



ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

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BRUCE RAUNER, GOVERNOR

ALEC MESSINA, ACTING DIRECTOR

618-346-5120
FAX: 618-346-5155

May 30, 2017

RECEIVED
JUN 12 2017

BY: _____

Shell Oil Products
Attn: Kevin Dyer
17 Junction Drive
Glen Carbon, Illinois 62034

Re: LPC # 1191150002 – Madison County
Shell Oil Products US
Compliance File

Dear Mr. Dyer:

On April 17 & May 1, 2017, an inspection of the above referenced site was conducted by Gina Search representing the Illinois Environmental Protection Agency. The purpose of this inspection was to determine the site's compliance with the Illinois Environmental Protection Act and 35 Illinois Administrative Code 724, Subpart F and Part 620 regulations and your RCRA Post-Closure Permit.

No violations were noted at the time of this inspection. For your information, a copy of the inspection report is enclosed. Please contact Gina Search at 618-346-5157 if you have any questions regarding this inspection.

Sincerely,

Chris N. Cahnovsky, Regional Manager

Enclosure

Owner

Name: **WRB Refining LP**
 Address: **900 South Central Avenue**
 City: **Roxana**
 State: **IL** Zip Code: **62084**
 Phone #: **618-255-2374**

Operator

Name: **Phillips 66**
 Address: **900 South Central Avenue**
 City: **Roxana**
 State: **IL** Zip Code: **62084**
 Phone #: **618-255-2478**

Part B Permit

Application Date: **5/30/2008** Log #: **B-43R** Issue Date: **9-23-2010**
 Expiration Date: **10-28-2020** Current Mod #: **25** Mod Issue Date: **8-29-2015**

Active Enforcement Orders

CACO: CAFO: Federal Court:
 Consent Decree: IPCB: State Court:

TSD Activity Summary

Activity Process Code	On Part B?	Ever done?	Closed?	Being done during inspection?
D83 - Surface Impndmnt	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
T02 - Surf Impnd T02	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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1191150002 – Madison County
Shell Oil Products USA – WRB Refining LLC
ILD080012305
Subpart F

RCRA Groundwater Operation and Maintenance Inspection

Introduction

On April 17, and May 1, 2017, I conducted a RCRA Groundwater Operation and Maintenance (O&M) Inspection at WRB Refining LLC Wood River Refinery located at 900 South Central Avenue in Roxana, Illinois. This was a triennial evaluation of Shell's compliance with the groundwater portions of its RCRA Part B Permit, applicable sections of the Illinois Environmental Protection Act ("Act") and 35 Ill. Adm. Code. This O & M consisted of a site inspection and oversight of groundwater sampling activities. The inspection lasted from 9:00 a.m. – 3:30 p.m. (This time is approximate for each day). I interviewed Lindsay Rathnow, Sam Fisher, Megan Karrick and Josh Clark all with AECOM.

The Wood River Refinery is located approximately one mile east of the Mississippi River and has been in operation since 1918. The refinery was operated for many years by Shell Oil Company. On July 1, 1998, ownership was transferred to Equilon Enterprises. In June 2000, the refinery sold to Toscopetro, but Equilon retained responsibility for certain environmental liabilities at the facility. Phillips Petroleum Company purchased the refinery in September 2001, and Phillips merged with Conoco Corporation in August 2002 and became ConocoPhillips. In 2007, ConocoPhillips formed a joint venture (WRB Refining, LLC) with Encana US Refineries, LLC (now known as Cenovus Energy, Inc.). In April 2012, Phillips 66 Company replaced ConocoPhillips Company as the operator of the Wood River Refinery. WRB Refining LP is a 50/50 joint venture between Phillips 66 Company and Cenovus Energy. Phillips 66 allows Shell to conduct groundwater monitoring at the site and Shell reports those results pursuant to Shell's RCRA permit.

Field Activities

The general focus of the field inspection was to evaluate the operation and maintenance of the groundwater monitoring system and review the sampling protocol of the AECOM sampling team.

In-Office Evaluation

Documents evaluated as part of the in-office evaluation included the facility's RCRA Part B Permit, the approved permit application, groundwater monitoring reports, and various other documents found in the regional Agency file.

Phillips 66 operates a petroleum refining complex in Roxana, Illinois, which produces propane, motor gasoline, benzene, aviation fuels, diesel, asphalt, petroleum coke, lubricating oils and heavy fuel oil. This refinery has a production capacity of 306,000 barrels of crude oil per day. A major refinery expansion was completed in 2012. The expansion is expected to increase the refinery output to about 400,000 barrels per day.

Phillips 66 is situated on a 1900-acre parcel in Madison County at 900 South Central Avenue in Roxana, Illinois. The property is located on the east bank of the Mississippi River in a broad plain called the American Bottoms. The facility is composed of five areas including: North Property, Main Property, Southwest Property, West Property and the Riverfront Property. The North Property contains storage tanks and current and past waste management areas. The process water well field is in this area. The Main Property contains the main refinery process units, maintenance shops and administrative buildings. The Southwest Property contains crude oil storage tanks and a storm water pond. The West Property contains the Wastewater Treatment Plant, sulfur recovery units and storage tanks. The Riverfront Property contains the effluent polishing lagoons and barge loading facilities. The River Wells are also located on this property.

Regulatory and Permit Status

A renewed RCRA Post-Closure Permit was issued on September 23, 2010 with an effective date of October 28, 2010. This permit was modified on July 29, 2015. The permit focuses on three areas: (1) post-closure care of the Solid Waste Disposal Basin; (2) conducting a groundwater corrective action program to address contaminated groundwater at the facility; and (3) providing corrective action as appropriate on several solid waste management units at the facility and requirements for addressing contamination associated with a 1986 benzene release near the corner of Rand Avenue and Route 111 in Roxana, Illinois.

The original permit, issued in 1989, had two portions, one issued by IEPA and one issued by USEPA. The permit required corrective action at 22 Solid Waste Management Units (SWMUs) and an additional six SWMUs have been added. The following SWMUs received a USEPA no further action letter: B, K, L, S, T, X, Z, AC, AD. Environmental Land Use Controls (ELUC) have been filed with the Madison County Recorder for the following SWMUS: AC, I, A, E, N, W, C, F, G, H, U, Z, AA, AB, D, J, L, M, X, AE, T.

The July 29, 2015 Modified Permit responded to Shell's August 23, 2013 request to remove groundwater gauging requirements for the Riverfront, West and Southwest Tank Farm Properties and discontinue Southwest Tank Farm groundwater sampling. The Agency collected split samples from the Southwest Tank Farm Property monitoring wells on April 14-17, 2014. The Volatile Organic Compound (VOC) and Semi Volatile Organic Compound (SVOC) analytical results for these wells were all nondetect. In the Modified Permit, the Agency then approved the request for ending the quarterly gauging at the Southwest Tank Farm wells: P103, P108, P109, P121 through P128, T-8, T-46 and T-58. The Agency also collected split samples from two groundwater monitoring wells, P-47 and P-51, at the Riverfront Property on April 14-17, 2014. VOCs were detected in

the P-47 samples. The P-51 sample exceeded the 620 Class I benzene standard. In the July 29, 2015 Modified Permit, condition IV.F.8. was added that required Shell to submit an investigation work plan for delineating the extent of the groundwater contamination at the Riverfront Property. Shell submitted the Riverfront Property Delineation Work Plan dated October 26, 2015.

Wastes Managed in Units Subject to Groundwater Monitoring

Solid Waste Disposal Basin

The Solid Waste Disposal Basin covers approximately 15 acres and was put in service in 1973. The SWDB is a disposal site for the solids that were produced by Shell's effluent treatment plant and sludge from the process sewer system. This waste management unit includes the unregulated old fly ash pond that for the purposes of groundwater monitoring is inseparable from the SWDB.

In November 1988 when the First/Third Land Disposal Restrictions were promulgated, the facility ceased discharging oil primary sludge from the treatment of wastewater at the refinery. This included several listed refinery K wastes that went to the SWDB: API separator sludge, DAF solids and waste bio-solids. In September 1990, the TCLP regulations impacted the continued operation of the SWDB. The lime sludge blow down generated by the cold lime water softening of the North and Main Property well water was reclassified as hazardous for benzene (D018) and no longer discharged to the SWDB.

The approved closure plan for the SWDB (Site 15) provides for extended closure. The responsibility for the management and closure of the SWDB has stayed with Shell Oil Products US. Shell submitted a closure plan for the SWDB in November 1998. The solidification of the hazardous waste was completed on May 8, 2003. A total of 321,600 cubic yards of sludge were solidified. The IEPA approved certification of closure of the Solid Waste Disposal Basin as a landfill on August 24, 2005. The thirty-year post-closure care period began at this time.

Ponds 1 and 2

Ponds 1 and 2 are located west of Highway 111 on ConocoPhillips' West Property. Pond 2 is a surface impoundment which is part of the facility's NPDES permitted WWTP which treats the refinery wastewaters. Pond 1 was placed in service in 1957 and was a surface impoundment which served as an equalization basin (primary treatment). Pond 1 was removed from hazardous waste service on July 20, 2000. IEPA determined that no further action was necessary for closure of the unit, contingent upon establishment of the ELUC. A new concrete activated sludge unit is being constructed within the footprint of this unit. Pond 1 received Closure Certification on August 19, 2010.

Pond 2 was placed in service in 1972 and was an activated sludge aeration basin. At times these lagoons received wastewater containing benzene which exceeded the 0.5 ppm benzene TCLP limitation, and as a result of the September 1990 TCLP Regulations, Pond 1 and 2 were classified as TC characteristic for benzene. The January 23, 2013 IEPA

letter approved Shell's closure documentation report for Pond 2 and certified the closure of Pond 2. It also included a copy of the approved ELUC filed with the Madison County Recorder. Monitor wells P114, P115, P116 and P117 are no longer sampled for Pond 2 requirements, but they are still gauged on a quarterly basis. The July 29, 2015 Permit Modification addressed Shell's May 14, 2015 request to abandon well P-114 due to gauging difficulties. The Agency determined that P-114 could not be abandoned as it is part of the Roxana Interim Groundwater Monitoring Network. This well is used to demonstrate the extent of contamination and effectiveness of corrective action. Shell replaced the damaged well during 3rd quarter 2015.

Site Geology and Hydrogeology

The following information was gathered from the Agency groundwater files as part of the review process required by this inspection. The geologic and hydrologic conditions described in Shell's submittals are consistent with existing ISGS geologic information.

The Wood River refinery is located in the northern portion of an area known as the American Bottoms, near the junction of the Missouri and Mississippi Rivers. The American Bottoms is a 30 mile-long geologic unit containing the eastern floodplain of the Mississippi River. The aquifer underlying the facility is not influenced by recharge from the river, but it is recharged by percolating storm water runoff in the drainage channel east of the basin and from the Kendall Hills to the east.

The uppermost aquifer at this location, known as the American Bottoms aquifer, is a thick sequence of glacial outwash sands constituting the Mackinaw Member of the Henry Formation. These outwash sediments comprise most of the 100 feet of fill in the Mississippi River Valley. Overlying the Henry Formation are recent Holocene deposits of the Cahokia Alluvium, sand, silt and clay deposited by the Mississippi River and its tributaries. Most of the unconsolidated fill at the Shell facility is recent alluvium and glacial valley train materials which range approximately 100 to 170 feet thick.

The lithology of the uppermost aquifer is dominantly a medium to coarse grained, quartz sand. This sand coarsens with depth. The base of the aquifer can be considered coarse-grained sand, gravel or a mixture of coarse-grained sand and gravel. The saturated thickness of the aquifer ranges from 64 feet to 113 feet. Soil borings indicate that the uppermost aquifer is not overlain by an aquitard thus the aquifer is considered to be unconfined, making it more susceptible to contamination.

While drilling the nested wells in 1991, a shale unit beneath the sand aquifer was encountered at 10 locations and a dense limestone at 3 boring locations. Thus the bedrock surface underlying the unconsolidated fill at the WRB Refining LLC site can be identified as either Pennsylvanian limestone or Pennsylvanian shale. The bedrock has low permeability and poor water quality with depth. Deep borings on the property have shown depth to bedrock to range from 119 feet to as much as 170 feet below ground surface.

Shell produced aquifer determinations using the following techniques: piezometer installation for water level measurements and hydraulic conductivity measurements of core samples and slug tests. Slug tests were conducted on ten wells including four deep wells. The measured conductivities vary over 2 to 3 orders of magnitude, but fall within the range of values typical of sandy deposits. The average conductivity was reported as 3.6×10^{-2} cm/sec. Porosity for the site ranged from 23.1 clayey sand to 46.9 fine-coarse sand.

Shell has classified the groundwater lying beneath the facility as a Class I: Potable Resource Groundwater according to 620.201. This classification has been approved by IEPA. The American Bottoms aquifer is a significant source of municipal water as well as a major source of water for industrial and agricultural activity in the area.

Due to historical pipeline and tank leaks an oil plume is present on the aquifer under the Refinery Property. Recovery of oil from the North Property wells began approximately in 1945. Prior to 1953, the North property wells were pumped in volumes up to 10,000 gpm. In 1953, the Ranney well at the Mississippi river was installed to make use of the softer water and to supplement the North Property water. Oil recovery dropped off when less water was pumped from the North Property wells. Additional oil recovery wells were installed in 1968 to increase the amount of oil recovered from the aquifer.

The Wood River Refinery's processes require approximately 10,000 gpm (gallons per minute) of water for steam generation, fire water and cooling water needs. A portion of this is supplied by the groundwater wells on the North and Main Properties. Condition IV.F.2.a. of the RCRA Post-Closure permit requires that the Production Wells shall pump at a minimum rate of 3,000 gpm to maintain the cone of depression to ensure groundwater flow is adequately controlled in the uppermost aquifer.

There are eighteen permitted, 20-inch diameter groundwater production wells that provide control of the horizontal and vertical groundwater flow along the combined boundaries of the North and Main Properties. Six production wells are located near the west fence line of the North and Main Properties and are referred to as the west fence line wells. Twelve production wells are located approximately between 7th and 11th Streets on the North Property and are referred to as the interior wells. None of the wells are fitted with individual flow meters. The groundwater pumps located in the North Property interior wells are rated at 500 gpm. The groundwater pumps located in the west fence line wells are rated at 135 gpm.

West Fence Line Production Wells

W-77, W-78, W-79, W-80, W-81 and W-85

Interior Production Wells

W-39, W-42, W-68, W-69, W-70, W-72, W-73, W-76, W-84, W-86, W-88 and W-89

Five of the west fence line production wells, W-77, W-78, W-79, W-80 and W-81 were installed along the west fence line in 1991. The western fence line production wells were

installed to increase the hydraulic gradient toward the interior production wells, improve the capture zone in this area and to prevent the accumulated hydrocarbons from migrating offsite. The refinery's west fence line borders many residences in the village of Roxana. Free product has been detected in the village and a dissolved plume is present under parts of the study area.

Hydrocarbon is present on top of the water table beneath portions of the North and Main Properties. The RCRA Post-Closure Permit requires that the hydrocarbon layer be removed and treated. There is an Oil Recovery System located on the North Property which consists of fifteen recovery wells equipped with submersible pumps. The oil recovery wells are installed near the groundwater production wells. There are five west fence line recovery wells and ten interior recovery wells. The recovery wells have total fluid pumps and operate continuously with an individual flow rate of approximately 10 gallons per minute. These pumps remove LNAPL, dissolved phase hydrocarbon and groundwater.

The normal direction of groundwater flow in the American Bottoms is toward the west, but the multi-level piezometers demonstrated that the flow in the vicinity of the SWDB is from east to west due to the cone of depression formed from groundwater withdrawal in the well fields. Groundwater flow in the area is towards the northeast due to the influence of the pumping system.

Sampling Oversight

During this inspection, the second quarter of groundwater sampling was being conducted. Shell conducts quarterly groundwater sampling in the Village of Roxana and semi-annual groundwater sampling of the refinery wells listed in the Part B Permit. The Village Study Area monitoring wells which are part of the investigation area were being sampled when I was present. In the Village Study Area the following wells are sampled: MW-1 through MW-14, MW-16, MW-22 through MW-28, P-54, P-56 through P-59, P-66, P-74, P-93A, P-93B, P-93C, P-93D, P114R, ROST-3-MW, ROST-4-PZ(C), and T-12. Shell is required to sample for the following parameters: Volatile Organic Compounds (VOCs), Semi-volatile Organic Compounds (SVOCs) and Polycyclic Aromatic Hydrocarbons (PAHs).

AECOM personnel sample the wells for the facility and have done so for several quarters of sampling. I observed and evaluated AECOM's sampling protocol during this inspection. The sampling personnel included Lindsay Rathnow, Sam Fisher, Megan Karrick and Josh Clark all with AECOM. Standard Operating Procedure No. 18, Low-Flow Groundwater Purging and Sampling was closely followed and extensive effort was taken to ensure that the collected samples were representative.

I observed the sampling procedures at monitoring wells MW-1, ROST 4-PZ-C, MW-22 and MW-24. The sampling crew approached each well while measuring the breathing zone with a photoionization detector (PID). The well was checked for evidence of damage and integrity problems. All of the wells were locked and labeled, and well evaluation data was recorded in the field log.

Upon unlocking the well the PID was used to measure headspace readings to check for elevated VOC levels. (See table below for individual well measurements). An oil-water interface probe was used to measure the depth-to-water, and the levels were taken from the top of the inner well casing and recorded to the nearest 0.01 foot. Isopropyl alcohol was used to wipe off the probe after each measurement.

The stainless steel low-flow pump was lowered into the well with the measured tape of the oil-water interface probe. Due to the occluded screens, the pump intake was set at five feet below the screen for the monitoring wells with 10 ft. screens. The purge rate was set at 300 milliliters per minute, and the interface probe was used to monitor for drawdown in the monitoring well. Stabilization parameters were collected every two minutes and recorded in the field notes. The following field parameters were measured: pH, Specific Conductivity, Temperature, Dissolved Oxygen, Oxygen Reduction Potential, and Turbidity. The purge water was collected in 5-gallons buckets and then transferred into drums at the Tannery Property AECOM Job Trailer. Heritage Environmental disposes of the non-hazardous liquids.

Upon stabilization, sampling was initiated. The in-line flow cell was disconnected and the groundwater samples were obtained directly from the tubing attached to the low-flow pump. The sample bottles were filled to avoid overtopping and rinsing of the bottle. Samples were collected in the order of sensitivity: VOCs, SVOCs, and PAHs. The sample bottles are prepared by Test America Laboratory. The full sample bottles were placed in individual bubble wrap sleeves and stored on ice in coolers. The samples are shipped out nightly to the Test America Laboratory.

Between wells, the stainless steel pump and water level indicator were cleaned with distilled water and liquinox soap and then rinsed with distilled water. The pump was connected to dedicated polyethylene tubing. The designated tubing is stored in large Ziploc bags at the AECOM job trailer or storage unit. The samplers wore clean gloves while sampling and changed gloves after each well. Care was taken not to place sampling equipment on the ground. The samplers carefully labeled each bottle and collected duplicates as necessary. All work surfaces were clean and care was taken to follow the approved protocol.

On May 1, 2017, I observed the monthly gauging of 23 Roxana Study Area monitoring wells. I interviewed Lindsay Rathnow, Megan Karrick and Kayla Mienhaus all with AECOM. A total of 57 monitoring wells are gauged on a monthly basis, the results are documented in the quarterly Roxana Interim Groundwater Monitoring Program reports. The following table contains the gauging data collected during this inspection.

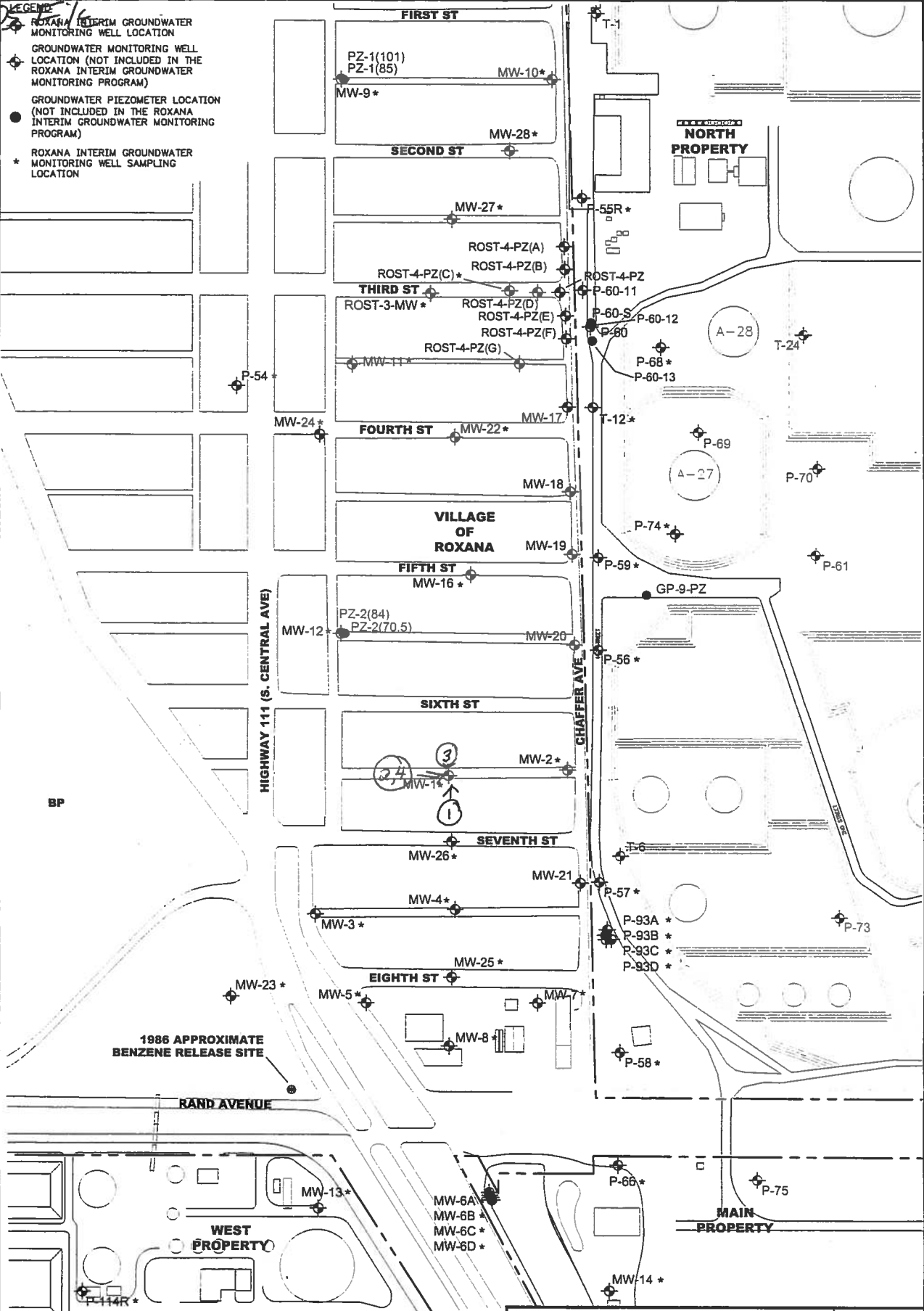
May 1, 2017 Roxana Study Area Gauging Data

Well ID	Screened Interval	Depth to Water	Monitoring well screen occluded	Photoionization Detector
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MW-01	48.80-58.80	38.50	Yes	2.4
MW-02	49.87-59.87	39.68	Yes	39.68
MW-03	34.67-44.67	25.71	Yes	0.0
MW-05	33.97-43.97	25.32	Yes	0.3
MW-07	42.92-52.92	38.88	Yes	38.88
MW-08	33.60-43.60	29.80	Yes	N/A
MW-09	46.45-56.45	40.56	Yes	0.0
MW-10	44.43-54.43	40.43	Yes	0.0
MW-11	41.66-51.66	37.98	Yes	0.0
MW-16	37.06-47.06	39.34	No	0.0
MW-18	34.92-49.92	38.11	No	0.0
MW-19	36.34-51.34	38.79	No	8.8
MW-20	35.88-50.88	39.64	No	0.0
MW-21	35.01-50.01	39.72	No	0.0
MW-22	37.88-47.88	38.09	No	204.0
MW-24	38.89-48.89	39.27	No	326.7
P-54	38.00-63.00	38.10	No	0.0
ROST-3- MW	37.81-47.81	38.07	No	15,000 Maxed out the PID
ROST-4-PZ	34.93-44.93	37.51	No	0.0
ROST-4- PZ(A)	34.77-44.77	36.88	No	0.0
ROST-4- PZ(B)	35.05-45.05	37.52	No	0.0
ROST-4- PZ(C)	34.95-44.95	38.36	No	0.0
ROST-4- PZ(D)	34.97-44.97	38.27	No	0.0

During this inspection the monitoring wells were checked for evidence of damage and integrity problems. All of the wells were locked and labeled. The surface seals and casings were in good condition.

No apparent violations were noted as a result of this RCRA Operation and Maintenance Inspection.



- LEGEND**
- ◆ ROXANA INTERIM GROUNDWATER MONITORING WELL LOCATION
 - ◇ GROUNDWATER MONITORING WELL LOCATION (NOT INCLUDED IN THE ROXANA INTERIM GROUNDWATER MONITORING PROGRAM)
 - GROUNDWATER PIEZOMETER LOCATION (NOT INCLUDED IN THE ROXANA INTERIM GROUNDWATER MONITORING PROGRAM)
 - * ROXANA INTERIM GROUNDWATER MONITORING WELL SAMPLING LOCATION

EQUILON ENTERPRISES LLC dba SHELL OIL PRODUCTS US
 INTERIM GROUNDWATER MONITORING PROGRAM
 ROXANA, ILLINOIS

PROJECT NO.
 60527968



DRN. BY: djd April 2017
 DSGN. BY: jr
 CHKD. BY: b3

1Q17
 Roxana Interim Groundwater
 Monitoring Well Locations

FIG. NO.
 2



DIGITAL PHOTOGRAPHS File Names: 1191150002 ~04172017-[Exp. #5].jpg



Date: 4/17/2017
Time: 9:00am-3:30pm
Direction: N
Photo by: G. Search
Exposure #: 1
Comments: Sampling at
MW-1

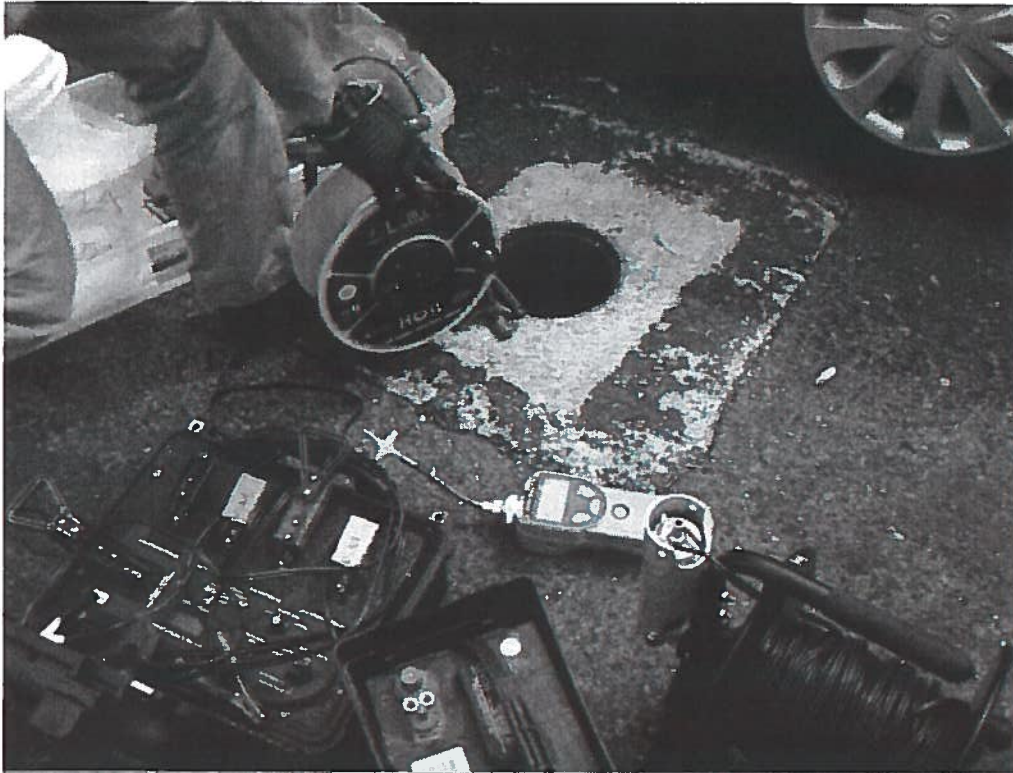


Date: 4/17/2017
Time: 9:00am-3:30pm
Direction: E
Photo by: G. Search
Exposure #: 2
Comments: Sampling at
MW-1



DIGITAL PHOTOGRAPHS

File Names: 1191150002~04172017-[Exp. #5].jpg



Date: 4/17/2017
Time: 9:00am-3:30pm
Direction: S
Photo by: G. Search
Exposure #: 3
Comments:



Date: 5/1/2017
Time: 9:00am-3:30pm
Direction: E
Photo by: G. Search
Exposure #: 4
Comments:



DIGITAL PHOTOGRAPHS File Names: 1191150002 -04172017-[Exp. #5].jpg



Date: 5/1/2017
Time: 9:00am-3:30pm
Direction: N
Photo by: G. Search
Exposure #: 5
Comments:

