COMPLIANCE / ENGINEERING / REMEDIATION

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July 14, 2017

Mr. Randolph Bayliss
Hydrologist, Districts III and IV
New Mexico Oil Conservation Division
1220 South Street Francis Drive
Santa Fe, New Mexico 87505

RE: Proposed Groundwater Delineation and Product Recovery Work Plan
Florance #47X
Environmental Order #3RP-317-0
Williams Four Corners LLC
San Juan County, New Mexico

Dear Mr. Bayliss:

LT Environmental, Inc. (LTE), on behalf of Williams Four Corners LLC (Williams), proposes the following work plan in response to the requirements of your letter dated May 26, 2017, following review of the 2016 Annual Groundwater Monitoring Report for the Florance #47X/Environmental Order #3RP-317-0. This work plan is intended to address impacted groundwater at the Florance #47X natural gas well (Site) located in Unit G of Section 5 within Township 30 North and Range 9 West in Crow Canyon, a tributary of Pump Canyon, in San Juan County, New Mexico.

BACKGROUND

Groundwater at the Site is impacted by petroleum hydrocarbons due to a release from a former earthen dehydrator pit. In June 1996, source material was excavated to approximately 19 feet below ground surface (bgs). A subsequent borehole drilled in the excavation to 115 feet bgs identified groundwater at approximately 97 feet deep that contained benzene, toluene, ethylbenzene, and total xylenes (BTEX) concentrations exceeding New Mexico Water Quality Control Commission (NMWQCC) standards. As a result, five groundwater monitoring wells were installed in the locations depicted on Figure 1. Groundwater elevations and water quality were monitored and monitoring wells MW-2, MW-3, and MW-5 have contained light aqueous phase liquid (LNAPL) at least once since installation. Historical records documenting monitoring activities and results can be found in previous annual reports submitted to the New Mexico Oil Conservation Division (NMOCD).

Currently, monitoring well MW-2 is damaged, although groundwater samples can be collected and indicate BTEX concentrations exceed NMWQCC standards. LNAPL is present in monitoring well MW-3, which is located downgradient of the original source area. Measured thickness of LNAPL was 1.50 feet in January of 2017 and 0.89 feet in April of 2017. Another downgradient monitoring well, MW-5, contains dissolved phase benzene concentrations exceeding NMWQCC standards. Upgradient well MW-1 and cross-gradient monitoring well MW-4 have been compliant

with NMWQCC standards since 2000 and 2003, respectively. The most recent monitoring results from April 28, 2017, are presented on Figure 1.

PROPOSED DELINEATION AND MONITORING WELL REPLACEMENT

To delineate LNAPL and dissolved-phase contaminant distribution, LTE proposes to install new monitoring wells downgradient of MW-3 and MW-5 and replace damaged monitoring well MW-2 (Figure 1). The existing damaged well MW-2 will be plugged and abandoned in accordance with New Mexico Office of the State Engineers (NMOSE) requirements to prevent movement of water within the boreholes and prevent the annular space surrounding the monitoring well casings from becoming a conduit to the groundwater supply.

Each new monitoring well be installed by Cascade Drilling (Cascade) using sonic drilling techniques. Continuous soil samples will be logged by an LTE geologist and described using the Unified Soil Classification System (USCS) to delineate hydrocarbon impacts. The intervals from immediately beneath the ground surface and then every five feet thereafter will be screened for volatile aromatic hydrocarbons as well as any soil that is stained or has a hydrocarbon odor using a photo-ionization detector (PID). If PID concentrations exceed 1,000 parts per million (ppm) in any of the soil samples, the sample will be submitted to a certified laboratory for analysis of BTEX by United States Environmental Protection Agency (EPA) Method 8021 and total petroleum hydrocarbons (TPH) – gasoline range organics (GRO), diesel range organics (DRO), and motor oil range organics (MRO) by EPA Method 8015. Additional soil borings will be advanced radially in approximately 50-foot steps from any soil boring demonstrating significant evidence of hydrocarbon impacts.

The monitoring wells will be installed to depth of approximately 100 feet bgs. Monitoring wells will be constructed of schedule 40, 2-inch diameter polyvinyl chloride (PVC) and include 15 feet of 0.01-inch machine slotted flush-threaded PVC well screen. LTE will set at least 10 feet of screen beneath the water table and approximately 5 feet above to allow for seasonal fluctuations and a proper seal during well construction. A clean 10-20 grade silica sand gravel pack will be placed from the bottom of the boring to one foot above the top of the screen. At least two feet of 3/8-inch natural bentonite chips will be set above the gravel pack to set a seal and the well will be grouted to the ground surface. A concrete surface completion with a steel well protector and locking cap will be installed around the PVC stick-up.

At least 24 hours after installation, the new monitoring wells will be developed utilizing an electric submersible pump. LTE personnel will remove a minimum of 10 saturated well casing volumes of water while monitoring the pH, electrical conductivity, and temperature until these parameters stabilize and turbidity is reduced to the greatest extent possible.

LTE will complete all work in accordance with industry-accepted practices. LTE will survey the new groundwater monitoring wells after construction with a Trimble® GeoExplorer® 3000 series Global Positioning System (GPS) to determine the latitude and longitude. Top-of-casing elevations will be surveyed to an accuracy of no less than plus or minus (±) 0.01 feet so that groundwater flow direction and gradient can be determined. Field activities will be documented in a bound field

book and soil descriptions will be documented on a boring log. Observations to be noted on the boring log will include, but not be limited to, lithology, moisture content, staining, soil boring depth, latitude, longitude, project number, and comments. Monitoring well construction details will be documented on a well completion log. All down-hole drilling equipment will be thoroughly decontaminated prior to each use. If impacted soil is identified within a borehole, cuttings will be drummed and transported to the Envirotech, Inc. Landfarm in Hilltop, New Mexico.

PROPOSED LNAPL RECOVERY

A mechanical LNAPL pumping system will be utilized to increase LNAPL recovery rates. The Geotech Solar Sipper uses a downwell pump to recover hydrocarbons through a floating oleophilic/hydrophobic intake filter. Once the pump canister is filled via the vacuum cycle, the pump reverses, pressurizes the system and pumps the recovered fluid to the surface and into a 55-gallon steel drum housed in secondary containment. The system can operate up to 180 feet below ground surface (bgs) and recovery rates are adjustable based on field observations. The system can be configured to operate two wells simultaneously. System startup and monthly operation and maintenance (O&M) events will track fluid recovery volumes and optimize fluid recovery rates. The system is capable of recovering up to 0.2 gallons of LNAPL per minute. System recovery rates will be based on field observations.

The LNAPL pumping system will be installed in monitoring well MW-3. Additionally if the presence of LNAPL is observed in either of the new downgradient wells, the LNAPL pumping system will be utilized in those wells. The LNAPL pumping system will be shared with another location and will be rotated quarterly between the other location and this Site. System effectiveness will be gauged based on LNAPL recovery rates and observed LNAPL thicknesses following static quarters.

MONITORING AND REPORTING

At least two weeks after completion of monitoring well installation and development, groundwater sampling will be conducted using an electric submersible pump with variable frequency drive for low-flow sampling. All new and existing monitoring wells will be sampled unless the monitoring wells contain LNAPL.

LTE will measure depth to groundwater and total depth of the monitoring wells with a Keck® oil/water interface probe prior to sampling. The submersible pump will be decontaminated prior to use and tubing will be decontaminated or new. As water is removed from the monitoring wells, pH, electric conductivity, and temperature will be monitored utilizing an in-line flow cell. Biological process parameters will also be monitored, including dissolved oxygen, oxidation-reduction potential, and ferrous iron.

Once monitoring wells are properly purged, groundwater samples for laboratory analysis will be collected by filling pre-cleaned vials with zero headspace to prevent degradation of the sample and plastic bottles with appropriate preservatives. All groundwater samples will be labeled with the date and time of collection, well designation, project name, collector’s name, and parameters to be

analyzed. The samples will be immediately chilled by placing them in a cooler with ice. The cooler will be delivered to a certified laboratory following proper chain-of-custody procedures for analysis of BTEX according to United States Environmental Protection Agency Method 8021 and attenuation parameters including nitrate, sulfate, alkalinity, and dissolved manganese.

All activities and results will be included in the annual report required for 2017. The report will include a description of well installation methods and all sampling and analysis results. Product recovery activities will be described, and include tracking of volumes recovered. Additional recommendations will be made based on results of sampling and recovery activities.

LTE appreciates the opportunity to provide this proposed work plan to the NMOCD. If you have any questions or comments regarding this plan, do not hesitate to contact me at (970) 385-1096 or via email at bherb@ltenv.com or Aaron Galer at Williams at (801) 584-6746 or Aaron.Galer@Williams.com.

Sincerely,

LT ENVIRONMENTAL, INC.

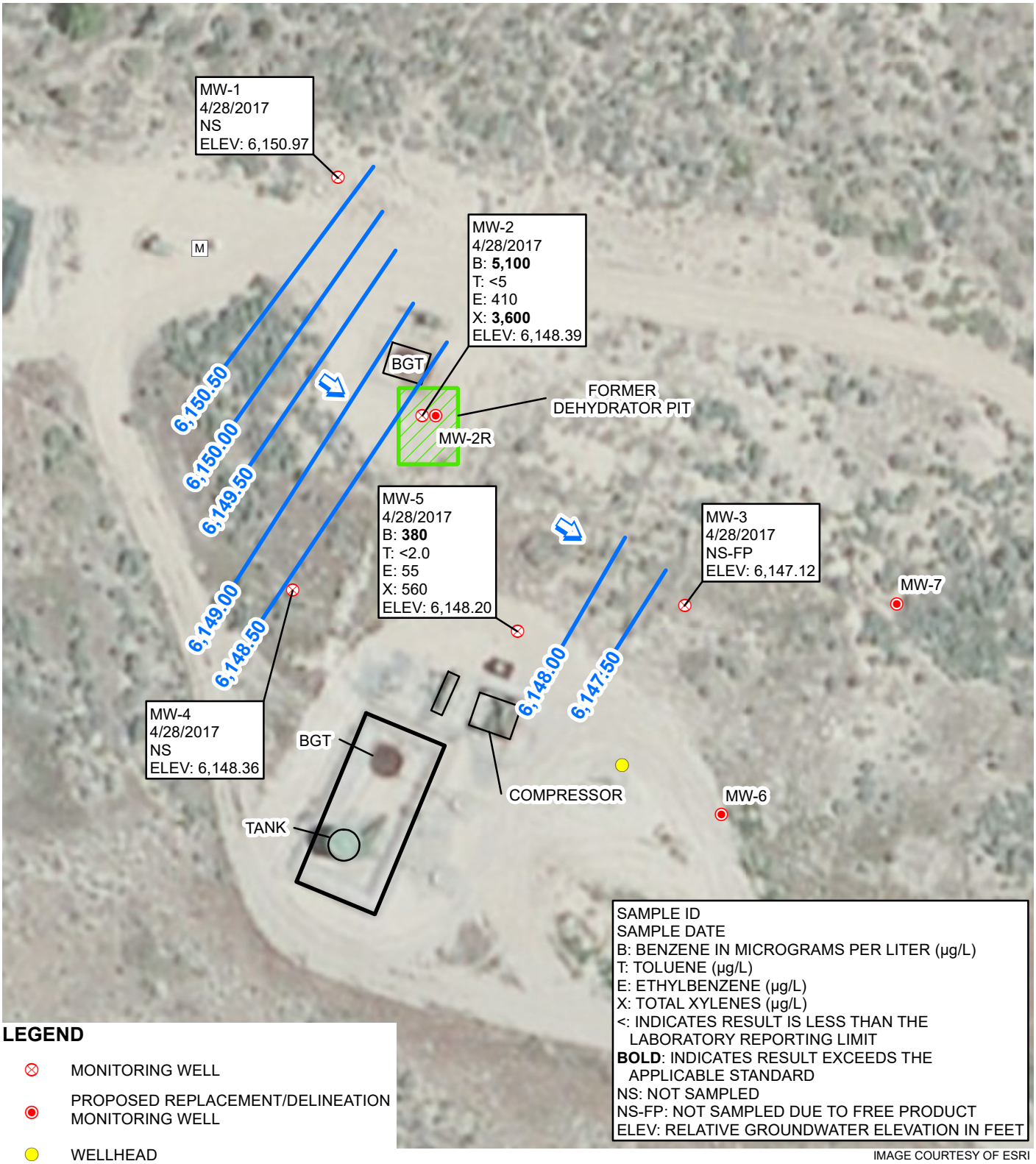
Brooke Herb
Project Geologist

Ashley L. Ager, M.S., P.G.
Senior Geologist

Attachments:

Figure 1 – Proposed Work Plan Site Map

FIGURE



LEGEND

- MONITORING WELL
- PROPOSED REPLACEMENT/DELINEATION MONITORING WELL
- WELLHEAD
- M METER HOUSE
- ESTIMATED GROUNDWATER FLOW DIRECTION
- RELATIVE GROUNDWATER ELEVATION CONTOUR
  CONTOUR INTERVAL = 0.50 FEET
- BERM

BGT: BELOW GRADE TANK

FIGURE 1
PROPOSED WORK PLAN SITE MAP
FLORANCE #47X
SAN JUAN COUNTY, NEW MEXICO

WILLIAMS FOUR CORNERS, LLC

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