / -104.355188227)	05/09/18	6	0.006	<0.002	<0.002	<0.002	<0.007	<0.200	<50.0
SS-05 @ 6' (40.443805372 / -104.355171177)	05/09/18	6	0.005	0.002	<0.002	<0.002	<0.007	0.235	<50.0
SS-06 @ 8' (40.443726401 / -104.355189284)	05/09/18	8	<0.050	<0.050	<0.050	<0.050	<0.175	14.0	<50.0
SS-07 @ 7' (40.433725717 / -104.355170263)	05/09/18	7	<0.050	<0.050	<0.050	<0.050	<0.175	<5.00	<50.0
SS-08 @ 6' (40.44372107 / -104.355188625)	05/09/18	6	18.8	64.9	20.4	71.2	4.05	3130	5150
SS-09 @ 6' (40.443726389 / -104.35520129)	05/09/18	6	3.91	26.2	9.79	35.7	2.31	1710	2280
PH-01 @ 10-11' (40.443805782 / -104.355188906)	01/17/19	10-11.0	4.20	20.2	9.70	39.9	4.04	1460	3900
PH-01 @ 14-15' (40.443805782 / -104.355188906)	01/17/19	14-15.0	18.5	53.1	26.1	95.6	6.31	3650	5140
PH-02 @ 8-9' (40.443814348 / -104.355200477)	01/17/19	8-9.0	0.293	0.972	0.828	3.55	0.536	123	501
PH-02 @ 14-15' (40.443814348 / -104.355200477)	01/17/19	14-15.0	6.42	27.6	12.7	48.0	3.82	1790	2670
PH-03 @ 10-11' (40.443773212 / -104.355184696)	01/17/19	10-11.0	0.675	5.48	3.05	12.9	1.15	509	1160
PH-03 @ 14-15' (40.443773212 / -104.355184696)	01/17/19	14-15.0	0.890	5.64	4.08	16.4	1.16	621	1360



TABLE 1
SOIL ANALYTICAL RESULTS SUMMARY
WELLS RANCH AE 32 ECONODE
FLOW LINE RELEASE
40.4440 / -104.3552
SW1/4 NW1/4 SEC.32 T6N R62W 6PM
WELD COUNTY, COLORADO
REMEDATION # 12140

Sample Location (Latitude/Longitude)	Date	Approximate Depth (feet)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	Naphthalene (mg/kg)	TPH-GRO (mg/kg)	TPH-DRO (mg/kg)
COGCC Table 910-1 Regulatory Limits (mg/kg)			0.17	85	100	175	23	500	
PH-04 @ 10-11' (40.44372107 / -104.355188625)	01/17/19	10-11.0	0.142	0.102	1.25	6.05	1.07	252	439
PH-04 @ 12-13' (40.44372107 / -104.355188625)	01/17/19	12-13.0	0.247	0.960	0.597	6.64	0.836	231	532
PH-05 @ 10-11' (40.443726389 / -104.35520129)	01/17/19	10-11.0	<0.050	<0.050	0.054	0.210	0.363	39.5	60.5
PH-05 @ 12-13' (40.443726389 / -104.35520129)	01/17/19	12-13.0	0.025	<0.002	<0.002	<0.002	<0.008	0.290	<50.0
PH-06 @ 8-9' (40.443770362 / -104.355141909)	01/17/19	8-9.0	0.108	0.278	0.056	1.52	0.442	415	833
PH-06 @ 9-10' (40.443770362 / -104.355141909)	01/17/19	9-10.0	<0.050	<0.050	<0.050	<0.050	<0.200	22.0	<50.0
PH-07 @ 12-13' (40.443700479 / -104.355307349)	01/17/19	12-13.0	<0.002	<0.002	<0.002	<0.002	<0.008	0.354	<50.0
PH-07 @ 14-15' (40.443700479 / -104.355307349)	01/17/19	14-15.0	<0.002	<0.002	<0.002	<0.002	<0.008	0.237	<50.0
PH-08 @ 12-13' (40.443807778 / -104.355334288)	01/17/19	12-13.0	<0.002	<0.002	<0.002	<0.002	<0.008	0.216	<50.0
PH-08 @ 14-15' (40.443807778 / -104.355334288)	01/17/19	14-15.0	<0.002	<0.002	<0.002	<0.002	<0.008	0.212	<50.0



TABLE 1
SOIL ANALYTICAL RESULTS SUMMARY
WELLS RANCH AE 32 ECONODE
FLOW LINE RELEASE
40.4440 / -104.3552
SW1/4 NW1/4 SEC.32 T6N R62W 6PM
WELD COUNTY, COLORADO
REMEDATION # 12140

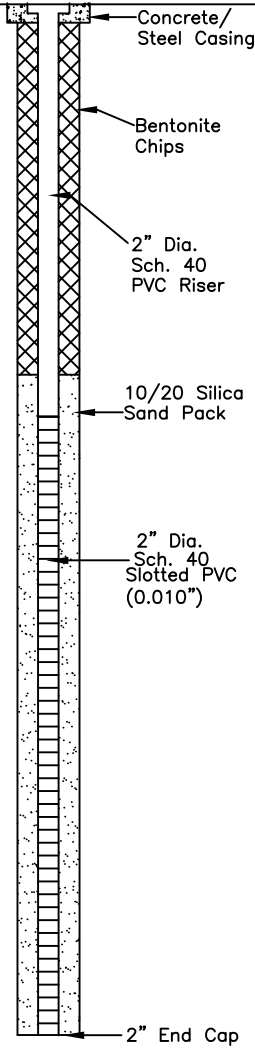
Sample Location (Latitude/Longitude)	Date	Approximate Depth (feet)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	Naphthalene (mg/kg)	TPH-GRO (mg/kg)	TPH-DRO (mg/kg)
COGCC Table 910-1 Regulatory Limits (mg/kg)			0.17	85	100	175	23	500	
SVE-01 @ 22.5-25' (40.443818606 / -104.355400044)	04/18/19	22.5-25	0.008	0.011	<0.002	<0.002	<0.008	0.215	<50.0
SVE-02 @ 22.5-25' (40.44378147 / -104.355358707)	04/18/19	22.5-25	0.012	0.011	<0.002	<0.002	<0.008	0.206	<50.0
SVE-03 @ 32.5-35' (40.443722223 / -104.35511743)	04/18/19	32.5-35	0.080	0.436	0.236	0.953	<0.200	156	32.3
SVE-04 @ 27.5-30' (40.443775392 / -104.355115091)	04/18/19	27.5-30	0.056	0.068	0.011	0.049	<0.008	0.529	<50.0
SVE-05 @ 22.5-25' (40.443845101 / -104.355110051)	04/18/19	22.5-25	0.020	0.043	0.010	0.043	<0.008	0.430	<50.0
COGCC = Colorado Oil and Gas Conservation Commission mg/kg = milligrams per kilogram TPH-GRO = Total Petroleum Hydrocarbons - Gasoline Range Organics TPH-DRO = Total Petroleum Hydrocarbons - Diesel Range Organics Note: Values presented with a less than symbol (<) did not contain concentrations at or above the laboratory reporting limit. Note: Values presented in BOLD contained concentrations exceeding COGCC Table 910-1 Regulatory Limits									

ATTACHMENT A

Soil Boring Logs/Well Completion Diagrams

Boring Log/Well Completion Diagram: SVE-01

PAGE 1 OF 1

DEPTH (FT)	LITHOLOGY	SAMPLE				OVM/OVA (PPM)	BLOW COUNT (per 0.5 FT)	DEPTH (FT)	WELL CONSTRUCTION DETAIL	COMMENTS
	DESCRIPTION	GRAPHIC LOG	TYPE	NUMBER	RECOVERY %					
0	(0-7') Potholed								 <p>Concrete/ Steel Casing</p> <p>Bentonite Chips</p> <p>2" Dia. Sch. 40 PVC Riser</p> <p>10/20 Silica Sand Pack</p> <p>2" Dia. Sch. 40 Slotted PVC (0.010")</p> <p>2" End Cap</p>	
5			PH							
10	(7-17') SAND - light brown, moderately moist, medium dense, rounded, very fine grained, poorly graded, N/O, N/S		DP	1	50	18.8 10.3	N/A			
15			SP	2	100	19.2 10.7	N/A			
20	(17-25') sandy CLAY - dark brown, dry, stiff to very stiff, low plasticity, moderately graded with <10% fine sand, N/O, N/S		DP	3	100	2.5 7.1	N/A			
25			CL	4	100	9.2 8.8	N/A			
30	BoB @ 25'									

DP - Direct Push
HC - Hydrocarbon
BoB - Bottom of Boring
N/O - no odor
N/S - no staining
TOC - top of casing
bgs - below ground surface

START/COMPLETION DATE: 04/18/2019

SAND PACK INTERVAL (FEET): 9-25

PROJECT: WELLS RANCH A32E ECONODE

BENTONITE/GROUT INTERVAL (FEET): 0-9

LOGGED BY: L. GATES

WELL SCREEN INTERVAL (FEET): 10-25

DRILLING COMPANY/EQUIPMENT: EAGLE/GEOPROBE

WELL DIAMETER (INCHES): 2

BORING DEPTH (FEET): 25'

WELL DEPTH (FEET): 25'

PID INSTRUMENT: MiniRAE 3000 - PID #9

TIME STARTED/COMPLETED: 1130/1230

SAMPLE COLLECTION DEPTH (FEET)/TIME: 22.5-25' / 1200



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Boring Log/Well Completion Diagram: SVE-02

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DEPTH (FT)	LITHOLOGY	SAMPLE				OVM/OVA (PPM)	BLOW COUNT (per 0.5 FT)	DEPTH (FT)	WELL CONSTRUCTION DETAIL	COMMENTS
	DESCRIPTION	GRAPHIC LOG	TYPE	NUMBER	RECOVERY %					
0	(0-7') Potholed									
5			PH					5		
10	(7-17') SAND - light brown, moderately moist, medium dense, rounded, very fine grained, poorly graded, N/O, N/S		DP	1	50	2.3 3.2	N/A	10		
15			SP	2	100	27.7 24.0	N/A	15		
20	(17-25') CLAY - brown, dry, hard, low plasticity, poorly graded, N/O, N/S		DP	3	100	45.0 112.4	N/A	20		
25			CL	4	100	100.3 59.1	N/A	25		
30	BoB @ 25'									

DP - Direct Push
 HC - Hydrocarbon
 BoB - Bottom of Boring
 N/O - no odor
 N/S - no staining
 TOC - top of casing
 bgs - below ground surface

START/COMPLETION DATE: 04/18/2019

SAND PACK INTERVAL (FEET): 9-25

PROJECT: WELLS RANCH A32E ECONODE

BENTONITE/GROUT INTERVAL (FEET): 0-9

LOGGED BY: L. GATES

WELL SCREEN INTERVAL (FEET): 10-25

DRILLING COMPANY/EQUIPMENT: EAGLE/GEOPROBE

WELL DIAMETER (INCHES): 2

BORING DEPTH (FEET): 25'

WELL DEPTH (FEET): 25'

PID INSTRUMENT: MiniRAE 3000 - PID #9

TIME STARTED/COMPLETED: 1020/1130

SAMPLE COLLECTION DEPTH (FEET)/TIME: 22.5-25' / 1107



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Boring Log/Well Completion Diagram: SVE-03

PAGE 1 OF 2

DEPTH (FT)	LITHOLOGY	SAMPLE				OVM/OVA (PPM)	BLOW COUNT (per 0.5 FT)	DEPTH (FT)	WELL CONSTRUCTION DETAIL	COMMENTS
	DESCRIPTION	GRAPHIC LOG	TYPE	NUMBER	RECOVERY %					
0	(0-7') Potholed		PH						Concrete/ Steel Casing	
5								5	Bentonite Chips	
7-13'	silty SAND - brown, moderately moist, medium dense to dense, sub-angular, fine grained, moderately graded with ~10-15% silt, N/O, N/S		DP	1	100	28.8 25.1	N/A		2" Dia. Sch. 40 PVC Riser	
10		SM						10		
13-18'	silty CLAY - brown, moderately moist to moist, stiff, low to moderate plasticity, moderately graded with ~20-30% silt, N/O, N/S		DP	2	100	29.8 88.4	N/A			
15		CL						15	10/20 Silica Sand Pack	
18-30'	SAND - yellow/brown, moist, loose to very loose, sub-angular, fine grained, poorly graded, no staining, strong hydrocarbon odor		DP	3	100	66.4 635.3	N/A			
20			DP	4	100	930.4	N/A	20	2" Dia. Sch. 40 Slotted PVC (0.010")	
25	@ 24-25' - CLAY lens	SP						25		
			DP	5	100	546.9	N/A			
			DP	6	100	848.1	N/A			
			DP	7	100	721.2	N/A			

DP - Direct Push
HC - Hydrocarbon
BoB - Bottom of Boring
N/O - no odor
N/S - no staining
TOC - top of casing
bgs - below ground
surface

START/COMPLETION DATE: 04/18/2019

SAND PACK INTERVAL (FEET): 14-35

PROJECT: WELLS RANCH A32E ECONODE

BENTONITE/GROUT INTERVAL (FEET): 0-14

LOGGED BY: L. GATES

WELL SCREEN INTERVAL (FEET): 15-35

DRILLING COMPANY/EQUIPMENT: EAGLE/GEOPROBE

WELL DIAMETER (INCHES): 2

BORING DEPTH (FEET): 35'

WELL DEPTH (FEET): 35'

PID INSTRUMENT: MiniRAE 3000 - PID #9

TIME STARTED/COMPLETED: 1300/1445

SAMPLE COLLECTION DEPTH (FEET)/TIME: 32.5-35' / 1415

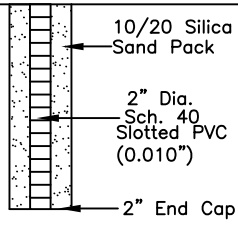


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Boring Log/Well Completion Diagram: SVE-03

PAGE 2 OF 2

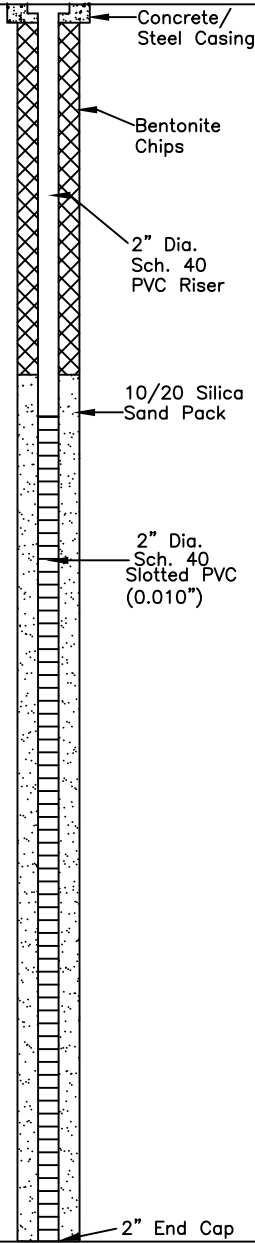
DEPTH (FT)	LITHOLOGY	SAMPLE				OVM/OVA (PPM)	BLOW COUNT (per 0.5 FT)	DEPTH (FT)	WELL CONSTRUCTION DETAIL	COMMENTS
	DESCRIPTION	GRAPHIC LOG	TYPE	NUMBER	RECOVERY %					
30	(30-35') silty CLAY - brown, dry, hard, low plasticity, moderately graded with ~20-30% silt, slight odor, no staining	CL	DP	8	100	488.0	N/A			
35			DP	9	100	32.9	N/A			
35	BoB @ 35'							35		DP - Direct Push HC - Hydrocarbon BoB - Bottom of Boring N/O - no odor N/S - no staining TOC - top of casing bgs - below ground surface
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START/COMPLETION DATE: 04/18/2019		SAND PACK INTERVAL (FEET): 14–35	
PROJECT: WELLS RANCH A32E ECONODE		BENTONITE/GROUT INTERVAL (FEET): 0–14	
LOGGED BY: L. GATES		WELL SCREEN INTERVAL (FEET): 15–35	
DRILLING COMPANY/EQUIPMENT: EAGLE/GEOPROBE		WELL DIAMETER (INCHES): 2	
BORING DEPTH (FEET): 35'	WELL DEPTH (FEET): 35'	 <div>EAGLE ENVIRONMENTAL CONSULTING, INC. 4101 INCA STREET, DENVER, CO 80211 Ph: 303-433-0479 • F: 303-325-5449</div>	
PID INSTRUMENT: MiniRAE 3000 – PID #9			
TIME STARTED/COMPLETED: 1300/1445			
SAMPLE COLLECTION DEPTH (FEET)/TIME: 32.5–35' / 1415			

Boring Log/Well Completion Diagram: SVE-04

PAGE 1 OF 1

DEPTH (FT)	LITHOLOGY	SAMPLE				OVM/OVA (PPM)	BLOW COUNT (per 0.5 FT)	DEPTH (FT)	WELL CONSTRUCTION DETAIL	COMMENTS
	DESCRIPTION	GRAPHIC LOG	TYPE	NUMBER	RECOVERY %					
0	(0-7') Potholed								 <p>Concrete/ Steel Casing</p> <p>Bentonite Chips</p> <p>2" Dia. Sch. 40 PVC Riser</p> <p>10/20 Silica Sand Pack</p> <p>2" Dia. Sch. 40 Slotted PVC (0.010")</p> <p>2" End Cap</p>	
5			PH					5		
10	(7-14') SAND - light brown, moderately moist, medium dense, rounded, very fine grained, poorly graded, N/O, N/S		DP	1	50	13.7	N/A	10		
		SP				40.2	N/A			
			DP	2	100	863.8	N/A			
15	(14-30') silty CLAY - dark brown, dry, very stiff, low plasticity, moderately graded with ~15-30% silt, N/S					765.2	N/A	15		
			DP	3	100	641.4	N/A			
20	@ 18-25' - strong odor		DP	4	100	445.1	N/A	20		
		CL				1215	N/A			
			DP	5	100	1215	N/A			
25	@25' - slight odor		DP	6	100	120.7	N/A	25		
			DP	7	100	12.1	N/A			
30	BoB @ 30'									DP - Direct Push HC - Hydrocarbon BoB - Bottom of Boring N/O - no odor N/S - no staining TOC - top of casing bgs - below ground surface

START/COMPLETION DATE: 04/18/2019

SAND PACK INTERVAL (FEET): 9-30

PROJECT: WELLS RANCH A32E ECONODE

BENTONITE/GROUT INTERVAL (FEET): 0-9

LOGGED BY: L. GATES

WELL SCREEN INTERVAL (FEET): 10-30

DRILLING COMPANY/EQUIPMENT: EAGLE/GEOPROBE

WELL DIAMETER (INCHES): 2

BORING DEPTH (FEET): 30'

WELL DEPTH (FEET): 30'

PID INSTRUMENT: MiniRAE 3000 - PID #9

TIME STARTED/COMPLETED: 1445/1540

SAMPLE COLLECTION DEPTH (FEET)/TIME: 27.5-30' / 1525

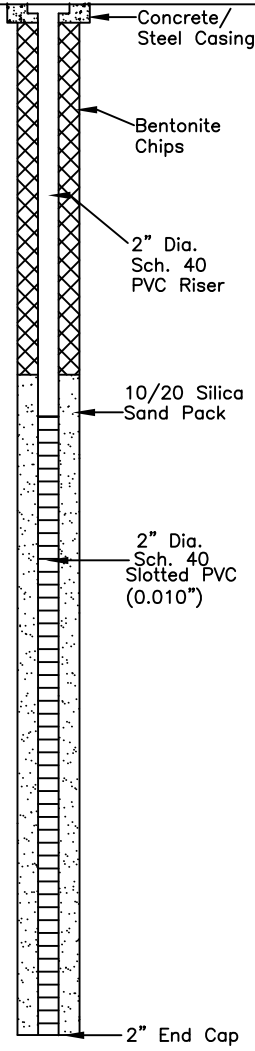


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Boring Log/Well Completion Diagram: SVE-05

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DEPTH (FT)	LITHOLOGY	SAMPLE				OVM/OVA (PPM)	BLOW COUNT (per 0.5 FT)	DEPTH (FT)	WELL CONSTRUCTION DETAIL	COMMENTS
	DESCRIPTION	GRAPHIC LOG	TYPE	NUMBER	RECOVERY %					
0	(0-7') Potholed								 <p>Concrete/ Steel Casing</p> <p>Bentonite Chips</p> <p>2" Dia. Sch. 40 PVC Riser</p> <p>10/20 Silica Sand Pack</p> <p>2" Dia. Sch. 40 Slotted PVC (0.010")</p> <p>2" End Cap</p>	
5			PH							
7	(7-13') SAND - light brown, moderately moist, medium dense, rounded, fine to very fine grained, poorly graded, N/O, N/S									
10		SP	DP	1	100	12.1	N/A			
13						34.4				
15	(13-25') silty CLAY - dark brown, dry, very stiff, low plasticity, moderately graded ~with 15-30% silt, N/O, N/S		DP	2	100	55.0	N/A			
18						98.1				
20		CL	DP	3	100	123.0	N/A			
23										
25			DP	4	100	97.2	N/A			
28										
30			DP	5	100	55.9	N/A			
30	BoB @ 25'									DP - Direct Push HC - Hydrocarbon BoB - Bottom of Boring N/O - no odor N/S - no staining TOC - top of casing bgs - below ground surface

START/COMPLETION DATE: 04/18/2019

SAND PACK INTERVAL (FEET): 9-25

PROJECT: WELLS RANCH A32E ECONODE

BENTONITE/GROUT INTERVAL (FEET): 0-9

LOGGED BY: L. GATES

WELL SCREEN INTERVAL (FEET): 10-25

DRILLING COMPANY/EQUIPMENT: EAGLE/GEOPROBE

WELL DIAMETER (INCHES): 2

BORING DEPTH (FEET): 25'

WELL DEPTH (FEET): 25'

PID INSTRUMENT: MiniRAE 3000 - PID #9

TIME STARTED/COMPLETED: 1540/1615

SAMPLE COLLECTION DEPTH (FEET)/TIME: 22.5-25' / 1610



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