

April 1, 2019

Mr. Cory Smith  
Environmental Specialist  
New Mexico Oil Conservation Division  
1000 Rio Brazos  
Aztec, New Mexico 87410

OCD RCVD 4/2/19



**RE: Remediation Work Plan  
OH Randel #5, API #30-045-05964  
Hilcorp Energy Company  
San Juan County, New Mexico**

Dear Mr. Smith:

LT Environmental, Inc. (LTE), on behalf of Hilcorp Energy Company (Hilcorp), is submitting this remediation work plan associated with subsurface petroleum hydrocarbon impacts encountered at the OH Randel #5 natural gas production well (Site). The Site located on Navajo tribal land approximately 2.65 miles west of United States Highway 550 in San Juan County, New Mexico, in Unit D of Section 10, Township 26 North and Range 11 West (Figure 1).

This remediation work plan is being submitted in response to the February 27, 2019 rejection of the *Delineation Report and Remedial Alternative Evaluation* submitted on January 21, 2019. The full site history, characterization, and delineation of hydrocarbon impacts to soil were described in the *Delineation Report and Remedial Alternative Evaluation*. This remediation work plan was prepared to address the primary concern characterized by the New Mexico Oil Conservation Department (NMOCD) as high levels of benzene, toluene, ethylbenzene, and xylenes (BTEX) constituents that are extensively distributed, soluble, and highly mobile.

### **PROPOSED CLOSURE SAMPLING**

As detailed in the *Delineation Report and Remedial Alternative Evaluation*, three separate source areas attributed to separate releases have been identified within two areas of the Site: a recent production tank release (the Primary Source) and an underlying historical release (the Secondary Source) on the western side of the Site and a more extensive historical release on the eastern side of the Site (Tertiary Source). The source areas were distinguished based on concentrations of contaminants of concern and geometry of the impacted soil. The western area is under the production tank and the Primary and Secondary sources are differentiated vertically. Higher concentrations of benzene and BTEX were observed in the eastern area of the Site compared to the western area under the production tank (Figure 2). Additionally, the presence of total petroleum hydrocarbons (TPH) exceeding the NMOCD remediation action levels in the eastern area suggests a separate source signature for the Tertiary Source.

## Smith, Cory, EMNRD

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**From:** Smith, Cory, EMNRD  
**Sent:** Friday, April 19, 2019 10:17 AM  
**To:** 'Clara Cardoza'  
**Cc:** Ashley Ager; Matt Henderson; Devin Hencmann  
**Subject:** RE: [EXTERNAL] RE: OH Randel #5 Delineation and Variance Request

Clara,

OCD approves the remediation plan with the following conditions

- HEC will either add or move a proposed borehole to be near the release location as depicted in figure #2.
- HEC will notify OCD at least 48 hours prior to the collection of confirmation samples.

The exact location of closure bore holes can be discussed onsite if needed.

Thanks,

Cory Smith  
Environmental Specialist  
Oil Conservation Division  
Energy, Minerals, & Natural Resources  
1000 Rio Brazos, Aztec, NM 87410  
(505)334-6178 ext 115  
[cory.smith@state.nm.us](mailto:cory.smith@state.nm.us)

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**From:** Clara Cardoza <[ccardoza@hilcorp.com](mailto:ccardoza@hilcorp.com)>  
**Sent:** Monday, April 1, 2019 1:42 PM  
**To:** Smith, Cory, EMNRD <[Cory.Smith@state.nm.us](mailto:Cory.Smith@state.nm.us)>  
**Cc:** Ashley Ager <[aager@ltenv.com](mailto:aager@ltenv.com)>; Matt Henderson <[mhenderson@hilcorp.com](mailto:mhenderson@hilcorp.com)>; Devin Hencmann <[dhencmann@ltenv.com](mailto:dhencmann@ltenv.com)>  
**Subject:** [EXT] RE: [EXTERNAL] RE: OH Randel #5 Delineation and Variance Request

Cory, attached please find Hilcorp Energy's proposed remediation plan. I will hand deliver a hard copy this afternoon. Please let us know if you have any questions or concerns.

Thank you,  
Clara

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**From:** Smith, Cory, EMNRD [<mailto:Cory.Smith@state.nm.us>]  
**Sent:** Wednesday, February 27, 2019 3:11 PM  
**To:** Clara Cardoza <[ccardoza@hilcorp.com](mailto:ccardoza@hilcorp.com)>  
**Cc:** Ashley Ager <[aager@ltenv.com](mailto:aager@ltenv.com)>; Matt Henderson <[mhenderson@hilcorp.com](mailto:mhenderson@hilcorp.com)>; Devin Hencmann <[dhencmann@ltenv.com](mailto:dhencmann@ltenv.com)>  
**Subject:** [EXTERNAL] RE: OH Randel #5 Delineation and Variance Request

Clara,

OCD has reviewed the Delineation and Variance Request for the OH Randel # 5 received on February 1, 2019. After Review the OCD has denied HilCorp variance request to leave the impacted material in place. The Primary concern is the impacted mass is very large and contains high levels of BTEX constituents which are soluble and highly mobile. The mass is deep enough that natural biodegradation will not be very effective and will take an extremely large amount of time due to the eventual anaerobic environment caused by biodegradation.

The delineation report and variance request will be scanned into the well file asap.

Please submit to the OCD no later than April 1, 2019 HilCorps proposed remediation plan to include time lines.

Cory Smith  
Environmental Specialist  
Oil Conservation Division  
Energy, Minerals, & Natural Resources  
1000 Rio Brazos, Aztec, NM 87410  
(505)334-6178 ext 115  
[cory.smith@state.nm.us](mailto:cory.smith@state.nm.us)

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**From:** Devin Hencmann <[dhencmann@ltenv.com](mailto:dhencmann@ltenv.com)>  
**Sent:** Thursday, January 31, 2019 1:45 PM  
**To:** Smith, Cory, EMNRD <[Cory.Smith@state.nm.us](mailto:Cory.Smith@state.nm.us)>  
**Cc:** Ashley Ager <[aager@ltenv.com](mailto:aager@ltenv.com)>; Clara Cardoza <[ccardoza@hilcorp.com](mailto:ccardoza@hilcorp.com)>; Matt Henderson <[mhenderson@hilcorp.com](mailto:mhenderson@hilcorp.com)>  
**Subject:** [EXT] OH Randel #5 Delineation and Variance Request

Cory,

Please see the attached Delineation and Variance Request Report for the OH Randel#5.

Please let me know if you have any questions.

Thank you,  
Devin



Devin Hencmann  
Project Geologist  
(970) 385-1096 office  
(970) 403-6023 cell  
848 East 2<sup>nd</sup> Avenue, Durango CO 81301  
[www.ltenv.com](http://www.ltenv.com)



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An original soil vapor extraction (SVE) system was installed to target the most recent release from the production tank. It is likely that this SVE system has addressed impact to soil identified in the western area. LTE proposes to utilize a hollow stem auger drill rig to advance 3 delineation/confirmation boreholes to 30 feet below ground surface (bgs) in the Primary and Secondary source areas to evaluate remediation with confirmation closure samples.

Boreholes will be positioned to supplement existing soil data. One borehole will be advanced near former borehole HA-2 to complete lateral delineation on the western extent of impact. Two additional boreholes will be advanced near SVE-2 and SVE-5 to collect soil samples to confirm that the soil vapor extraction (SVE) system has remediated impacted soil in the Primary and Secondary source. Should confirmation samples indicate additional remediation is necessary, Hilcorp will add additional SVE wells as described in the subsequent sections of this work plan. The proposed boring locations are illustrated on Figure 2.

Continuous soil samples will be logged by an LTE geologist and described using the Unified Soil Classification System (USCS). The intervals from immediately beneath the ground surface to 10 feet bgs and then every five-foot interval thereafter will be composited and screened for volatile aromatic hydrocarbons. Soil with the highest field screening results and from the bottom of each soil boring will be collected for laboratory analysis of BTEX and total petroleum hydrocarbons (TPH) gasoline range organics (GRO), diesel range organics (DRO), and motor oil range organics (MRO).

## PROPOSED REMEDIATION PLAN

Results from previous delineation activities as well as a site map detailing the vertical and horizontal extents of identified hydrocarbon impacts were presented in the previously submitted *Delineation Report and Remedial Alternative Evaluation*.

The estimated volume of BTEX impacted soil above standards is:

- Primary and Secondary sources 330 cubic yards; and
- Tertiary source 7,455 cubic yards.

SVE has been remediating the Primary and Secondary sources. SVE is proposed to remediate the Tertiary Source. SVE technology remediates petroleum hydrocarbon impacts *in situ* by applying a vacuum to wells drilled into the impacted area. The applied vacuum initiates air flow from the subsurface and into the SVE wells. The subsurface air flow enhances petroleum hydrocarbon volatilization and the vapors are pulled out by a blower/vacuum pump on the surface. The removed petroleum hydrocarbons are typically emitted directly into the atmosphere unless air permitting thresholds or sensitive receptors require air treatment with petroleum hydrocarbon removal.



Wells are drilled into the subsurface and screened to provide air flow evenly throughout the subsurface. When determining the number of wells and screen intervals, heterogeneities in the geology are considered to prevent air being pulled only through the most permeable zones. SVE systems typically operate for 1 to 10 years until cleanup is obtained. Geology can be too tight to allow airflow and, in such cases, SVE is not feasible.

The current SVE system includes 7 SVE wells designed to treat the Primary and Secondary sources and 5 SVE wells to treat the shallow (<40 feet bgs) Tertiary Source impacts. System startup occurred on August 11, 2016 and approximately 7.1 tons of total volatile petroleum hydrocarbons (TVPH) have been removed since startup on August 11, 2016 to August 17, 2018. The system was installed in phases as assessments indicated soil impacts requiring remediation. Information on the system and operations can be found in the *LTE Summary Report and Delineation Work Plan* dated September 7, 2018.

To influence and remediate the remaining Tertiary Source LTE initially proposes installation of 19 additional SVE wells. 18 of those SVE wells will be co-installed in 9 borings for a nested configuration. Each nested well will contain 15 feet of screen that will be separated from the other well inside the boring with a bentonite grout mixture to prevent short circuiting. The nested configuration will allow greater operational adjustments and ensure influence throughout the entire impacted interval. Operating these additional SVE wells will likely require a blower with higher vacuum and flow capabilities than the current 1 horsepower motor. LTE proposes utilizing the existing system to conduct a pilot test to determine what vacuum and flow is necessary to influence the impacted zones. The system will be expanded with an additional blower if deemed necessary via the pilot test. The configuration and number of SVE wells to be installed will be adjusted based on the results of the pilot test and evaluation of blower needs. It is anticipated that the SVE system would operate for an additional 2 years to remediate the remaining source areas. Periodic operation and maintenance (O&M) will be conducted on the system to measure hydrocarbon recovery and to make system adjustments to maximize hydrocarbon recovery rates. A timeline of proposed activities is included in the following section.

## TIMELINE

The following timeline is proposed with day 0 being the day this workplan receives approval.

- 1 month –Closure evaluation sampling of the Primary and Secondary source, and installation of four SVE wells (four nested in two borings) for pilot test;
- 2 months – Pilot test of SVE wells to specify equipment and begin operation of SVE wells with existing system;
- 3 months – Submittal of pilot test report;
- 4 months – Begin installation of additional SVE wells;
- 6 months – Begin operation of SVE wells with new SVE system (if deemed necessary);





- 1 year and 7 months – Soil confirmation sampling to determine system effectiveness and additional system operation if necessary;
- 2 years and 7 months – Additional soil confirmation sampling (if necessary) and site closure.

Quarterly reporting will be conducted after installation of the SVE system to keep the NMOCD informed on major site advancements and SVE system operations. Quarterly reports will document hydrocarbon mass recovery, system runtime, and gas sample analysis. An annual gas sample will be collected from the influent SVE system and submitted for analysis of full volatile organic compounds (VOCs) by United States Environmental Protection Agency Method 8260.

We look forward to your review of this report and subsequent approval of the remediation approach. If you have any questions or comments, please do not hesitate to contact Ashley Ager at (970) 385-1096 or [aager@ltenv.com](mailto:aager@ltenv.com).

Sincerely,

LT ENVIRONMENTAL, INC.

A handwritten signature in black ink, appearing to read 'Devin Hencmann'.

Devin Hencmann  
Project Geologist

A handwritten signature in black ink, appearing to read 'Ashley L. Ager'.

Ashley L. Ager, P.G.  
Senior Geologist

cc: Clara Cardoza, Hilcorp

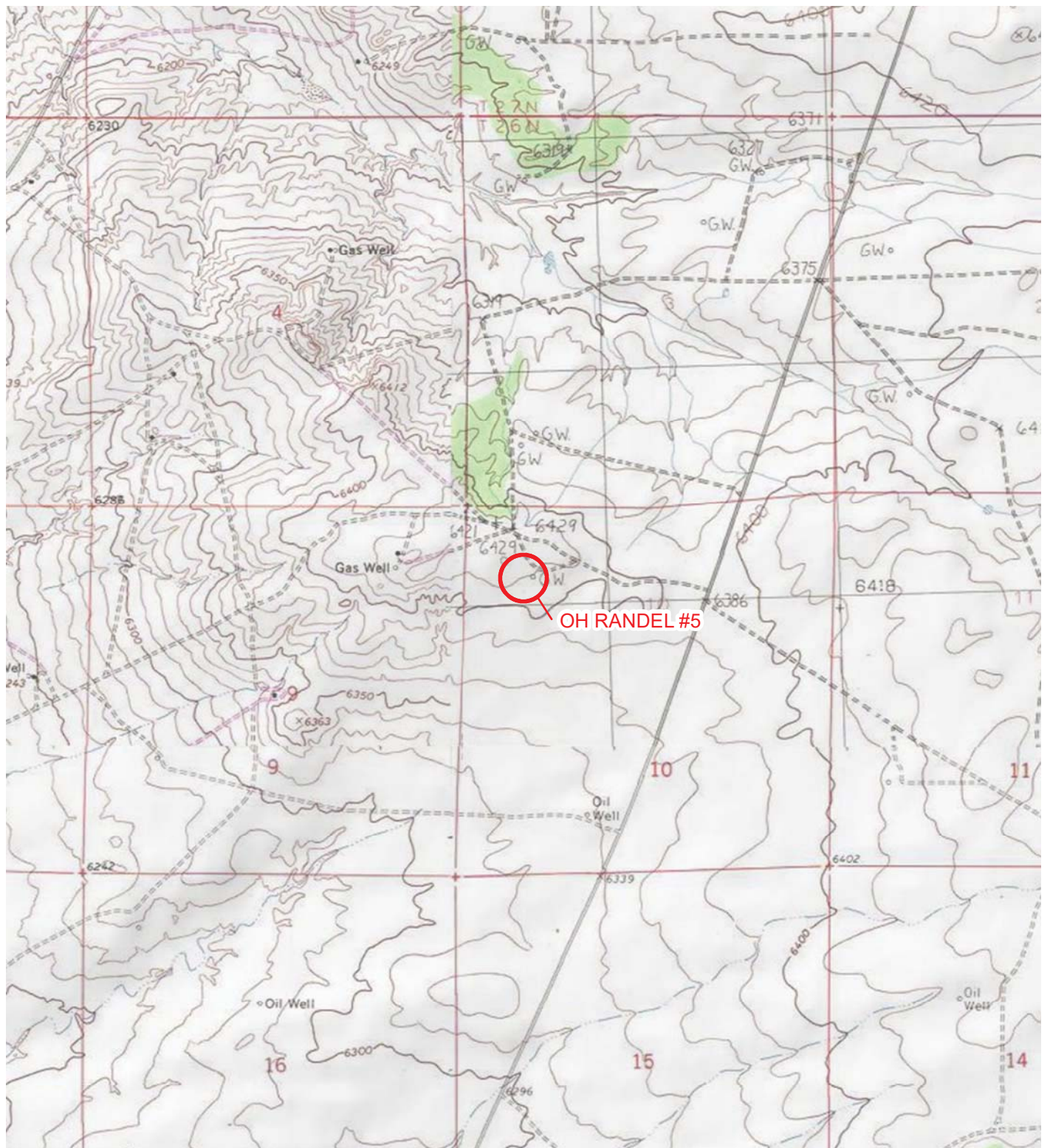
Attachments:

- |          |                               |
|----------|-------------------------------|
| Figure 1 | Site Location Map             |
| Figure 2 | Proposed Sampling Map         |
| Figure 3 | Initially Proposed SVE Layout |









# LEGEND

○ SITE LOCATION



NEW MEXICO

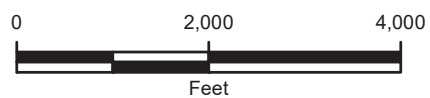


IMAGE COURTESY OF ESRI/USGS

**FIGURE 1**  
**SITE LOCATION MAP**  
**OH RANDEL #5**  
**NWNW SEC 10 T26N R11W**  
**SAN JUAN COUNTY, NEW MEXICO**  
**HILCORP ENERGY COMPANY**





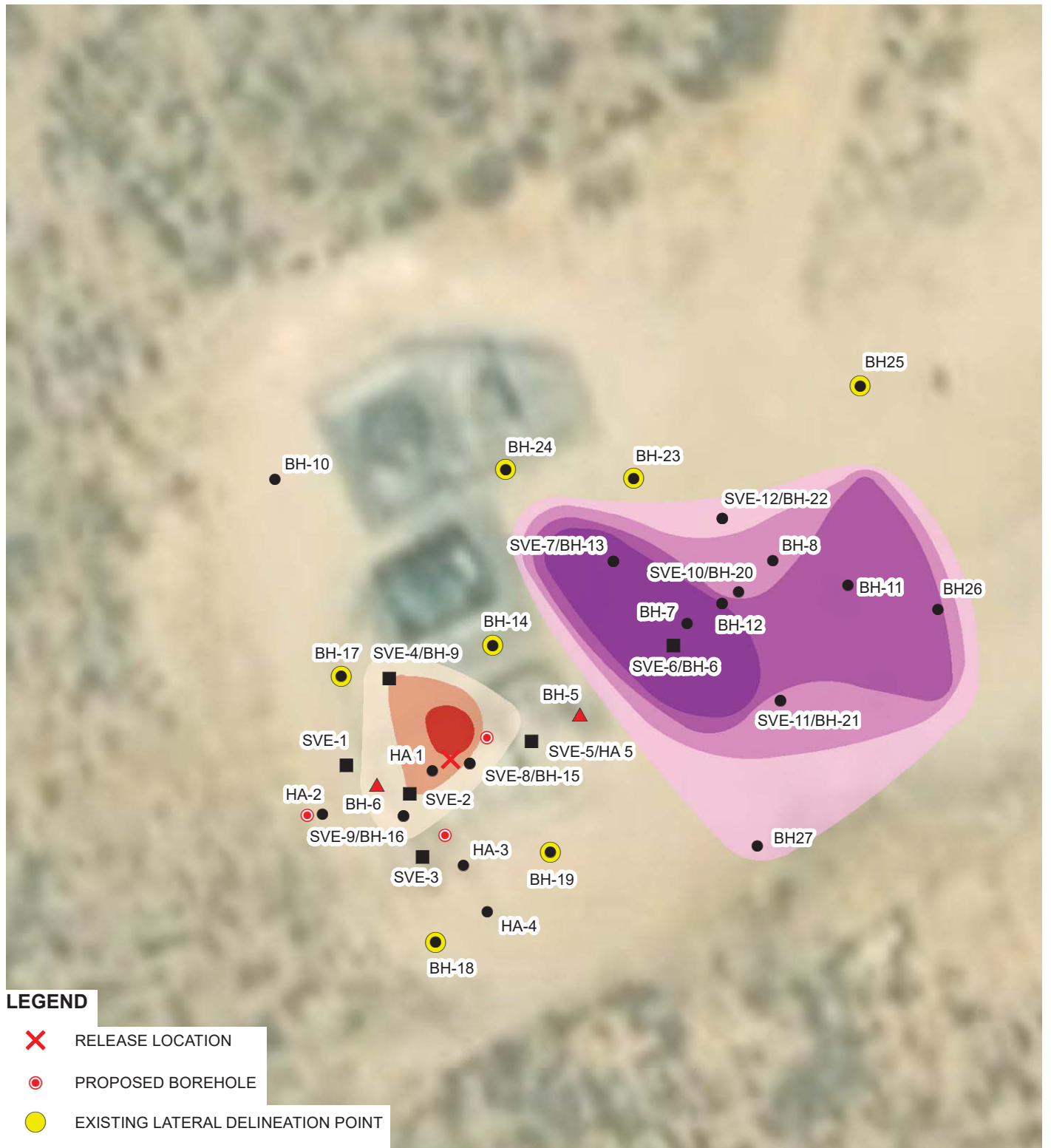


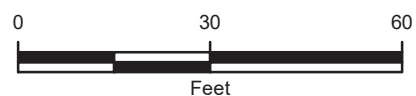
IMAGE COURTESY OF ESRI

## LEGEND

- ✕ RELEASE LOCATION
- PROPOSED BOREHOLE
- EXISTING LATERAL DELINEATION POINT
- BOREHOLE
- SOIL VAPOR EXTRACTION (SVE) WELL
- ▲ BOREHOLE ADVANCED BY XTO

## INFERRED BTEX ISOCONCENTRATION (PARTS PER MILLION)

50.00 - 200.00	50.00 - 100.00
200.01 - 400.00	100.01 - 200.00
400.01 - 600.00	200.01 - 300.00
> 600.00	



**FIGURE 2**  
**PROPOSED SAMPLING MAP**  
**OH RANDEL #5**  
**NWNW SEC 10 T26N R11W**  
**SAN JUAN COUNTY, NEW MEXICO**  
**HILCORP ENERGY COMPANY**



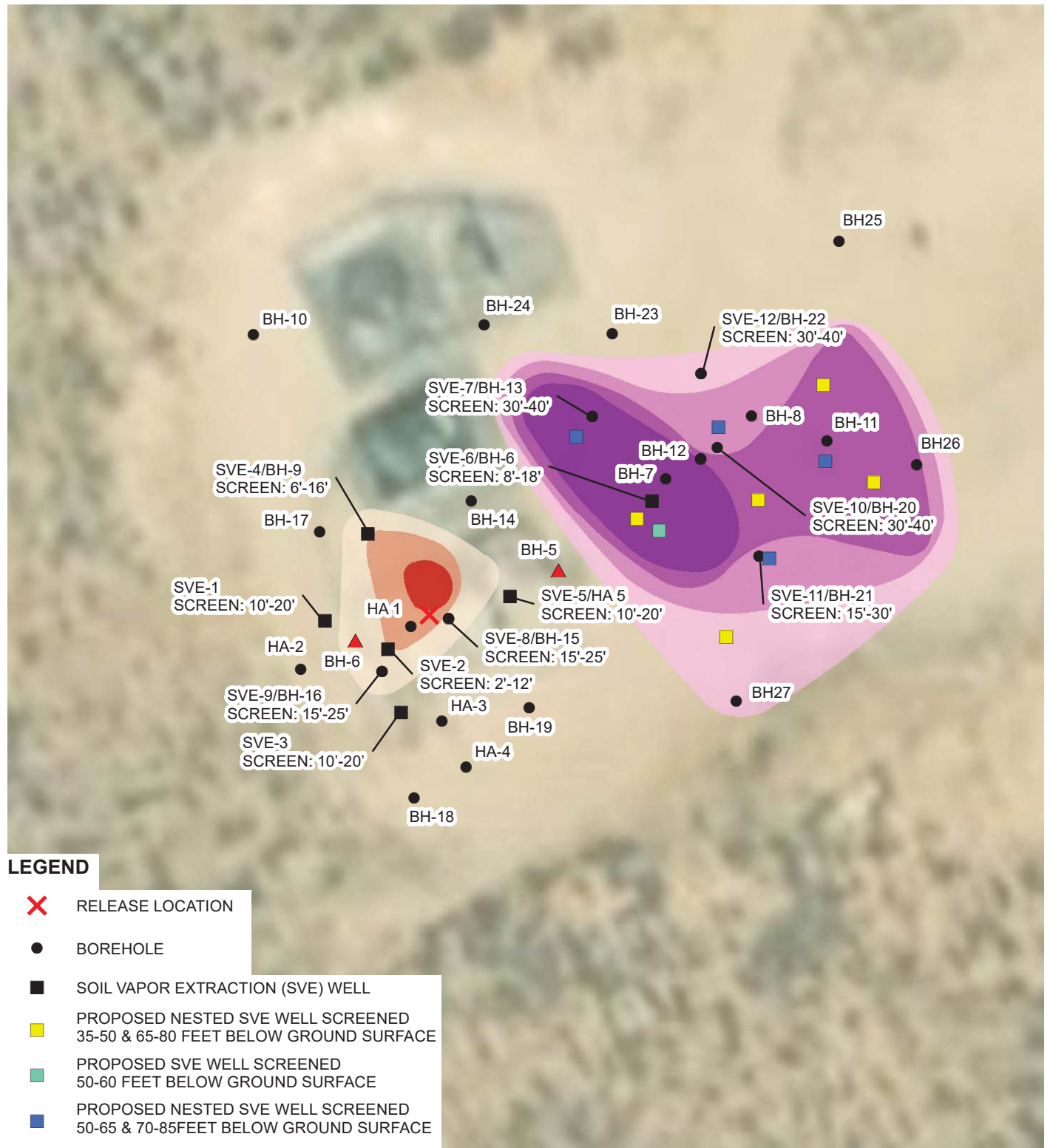
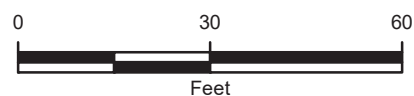


IMAGE COURTESY OF ESRI

INFERRED BTEX ISOCONCENTRATION (PARTS PER MILLION)

50.00 - 200.00	50.00 - 100.00
200.01 - 400.00	100.01 - 200.00
400.01 - 600.00	200.01 - 300.00
> 600.00	

NOTE: THE CONFIGURATION AND NUMBER OF SVE WELLS TO BE INSTALLED WILL BE ADJUSTED BASED ON THE RESULTS OF THE PILOT TEST AND EVALUATION OF BLOWER NEEDS.



**FIGURE 3**  
INITIALLY PROPOSED SVE LAYOUT  
OH RANDEL #5  
NWNW SEC 10 T26N R11W  
SAN JUAN COUNTY, NEW MEXICO  
HILCORP ENERGY COMPANY

