From: Rajen, Gaurav [Gaurav.Rajen@wnr.com]
Sent: Tuesday, August 25, 2009 1:58 PM
To: Chavez, Carl J, EMNRD; Monzeglio, Hope, NMENV
Cc: Riege, Ed
Subject: Final report - Tank 116 spill

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Attachments: C-141-final signed.pdf; Soil samples 6-09.pdf; Soil samples 6-17.pdf; Samples - July 2009.pdf; C-141 final-report 8-25-2009.doc

August 25, 2009

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr., Santa Fe, New Mexico 87505

Dear Carl:

It is a pleasure to send you our final report for our Tank 116 spill of Ultra Low Sulfur Diesel which we have cleaned up. Two paper copies will go out in the mail today. Electronic copies are attached.

As you will note in the report, we excavated soil from within our berm area up to two feet. As there are active pipelines in the area, and ongoing work activity, we found it difficult to excavate any further near the pipelines, and had to cover our excavation with clean soil to prevent any hazard to workers in the area. This covering was done before our second set of laboratory results had arrived, for safety reasons. Our first set of laboratory results showed levels of DRO around 50,000 ppm. After excavation the DRO levels were of the order of 4000-6000 ppm (no BTEX was detected). As these levels were below 2 feet, we believe they did not come from the recent Tank 116 spill. We have conducted a small test at one of these locations of passive venting, using a perforated pipe to get air into the ground. The levels below the perforated pipe have fallen from 4700 ppm to 190 ppm. With your concurrence, we could now place more such perforated pipes in the area and we believe we will be able to reduce all the areas that were found to have DRO levels around 4000-6000 ppm to below concern. If we place many such perforated pipes we will also get concurrence (as needed) from the NMED's Air Quality Bureau.

We look forward to your response at your earliest convenience,

Sincerely,

Gaurav Rajen

C-141 Final Report - Tank 116 Spill

1.0 Description of Site and Incident

Tank 116 is located within the northern tank farm area of the Gallup Refinery. Figure 1 depicts an aerial view of the refinery – and Tank 116 is described in a detailed image extracted from this picture.

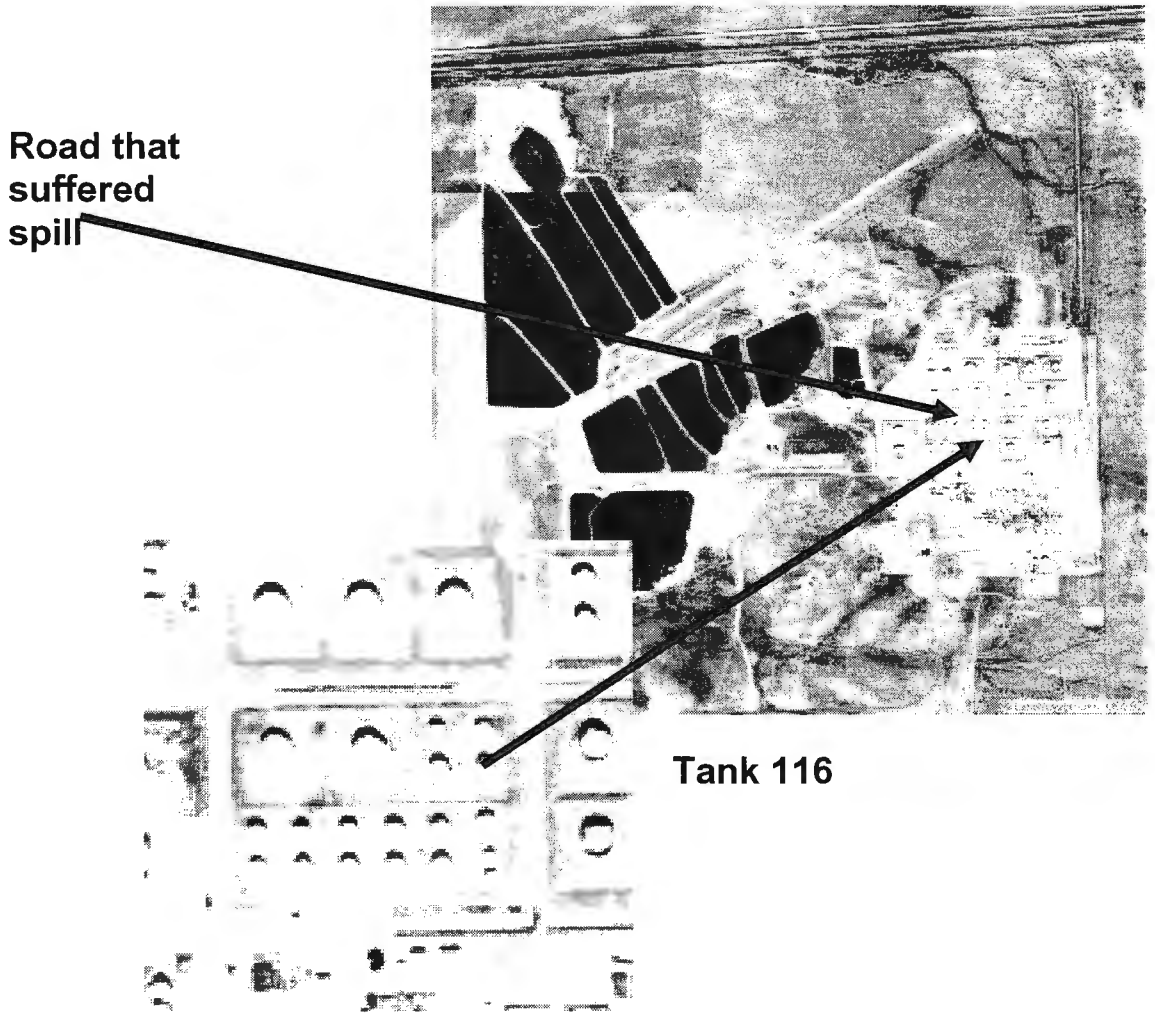

Figure 1: Location of Tank 116 within the Gallup Refinery

1.1 Nature of Spill Incident

At approximately 2:50 am on 4/24/2008, the Operations Shifter discovered Tank 116 running over. The Pump Operator was notified and a transfer was started into Tank 583. Tank 116 had run over and spilled Ultra Low Sulfur Diesel (ULSD) onto the soil within the area surrounded by a berm. A lesser amount of ULSD ran down within the foam line leading into the tank. This foam line is designed to provide foam into the tank to suppress fires in an emergency and has to be kept open. Through a drain valve on the foam line that is buried in the ground outside the berm area, some ULSD leaked out onto a service road running adjacent to Tank 116. The operator used a backhoe to build a containment dike on this road outside the tank berm area, and the spill on the road was blocked from further migration. Figure 2 depicts the spill around the tank within the area of the berm. The photograph presented in Figure 3 depicts the spill emanating from the buried drain valve that migrated along the service road.

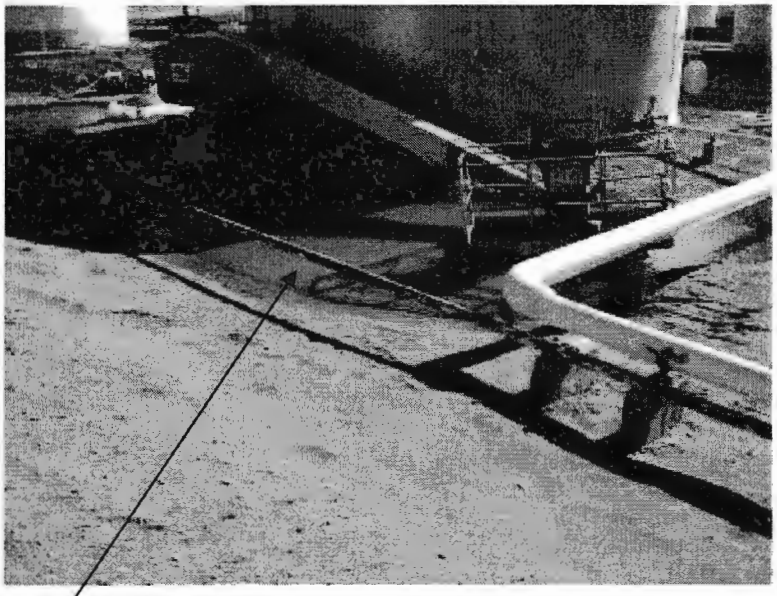

Figure 2: Photograph depicting contaminated areas within the berm adjacent to Tank 116 – Tank 116 is off the picture; much of the product flowed and collected next to Tank 115 which can be seen. At this time, maintenance work was ongoing on Tank 115 which is why heavy equipment is seen in the area.

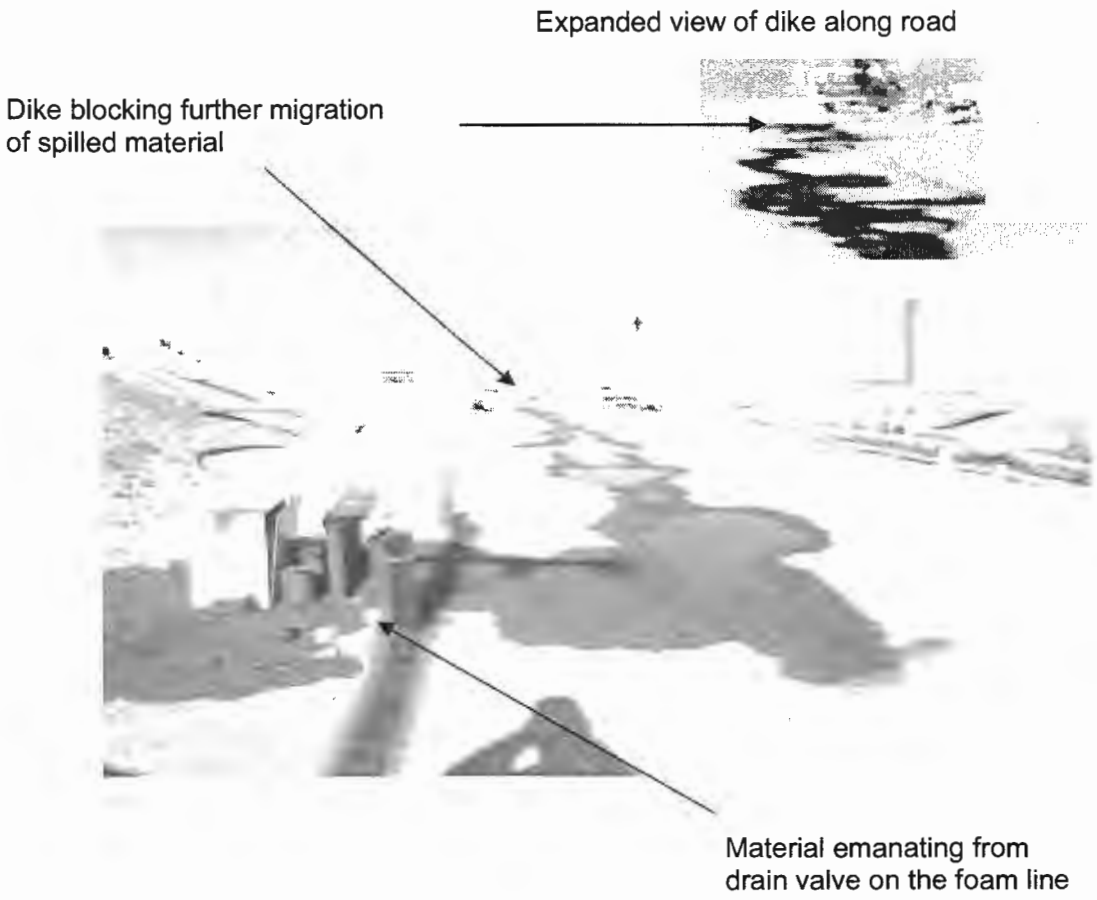

Figure 3: Photograph depicting spilled material along a service road adjacent to Tank 116.

2.0 Remediation Actions

Almost immediately following the spill, a vacuum truck was used to pick up free product (as much as possible), and absorbent material was placed on affected areas to soak up product remaining on the surface. Later, contaminated soil was excavated and stored on plastic in a staging area for later disposal in a permitted landfill. Figures 4-7 depict photographs of various stages of the excavation and subsequent clean-up of the area.

Figure 4: Excavation of contaminated soil in the area described in Figure 2. Note active pipeline towards the rear.

Figure 5: Preliminary excavation of contaminated soils near the drain pipes where product flowed out from the open foam line within the tank

Figure 6: Preliminary clean-up of road which had experienced run-off of product.

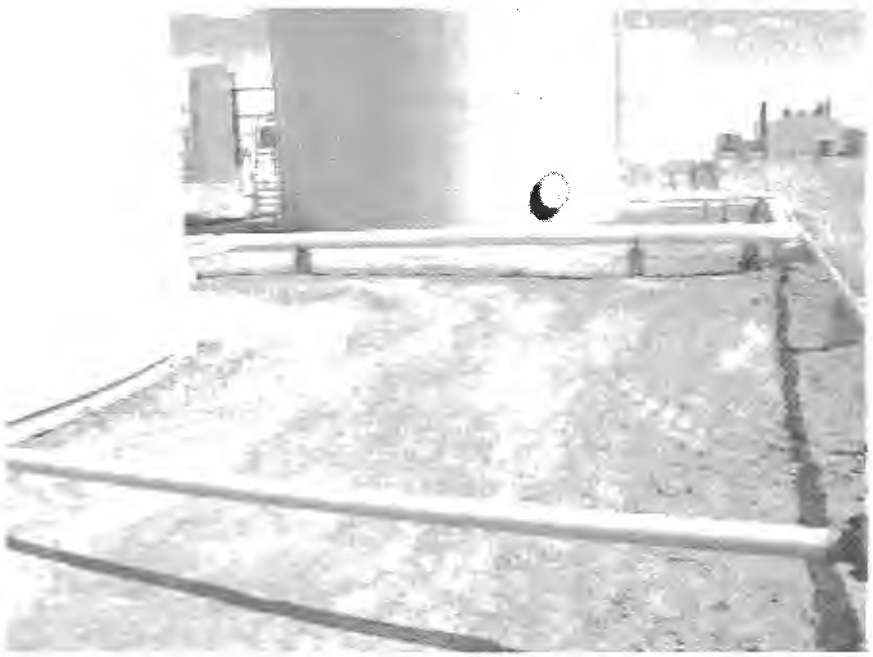

Figure 7: Final clean-up of affected area near Tank 116

After all free product had been removed and contaminated soil (from visual observation) excavated, we prepared a sampling plan and collected soil samples that were sent to Hall Environmental Analytical Laboratories for testing. The sampling locations and preliminary results for Diesel Range Organics (DRO) in red font are described in Figure 8. Appendix A presents details of the laboratory results. The composite samples were biased to locations where we could observe soil staining.

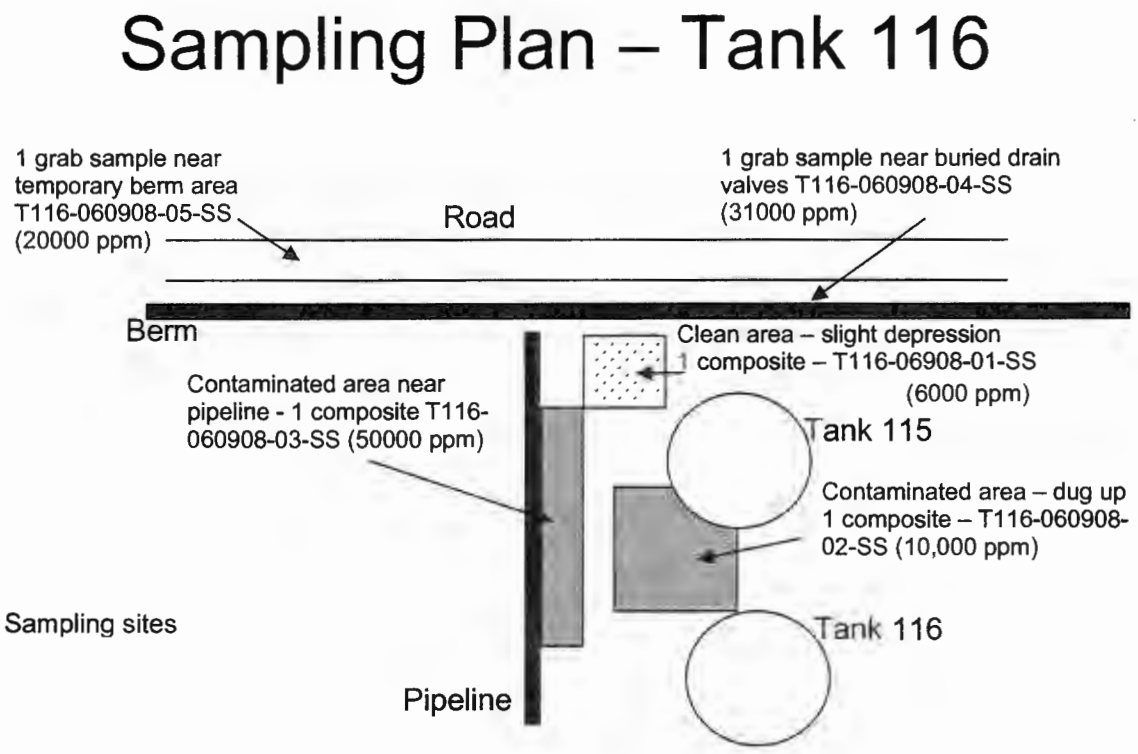

Figure 8: Preliminary sampling locations and results for DRO

These data showed levels of DRO from 6000 ppm to 50,000 ppm. The samples were also analyzed for Gasoline Range Organics (GRO) and Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) using EPA-approved and OCD-recommended methods. GRO and BTEX were at non-detect levels. Based on these data, subsequent excavations were undertaken and the sites were sampled again. Figure 9 presents results from this second set of samples.

These tanks are an active work site. While waiting to receive the second set of laboratory results we were compelled to cover the excavated areas for safety reasons as depressions and excavations represent a safety hazard for personnel who continuously work around these tanks.

Sampling Plan – Tank 116

- Sampling sites

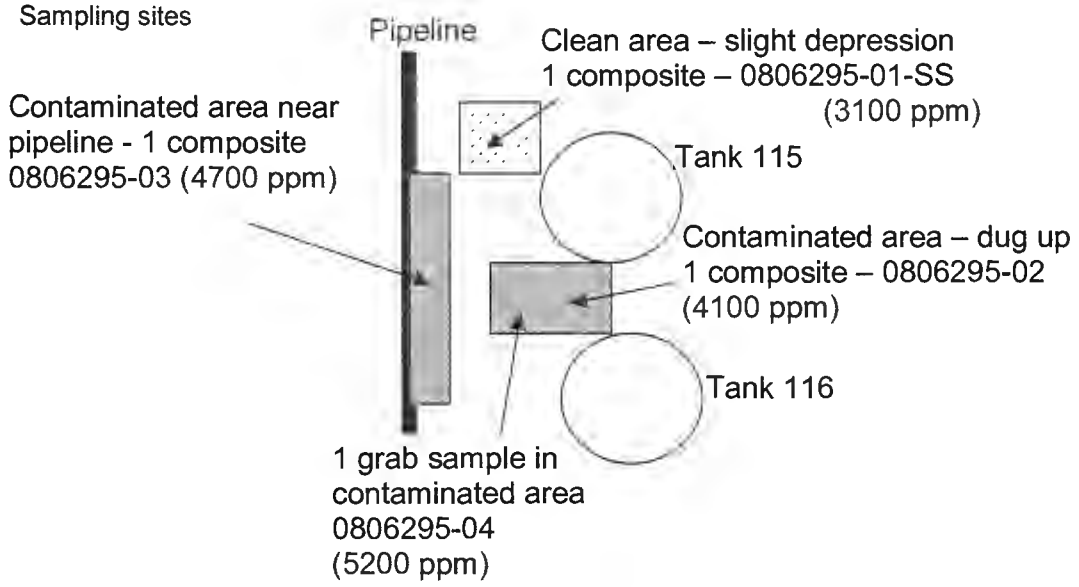

Figure 9: Second set of results after excavation had occurred.

Laboratory data for these samples are also presented in Appendix A. These results show levels of DRO of the order of 4000 - 5000 ppm that were found at the bottom of the excavated area even after 2 feet of contaminated dirt had been removed.

We have assessed the potential for contaminants from this current spill to migrate into the subsurface as being much less than 2 feet. We have excavated soils to this level and disposed off these soils at a permitted landfill. We believe that the levels of DRO being found below this level are probably from previous historical occurrences. Also, near the active pipelines located within the spill area that bring product in and out of the tanks it is not possible for us to excavate deeper without prejudice to the safety of these pipelines. We have reduced the levels of contamination by a factor greater than 10. However, there is some contamination at the level of approximately 4000 – 5000 ppm of DRO existing at the site.

3.0 Abatement Options

What can be done about possible past spills now that the site is covered?

Our approach has been the following:

- We have modeled the likely spread of contaminants into the subsurface using an EPA-approved model called CHEMFLO. We assumed a loamy-clay soil with 1

foot of ponded liquids on top. No contamination was predicted to travel deeper than about 1-2 feet even if the liquids stayed at a 1 foot depth on the surface for over 1000 hours – this was not the case in practice as product was picked up within a few hours after the spill. Details are provided in Appendix A. This lends support to the conclusion that contaminated soils below two feet is probably from previous activities.

- We have carried out a test of passive venting at the site, using a perforated pipe emplaced in to the soil above an area of contamination and started collecting measurements of vapor concentrations within this pipe. Figure 10 depicts a photograph of the perforated pipe we constructed, and Figure 11 shows it in place near a pipeline where it is difficult to excavate.

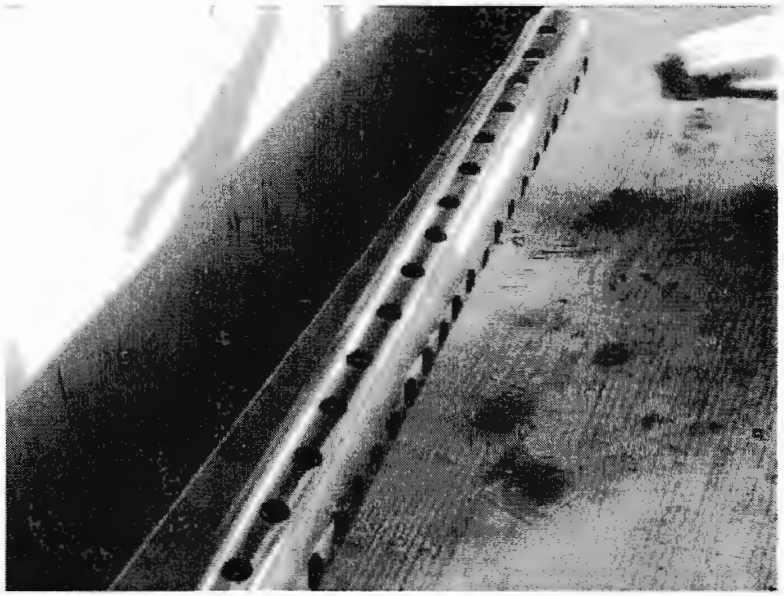

Figure 10: Perforated pipe that has been constructed

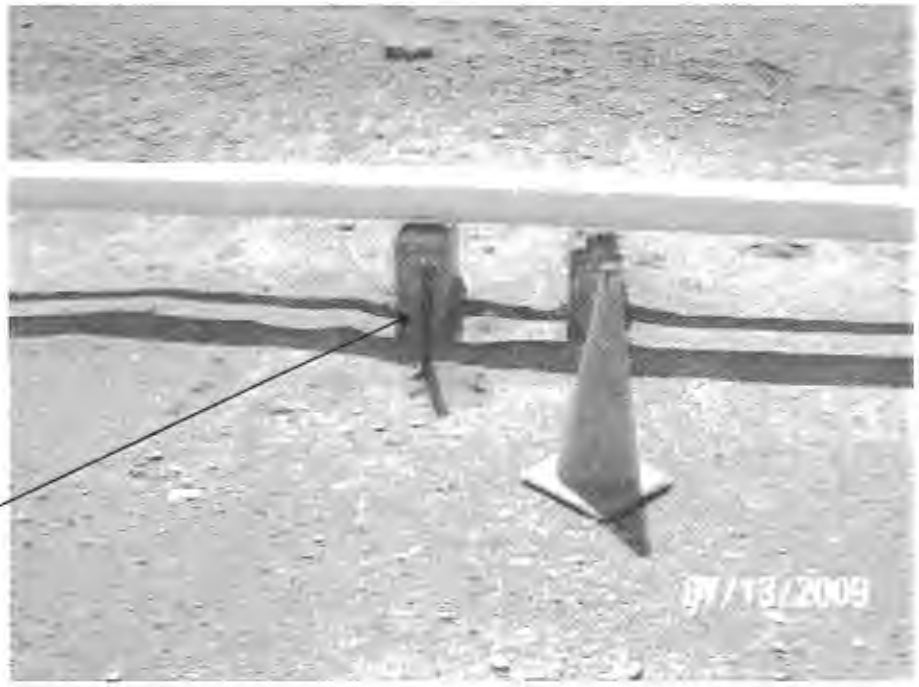

Figure 11: Photograph of emplaced pipe – the section with holes is inside the ground

Over time, vapor concentrations found within the pipe varied considerably. To monitor these concentrations we used a sensitive hydrocarbon vapor detection system based on a flame ionization detector. The concentrations could have been varying because microbial activity within the ground was being enhanced by virtue of the perforated pipe allowing increased air to breathe into the soil. These changing levels could also be from diurnal variations in the flow of soil gases as the ground heats and cools. We monitored these levels for a period of 12 months. Then, we collected a soil sample from this location which was previously known to be at 4700 ppm of DRO. **This level is now 190 ppm**. Details of this set of samples are provided in Figure 12. (We were confident that the entire road surface and buried valve area had been entirely cleaned up – however, as confirmatory samples had not been taken we have collected these and results are also provided.) We will now place more such pipes with OCD's concurrence to reduce contamination that is known to exist within the ground. We also seek OCD's concurrence to postpone further excavation until an opportune time arises in the future, and/or the area is taken out of service.

Sampling Plan – Tank 116

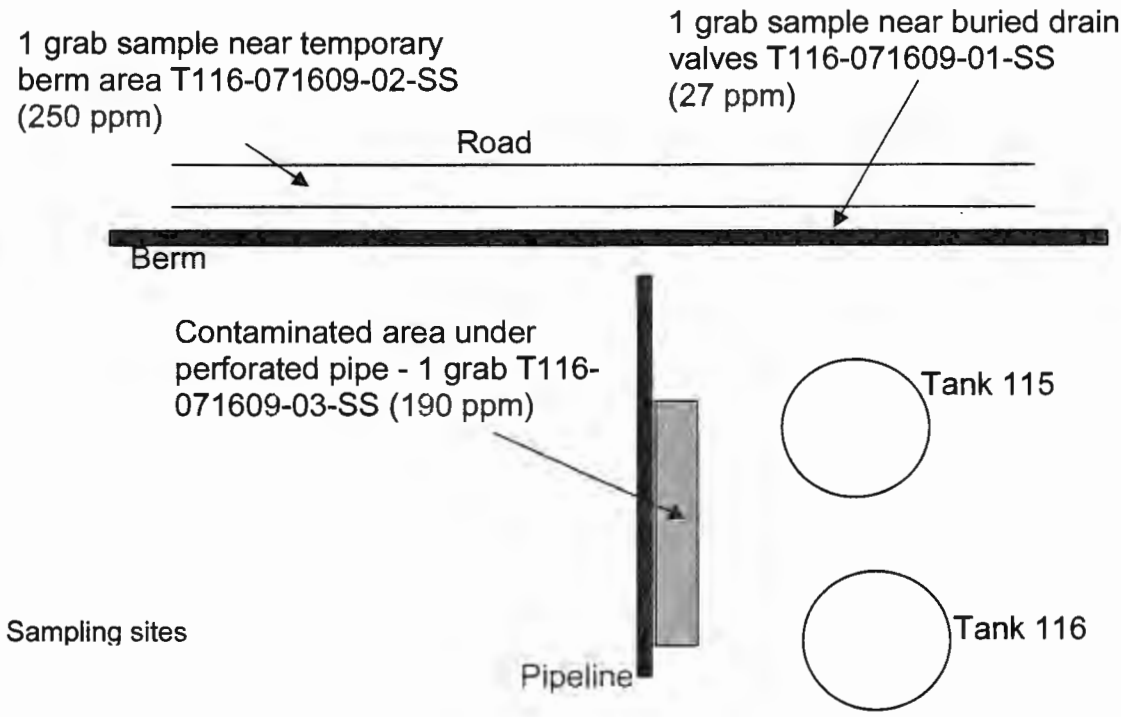

Figure 12: Last set of data from a third sampling event

4.0 Conclusions

As the spill site is an active work area, and because of the close proximity of functioning pipelines, we have been compelled to fill in the excavated areas (excavated to 2 feet) after having removed known contaminated dirt. We request the Oil Conservation Division (OCD) to allow us to add more perforated pipes at the location and continue to reduce the DRO levels that were found to exist at the site (of the order of 4000 – 5000 ppm). When this area is removed from service, we will clean up all contaminated soils to required levels if any are found.

APPENDIX A

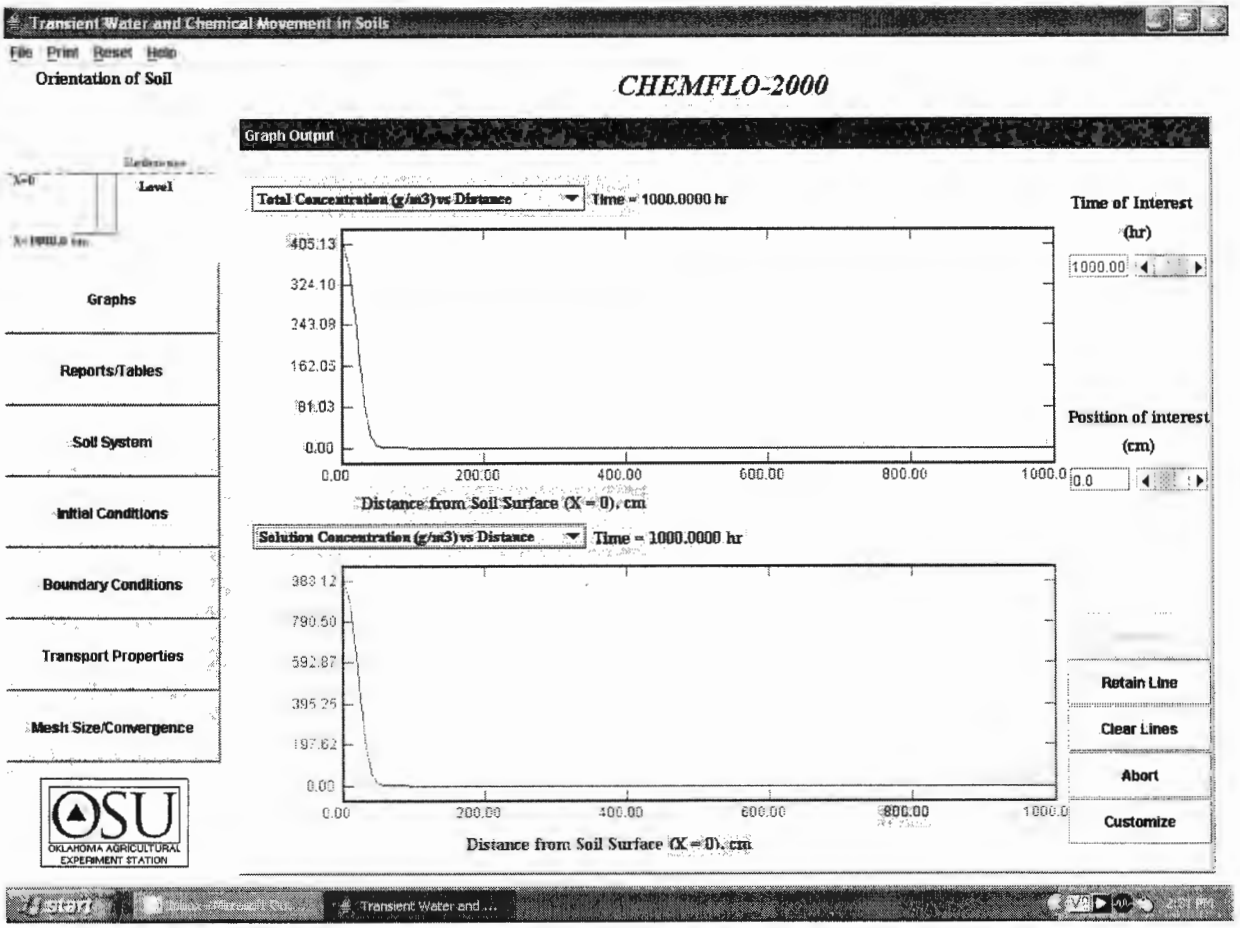

Figure A.1: Likely migration of contaminants into the subsurface – as can be seen, even after 1000 hours, no contamination is expected deeper than about 50 cm (1.6 feet). Therefore, it is extremely likely that contamination found deeper than 2 feet was from previous spills.

Assumptions in the model –

Figure A.2 presents details of the soil parameters built into the model. We assumed a sandy clay loam. Figure A.3 presents assumed chemical transport parameters.

CHEMFLO-2000

Select Soil of Interest

Soil: Sandy Clay Loam

◉ Finite Length Soil Soil Length (cm): 500.0

○ Semi-infinite Soil

Angle of Inclination, (degrees): 90

Layer	Thickness (cm)	Conductivity Function	Water Characteristic Function	Organic Carbon (g/g)	Bulk Density (Mg/m3)
1	500.0	van Genuchten	van Genuchten	0.014	1.62
		K_s (cm/hr) = 1.31	θ_s (v/v) = 0.39		
		α (1/cm) = 0.059	θ_r (v/v) = 0.1		
		n = 1.48	α (1/cm) = 0.059		
			n = 1.48		

Figure A.2: Assumed soil parameters

CHEMFLO-2000

Transport Properties

Diffusion Coefficient of Chemical in Water(cm2/hr)	0.03528
Dispersivity (cm)	0.12
Uniform Partition Coefficient (m3/Mg soil)	0.095
Uniform 1st-Order Degradation Const. in Liquid (1/hr)	0.47
Uniform 1st-Order Degradation Const. on Solids (1/hr)	0.0004
Uniform Zero-Order Production Constant (g/m3/hr)	0.0

Figure A.3: Assumed chemical transport properties