

Powder Wash North Compressor Station – South Pit

Site Background:

A historical skim pit (25'x25') at the Powder Wash North Compressor Station was inactive. The timeframe of the pit use is unknown but the pit can be seen on aerial imagery from 1993. Andeavor Logistics (Andeavor) personnel tested the soil in the bottom of the pit in 2015. Results indicated impact above Colorado Oil and Gas Conservation Commission (COGCC) standards. Andeavor contracted LT Environmental, Inc. (LTE) to delineate the extent of impact for this pit and others in the area. LTE advanced six soil borings in November 2015 to depths of 16.5 feet below ground surface (bgs) to 32 feet bgs. The geology appeared conducive to soil vapor extraction (SVE) remediation. Four SVE pilot test wells were installed in April 2016. Wells were installed at two separate depths to test heterogeneities in the soil. The SVE pilot test was conducted in May 2016 with favorable results. Remediation plan submitted to the COGCC (Remediation #10389). Two additional SVE wells (six total) were installed in July 2017 to ensure SVE influence throughout the impacted zone. A solar SVE system was installed and began operation on July 19, 2017. More details on the system are provided below.

The Site is located on BLM land in Moffat County, Colorado. There are Sage Grouse seasonal wildlife stipulations that are being observed that limit construction activities. The area surrounding is largely rolling sagebrush and undeveloped rangeland mixed with natural gas well infrastructure. There is no electrical power infrastructure onsite, which makes solar powered remediation the most technically feasible remediation method.

Description of Impact:

Soil contaminants of concern (COCs) that were detected exceeding COGCC Table 910-1 were total petroleum hydrocarbons (TPH), benzene, toluene, benzo(a)pyrene, arsenic, electrical conductivity (EC), and pH. Discussions with the COGCC indicate that arsenic, EC, and pH are not drivers for site closure. All other COCs analyzed were compliant with COGCC standards. During the 2015 assessment concentrations of total petroleum hydrocarbons (TPH) in soil ranged from less than 4.5 milligrams per kilogram (mg/kg) to 3,270 mg/kg. Benzene ranged from less than 0.033 mg/kg to 14 mg/kg. The extent of impact is approximately 60 feet long by 40 feet wide and 32 feet deep (2,844 cubic yards).

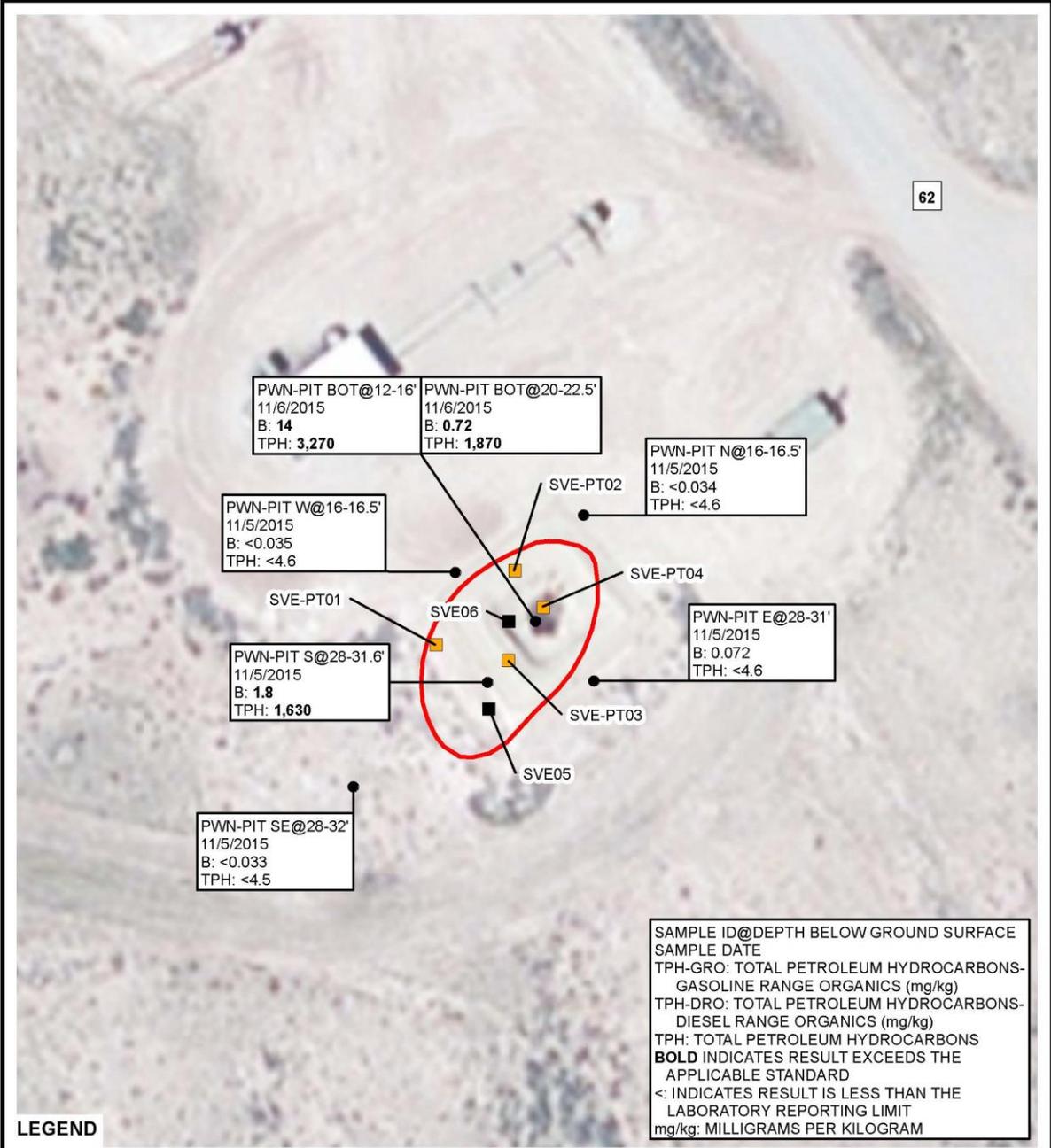
Remediation System:

Technical Specs:

- 5 horsepower regenerative SVE blower capable of 92" H2O max vacuum and 170 cfm @ 50" H2O;
- Power is delivered directly from the solar panels to the motor with a variable frequency drive (VFD). The VFD that measures the solar array output in real time and adjusts the motor speed as needed. The system starts slow, ramps up during peak sunlight, then ramps down during low sunlight/cloudy times. Average system flow throughout the day is 30 cfm at 75" H2O vacuum;
- 6 kW solar array (20 panels); and
- Stack vented to the atmosphere.

System Operation:

The system is scheduled to operate for a 1 to 2-year period. Closure sampling will be predicted via stack air sample analysis that is collected monthly. Closure sampling will be conducted when the decline in volatile organic compound (VOC) concentrations is <1 mg/L total volatile petroleum hydrocarbons or has reached asymptotic concentrations. Additional soil borings will be advanced and confirmation soil samples will be collected for site closure. The system will then be mobilized to another location in the area for remediation of another historic skim pit.



SAMPLE ID@DEPTH BELOW GROUND SURFACE
 SAMPLE DATE
 TPH-GRO: TOTAL PETROLEUM HYDROCARBONS-
 GASOLINE RANGE ORGANICS (mg/kg)
 TPH-DRO: TOTAL PETROLEUM HYDROCARBONS-
 DIESEL RANGE ORGANICS (mg/kg)
 TPH: TOTAL PETROLEUM HYDROCARBONS
BOLD INDICATES RESULT EXCEEDS THE
 APPLICABLE STANDARD
 <: INDICATES RESULT IS LESS THAN THE
 LABORATORY REPORTING LIMIT
 mg/kg: MILLIGRAMS PER KILOGRAM

LEGEND

- SOIL BORING
- PROPOSED SOIL VAPOR EXTRACTION WELL
- SOIL VAPOR EXTRACTION WELL (4/25/2016)
- ESTIMATED AREA OF TPH IMPACT

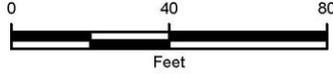


IMAGE COURTESY OF ESRI



FIGURE 3
 REMEDIATION LAYOUT
 POWDER WASH NORTH COMPRESSOR STATION - SOUTH PIT
 NENE SEC 32-T12N-R97W
 MOFFAT COUNTY, COLORADO
 TESORO LOGISTICS LP



P:\Tesoro Logistics\GIS\POWDER WASH NORTH\MD044715005_PWN_FIG02_SOUTH_PIT.mxd

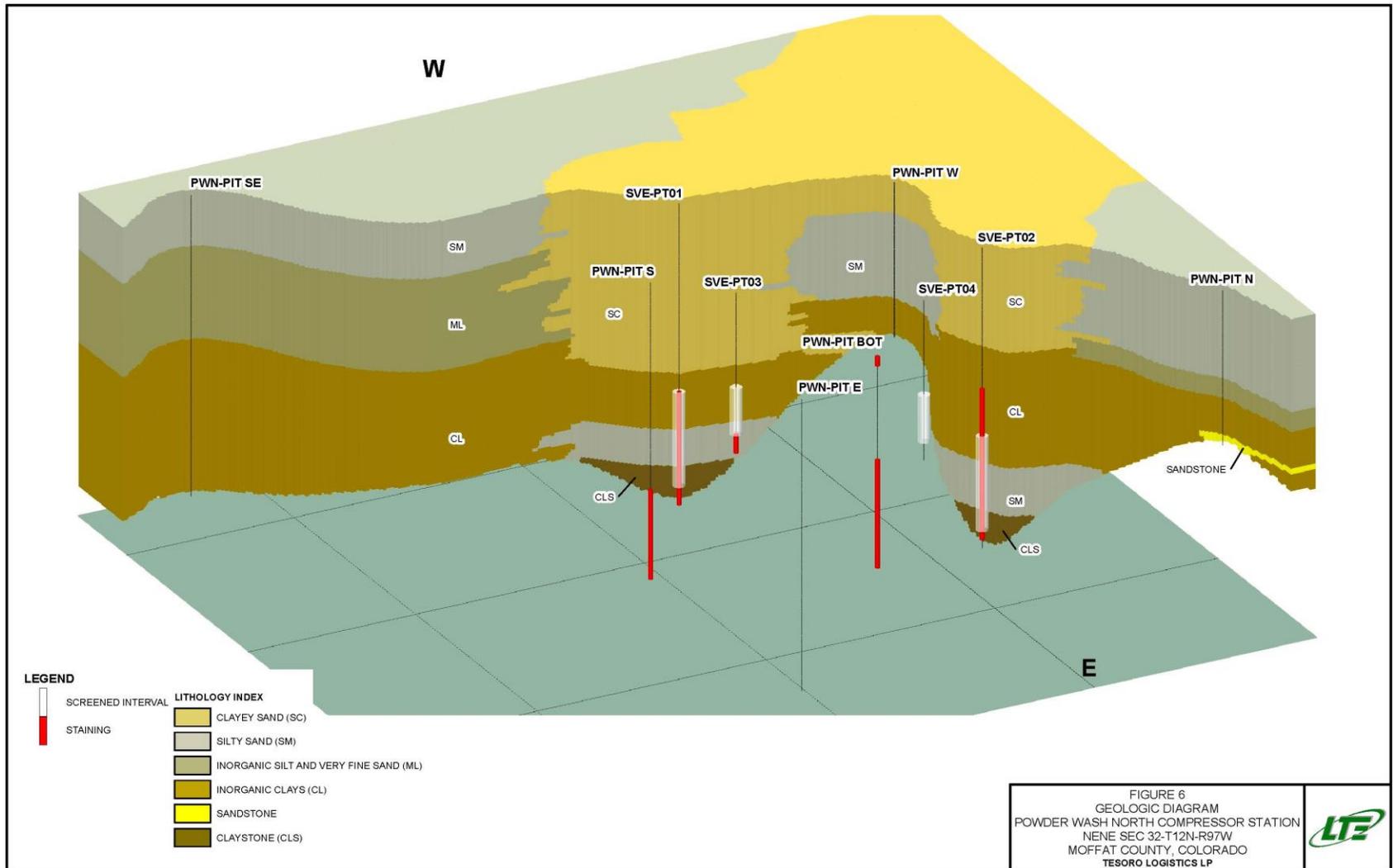


FIGURE 6
 GEOLOGIC DIAGRAM
 POWDER WASH NORTH COMPRESSOR STATION
 NENE SEC 32-T12N-R97W
 MOFFAT COUNTY, COLORADO
 TESORO LOGISTICS LP



P:\Team Logistics\TEP\POWER WASH NORTH\MOFFAT\32T12N-R97W\32T12N-R97W\32T12N-R97W.dwg



