DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)
AI # 1456
Current Human Exposures Under Control

Facility Name: Motiva Enterprises LLC/Shell Chemical LP, Norco East Site
Facility Address: 15536 River Road, Norco, LA 70079
Facility EPA ID #: LAD 008 186 579

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

__X__ If yes - check here and continue with #2 below.

_____ If no - re-evaluate existing data, or

_____ If data are not available skip to #6 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale / Key Contaminants
Groundwater	X	___	___	Several groundwater investigations, including the East Site Perimeter Groundwater Assessment have been completed. See table below for list of key contaminants.
Air (indoors)[2]	___	X	___	No buildings are located over areas of soil and/or groundwater impacts. Additionally, all refinery control rooms are maintained with positive pressure.
Surface Soil (e.g., <2 ft	X	___	___	Impacted surficial soils were identified during the South Property Benzene Investigation. See table below for list of key contaminants.
Surface Water	___	X	___	No impacts to surface water are suspected based on investigations conducted to date.
Sediment	___	X	___	No impacts to sediment were identified during investigations conducted to date.
Subsurf. Soil (e.g., >2 ft)	X	___	___	Impacted soils have been identified during various subsurface investigations. See table below for list of key contaminants.
Air (outdoors)	X	___	___	Potential for construction worker scenario only for soils identified during South Property Benzene Investigation and along Airline Highway North Property Frontage.

_____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

__X__ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

_____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s):

Perimeter Groundwater Assessment. In September 1997, as part of the Phase I data evaluation of the Perimeter Groundwater Assessment at the Norco East Site (Figure 1 of Appendix A), Norco performed a review of known soil and/or groundwater impacts (PSI, 1997a). The review included data from 69 environmental site assessments and groundwater monitoring data from various on-going monitoring systems, including the Area 12 Perimeter System, the Refinery Wastewater Treatment System, the Old Landfill System, the New Landfill System and the Refinery Effluent Conveyance System. Additionally, a review of historic aerial photographs and facility maps was performed. The goal of the data review was to evaluate the potential for impacts to the site perimeter. Two areas of concern were identified near the site perimeter, the West Pond Separator and the rail car cleaning area (OL-5 Unit). Following the Phase I data evaluation in 1998 and 1999, a Phase II subsurface investigation was performed at the Norco East Site perimeter (PSI, 1998; PSI, 1999). Results from the Perimeter Groundwater Assessment indicated that the MO-1 GW_{3NDW} RECAP standard was exceeded for tetrahydrothiophene at well No. 150. It was also determined that shallow groundwater in the vicinity of well No. 150 discharges to the refinery wastewater conveyance and treatment system.

Groundwater Monitoring Systems. The following monitoring systems are in place at the Norco East Site and are located on Figure 2 of Appendix A:

- Closed Solid Waste Landfill (Quarterly)
- New Solid Waste Landfill (Semi-annual)
- Refinery Wastewater Treatment System (Semi-annual)
- South Property Monitoring System (Quarterly)
- West Pond Separator Monitoring System (Annual)

Groundwater quality is monitored at each of these locations at the specified frequency, and reported to LDEQ in periodic reports.

Recent Site Investigations. Since completing the investigations associated with the Perimeter Groundwater Assessment, several additional subsurface investigations have been performed at the Norco East Site. Findings associated with each investigation have been submitted to LDEQ for review (see References). Recent investigations have been performed in the following specific areas:

- West Pond Separator (Rail Yard Area)
- Airline Highway North Property Frontage
- SU2000 Area & South Property Benzene Investigations
- OL-5 Assessment
- Groundwater Certification Assessments

West Pond Separator
The West Pond Separator (WPS) area was historically used to treat stormwater and process wastewaters, with the last separator being closed in 1986. Several site investigations had been performed in this area during 1989-1992 and an annual groundwater-monitoring program commenced in 1993. Nine years of results for VOCs and SVOCs show stable groundwater conditions in this area. An additional groundwater investigation was completed in the WPS area in 1996 (PSI, 1996) and in 1999 as part of the Perimeter Groundwater Assessment (PSI, 1999). In 2001, additional soil sampling was performed as part of a source characterization project (ERM, 2001a).

Airline Highway North Property Frontage
The area between the Norco North Property fence line and Airline Highway was once a continuation of the drainage canal on the north side of Airline Highway east of the Motiva property. The portion of the drainage canal bordering the North Property fence line was filled-in sometime during the 1960's. A preliminary characterization of subsurface soils was completed in May 2001 (ERM, 2001b), following the initial discovery of impacted soils in March 2001.

SU2000 Area & South Property Benzene Investigations
In 2001, Norco conducted a subsurface investigation to delineate an existing MTBE plume associated with an SU2000 gasoline spill at the Norco East Site South Property (PSI, 2001). During the course of this investigation, a separate benzene plume was identified and an additional subsurface investigation was performed to characterize and delineate the plume (PSI, 2002). A network of monitoring wells was installed in October 2002 and quarterly sampling commenced in January 2003. Additional ongoing activities include an evaluation of the potential need for corrective action.

OL-5 Unit Assessment
In 1997, Norco performed an assessment at the OL-5 Unit following a release of gas oil. During these assessment activities, historic contamination, most likely associated with the former rail car cleaning facility that pre-dated construction of OL-5 Unit, was identified by the presence of SVOCs (PSI, 1997b).

Groundwater Certification Assessments
Numerous Groundwater Certification assessments have been performed historically at the Norco East Site. These

soil and groundwater investigations are required by the LDEQ for issuance of a Groundwater Certification and are most commonly performed prior to initiation of construction at the facility. As each groundwater certification assessment is performed a summary report is completed and submitted to LDEQ for approval.

The COCs in soil and groundwater exceeding MO-1 RECAP standards or site-specific background concentrations are listed in the following table. Locations of these exceedances are identified on Figures 3, 4 and 5 of Appendix A.

Chemical	CAS No.	RECAP Standard	Risk Based Value (mg/L or mg/kg)
Groundwater:			
Chrysene	218-01-9	GW3NDW*	2.00E-04
2-Methylnaphthalene	91-57-6	GW3NDW	1.78E-01
Benzene	71-43-2	GW3NDW	1.25E-02
Benzo(a)anthracene	56-55-3	GW3NDW*	2.00E-04
Bis(2-ethylhexyl)phthalate	117-81-7	GW3NDW*	1.00E-02
Dibenzofuran	132-64-9	GW3NDW	1.52E-02
Fluorene	86-73-7	GW3NDW	7.76E-02
Naphthalene	91-20-3	GW3NDW	2.23E-01
Phenanthrene	85-01-8	GW3NDW	8.78E-02
Tetrahydrothiophene	110-01-0	GW3NDW	1.81E+00
TPH		GW3NDW	2.36E+01
TPH-D		GW3NDW	2.36E+01
Soil:			
Chrysene	218-01-9	SoilGW3NDW	1.81E+00
2-Methylnaphthalene	91-57-6	SoilGW3NDW	1.70E+02
Anthracene	120-12-7	SoilGW3NDW	1.21E+02
Benzene	71-43-2	SoilGW3NDW	1.28E-01
Benzo(a)anthracene	56-55-3	SoilGW3NDW	1.63E-02
Benzo(a)pyrene	50-32-8	Soili	3.57E-01
Benzo(b)flouranthene	205-99-2	Soili	3.56E+00
Bis(2-ethylhexyl)phthalate	117-81-7	SoilGW3NDW	1.53E-01
Dibenz(a,h)anthracene	53-70-3	Soili	3.58E-01
Dibenzofuran	132-64-9	SoilGW3NDW	1.49E+01
Fluoranthene	206-44-0	SoilGW3NDW	1.86E+02
Fluorene	86-73-7	SoilGW3NDW	7.19E+01
Ideno(1,2,3-cd)pyrene	193-39-5	Soili	3.58E+00
Lead	7439-92-1	Site background	4.13E+02
Mercury	7439-97-6	SoilGW3NDW	4.00E+00
Naphthalene	91-20-3	SoilGW3NDW	3.23E+01
Phenanthrene	85-01-8	SoilGW3NDW	1.49E+02
TPH		Soili	5.01E+03
TPH-D		Soili	5.01E+03

*Based on analytical quantitation limit.

References:

- ERM, 2001. Airline Highway North Property Frontage Assessment. Shell Chemical Company/Motiva Enterprises LLC Norco Manufacturing Complex.

- ERM, 2001. Source Characterization Summary – Rail Yard Area Site Assessment. Motiva Enterprises LLC.
- Motiva Enterprises LLC, 2003. 2002 Annual Groundwater Monitoring Report, West Pond Separator Monitoring System, Norco Refinery, Motiva Enterprises LLC, AI #1406 (January 8, 2003).
- Motiva Enterprises LLC, 2002. Quarterly Groundwater Monitoring Report—October 2002 Sampling Event and Fourth Quarter 2002 Assessment Plan Status Report, Closed Solid Waste Landfill, Permit Number P-0114-A1, AI #1406, Motiva Enterprises LLC, Norco Refinery (November 21, 2002).
- Motiva Enterprises LLC, 2002. Semi-annual Groundwater Monitoring Report and Request for No Further Action, South Property Monitoring System, Motiva Enterprises LLC, Norco Refinery, Norco, Louisiana (November 1, 2002).
- Motiva Enterprises LLC, 2002. Groundwater Sampling Event—August 2002, Solid Waste Landfill, GD-089-0359/P-0310, Motiva Enterprises LLC—Norco Refinery, AI #1406 (October 21, 2002).
- Motiva Enterprises LLC, 2002. Semiannual Groundwater Monitoring Report, Refinery Wastewater Treatment System, Permit Number P-0268, AI #1406, Norco Refinery, Motiva Enterprises LLC (September 10, 2002).
- PSI, 2002. South Property Benzene Investigation. Shell Chemical LP, Norco East Site, Norco, Louisiana.
- PSI, 2001. Investigation of the SU2000 Area for RCRIS Submittal at the Motiva Enterprises Norco Refinery, Norco, Louisiana.
- PSI, 2000. East Site Perimeter Monitoring Plan for the Motiva Enterprises Norco Refinery and Shell Chemical Company – East Site, Norco, Louisiana.
- PSI, 1999. Round 2 of the Phase II Investigation. Perimeter Groundwater Assessment at he Motiva Enterprises Norco Refinery and Shell Chemical Company – East Site, Norco, Louisiana.
- PSI, 1998. Report of Round 1 Sampling Results of the Phase II Investigation. Perimeter Groundwater Assessment at the Shell Norco Manufacturing Facility – East Site, Norco, Louisiana.
- PSI, 1997. Phase I Evaluation Report. Perimeter Groundwater Assessment, Shell Norco Manufacturing Facility – East Site, Norco, Louisiana.
- PSI, 1997. Additional Assessment of OL-5 Gas-Oil Release, Shell Chemical Company – East Site, Norco Louisiana.

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggests that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table
Potential **Human Receptors** (Under Current Conditions)

Contaminated Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food[3]
Groundwater	No	No	No	Yes	No	No	No
~~Air (indoors)~~							
Soil (surface, <3 ft)	No	Yes	No	Yes	Yes	No	No
~~Surface Water~~							
~~Sediment~~							
Soil (subsurface, >3 ft)	No	No	No	Yes	No	No	No
Air (outdoors)	No	No	No	Yes	No	No	No

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.

2. enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

__X___ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

_____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale and Reference(s):
To establish a conceptual exposure model for the Norco East Site, available information has been analyzed to identify potential pathways of human and ecological exposure to impacted media. An exposure assessment flowchart is provided in Figure 6 of Appendix 1, and evaluates the potential sources, transport mechanisms, and exposure pathways associated with potentially affected soil, groundwater, sediment, or surface water at the site. For each exposure pathway, relevant on-site and off-site receptors have been identified. Based on available site information, this flowchart provides a site wide conceptual model of complete human exposure pathways at the Norco East Site facility.

Groundwater. A detailed evaluation of groundwater use for the area was included in the Management Option-2 Report of the CMS Work Plan (Equilon, 2001) for the Norco Chemical West Site. It is reasonable

to apply this evaluation of groundwater use to the Norco East Site. There is no current use of the impacted groundwater in the area. Consequently, groundwater exposure to Residents, Workers, Day-Care Facilities, Trespassers, Recreational Individuals, or Food is not expected. Since first encountered groundwater occurs between 2 and 8 feet below ground surface, it is possible that direct exposure may be possible during construction activities.

Surficial Soils. Impacted surficial soils above risk-based limits have been identified in limited soil samples during the South Property Benzene Investigation. The impacts are present in on-site soils. Consequently, exposure to Residents, Day-Care Facilities, Recreational Individuals, or Food is not expected. Potential exposure to Workers, Construction Workers, and Trespassers is possible.

Subsurface Soils. Impacted subsurface soils above risk-based limits have been identified during investigations at the South Property Benzene Investigation area, West Pond Separator, Airline Highway North Property Frontage and several assessments performed to support a Groundwater Certification. The subsurface soil impacts are greater than 3 feet in depth. Consequently, exposure to Residents, Workers, Day-Care Facilities, Trespassers, Recreational Individuals, or Food is not expected. Potential exposure to Construction Workers is possible.

Air (outdoors). Excavation activities may result in brief exposure of construction workers to vapors from soil or groundwater. Outdoor air exposure to Residents, Workers, Day-Care Facilities, Trespassers, Recreational Individuals, or Food is not expected.

Note that although the exposure pathways listed above are potentially complete, institutional and engineering controls are in place to prevent significant exposure (see question 4) including the following:

- Current OSHA health and safety protocols are in place to manage potential exposure during construction activities.
- The work permit process at the Norco East Site prevents the initiation of construction work without proper safety measures.
- Property owners have been notified of the presence of impacted soil and groundwater.

References:

- Equilon Enterprises LLC, 2001. RCRA Corrective Measures Study Work Plan (Revision 2), Shell Chemical Company, Norco, Louisiana.
- ERM, 2001. Airline Highway North Property Frontage Assessment. Shell Chemical Company/Motiva Enterprises LLC Norco Manufacturing Complex.
- ERM, 2001. Source Characterization Summary – Rail Yard Area Site Assessment. Motiva Enterprises LLC.
- PSI, 2002. South Property Benzene Investigation. Shell Chemical LP, Norco East Site, Norco, Louisiana.
- PSI, 2001. Investigation of the SU2000 Area for RCRIS Submittal at the Motiva Enterprises Norco Refinery, Norco, Louisiana.

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

__X__ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

Several controls have been implemented at the Norco East Site to limit exposure from any of the complete pathways identified in question #3. These controls include standard operating procedures for the Norco East Site (i.e., work permit procedures). The work permit process at the plant prevents the initiation of construction work without proper safety measures. Compliance with these procedures will prevent any significant exposures to construction workers (surficial soil, subsurface soil, shallow groundwater, and outdoor air).

Soil concentrations exceeding risk-based limits were found along the Airline Highway North Property Frontage and adjacent to the western property boundary of the South Property. Significant exposures to construction workers could not be entirely prevented using only controls in place at the Norco East Site. In both of these cases, notification of property owners was performed as an additional control measure. The Louisiana Department of Transportation and Development was notified of existing conditions in the right-of-way along Airline Highway, south of the North Property. St. Charles Parish was notified of existing subsurface conditions beneath Teal Street adjacent to the South Property. Additionally, current OSHA health and safety protocols are in place to manage potential exposure during construction activities.

References:

- ERM, 2001. Airline Highway North Property Frontage Assessment. Shell Chemical Company/Motiva Enterprises LLC Norco Manufacturing Complex.
- PSI, 2002. South Property Benzene Investigation. Shell Chemical LP, Norco East Site, Norco, Louisiana.

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

_____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):_____

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

__X__ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the **Motiva Enterprises LLC/Shell Chemical LP, Norco East Site** facility, EPA ID # LAD **008 186 579**, located at **15536 River Road, Norco, Louisiana** under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by (signature) Jeffrey T. Jones Date 12/30/02
(print) Jeffrey T. Jones
(title) Geologist III, Environmental Technology Division

Supervisor (signature) N M Dave Date 1/7/03
(print) Narendra M. Dave
(title) Geological Manager, Environmental Technology Division
Louisiana Department of Environmental Quality

Locations where References may be found:

Louisiana Department of Environmental Quality, Baton Rouge, LA
Motiva Enterprises LLC/Shell Chemical LP, Norco East Site, 15536 River Road, Norco, LA

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FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.