

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)

Current Human Exposures Under Control

Facility Name: Lockheed Martin - Michoud Assembly Facility (MAF).
Facility Address: 13800 Old Gentilly Road, New Orleans, LA 70129
Facility EPA ID #: LA 4 800 014 587

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?

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).

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

Page 2

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)?

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale / Key Contaminants</u>
Groundwater	<u>X</u>	—	—	<u>TCE, DCE, VINYL CHLORIDE</u>
Air (indoors) ²	—	—	<u>X</u>	<u>limited data to make determination</u>
Surface Soil (e.g., <2 ft)	<u>X</u>	—	—	<u>TCE, DCE, VINYL CHLORIDE</u>
Surface Water	<u>X</u>	—	—	<u>TCE, DCE, VINYL CHLORIDE</u>
Sediment	—	<u>X</u>	—	—
Subsurf. Soil (e.g., >2 ft)	<u>X</u>	—	—	<u>TCE, DCE, VINYL CHLORIDE</u>
Air (outdoors)	—	<u>X</u>	—	<u>Potential only during soil excavation</u>

— 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): Lockheed Martin correspondence to LDEQ dated July 12, 1998 documents results of the MAF risk-based corrective action program evaluation for the areas of concern associated with chlorinated ethenes

See attached Appendix A (from above reference) tables for representative contaminant concentrations and risk-based protective concentrations for the media of soil, surface water and groundwater.

Footnotes:

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) suggest 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.

APPENDIX A

**Table 7-45
Group 3 AOC RBCA Assessment
Proposed Alternate Concentration Limits (ACLs)
Surficial Soil**

Constituent Of Concern	CAS ID	C _s (mg/kg)	Proposed ACL (mg/kg)
cis-1,2-Dichloroethene (DCE)	156-59-2	9.75	696 to 1,200
Trichloroethene (TCE)	79-01-6	71.5	40.3 to 820
Vinyl Chloride (VC)	75-01-4	2.72	0.157 to 1,200

Notes:

C_s – Representative soil concentration from data statistics for Group 3 AOC RBCA Assessment (see Table 7-4, pg. 7-16).

ACL – Alternate concentration limit based on CO-2 CALs (see Table 7-24, pg. 7-62).

Lower value is based on the CO-2 CAL for the human health inhalation exposure pathway, as determined by the LDEQ.

Upper value is based on the CO-2 CAL protective of groundwater with a site-specific infinite Natural Attenuation Factor (NAF), as justified in Section 7.5.2.4, pg 7-59. The conclusion of this assessment is that surficial soil contaminants will never be transported via groundwater to a point of exposure for any receptor. Therefore, the soil saturation concentration (reported in the technical literature, and used by the LDEQ in calculating CO-2 soil CALs) is used as the proposed upper range ACL concentration. The soil saturation concentration is the highest expected concentration of the COC in surficial soil; higher concentrations will be released to the surrounding environment.

**Table 7-46
Group 3 AOC RBCA Assessment
Proposed Alternate Concentration Limits
Storm Drain Surface Water**

Constituent Of Concern	CAS ID	C_w (mg/L)	Proposed ACL (mg/L)
cis-1,2-Dichloroethene (DCE)	156-59-2	0.585	1.70 to 17.0
Trichloroethene (TCE)	79-01-6	0.608 g	0.021 to 0.21
Vinyl Chloride (VC)	75-01-4	0.104	0.036 to 0.36

Notes:

C_w – Representative storm drain water concentration from data statistics for Group 3 AOC RBCA Assessment (see Table 7-1, pg. 7-13).

ACL – Alternate concentration limit based on CO-1 CALs (see Table 7-10, pg. 7-39).

Lower limit is based on CO-1 CAL with no Natural Attenuation Factor (NAF).

Upper limit applies a NAF of 10 the CO-1 CAL, based on estimated actual attenuation that occurs during contaminant transport, as calculated below.

The use of a NAF = 10 is based on the average dilution of the storm drain outfall water entering the onsite Borrow Canal, which is the nearest potential point of exposure.

Outfall volume is based on a 2-hour storm event assuming a flow rate of 1 ft/s And ¼ to ½ capacity in the storm drain outfall piping. The volume of the Borrow Canal was estimated from the width (100 ft), length (5280 ft), and depth (6 ft) of the eastern branch. The dilution factor from the storm drain outfalls to the Borrow Canal ranges from 7.7 for ½-full pipes to 15 for ¼-full pipes, with a value of 10 as an average for a range of storm drain runoff events.

**Table 7-47
Group 3 AOC RBCA Assessment
Proposed Alternate Concentration Limits
Shallow Groundwater**

Constituent Of Concern	CAS ID	Surficial C_w (mg/L)	Shallow C_w (mg/L)	Proposed ACL (mg/L)
cis-1,2-Dichloroethene (DCE)	156-59-2	262	340	70.3 to 3,500
Trichloroethene (TCE)	79-01-6	693	1,000	2.60 to 1,100
Vinyl Chloride (VC)	75-01-4	32.3	41.2	4.46 to 2,760

Notes:

C_w – Representative surficial and Shallow Aquifer groundwater concentrations from Data statistics for Group 3 AOC RBCA Assessment (see Table 7-2, pg. 7-14 and Table 7-3, pg. 7-15, respectively).

ACL – Alternate concentration limit based on CO-1 CALs (see Table 7-11, pg. 7-40 and Table 7-12, pg. 7-41)

Lower value is based on the CO-1 CAL multiplied by a Natural Attenuation Factor (XNAF) of 124 for application at industrial sites with LDEQ RBCA groundwater classification 3 (gw3).

Upper value is based on the CO-1 CAL protective of groundwater with a site-specific infinite Natural Attenuation Factor (NAF), as justified in Section 7.5.2.4, pg 7-59. The conclusion of this assessment is that shallow groundwater contaminants will never be transported via shallow groundwater to a point of exposure for any receptor. Therefore, the solubility limit of the constituent of concern in water (reported in the technical literature, and used by the LDEQ in calculating CO-1 groundwater CALs) is used as the proposed upper range ACL concentration for shallow groundwater. The solubility limit is the highest expected concentration of the COC dissolved in groundwater; higher concentrations will separate into a separate dense non-aqueous phase liquid (DNAPL) that is not subject to the same fate and transport dynamics in the environment.

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

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)

<u>"Contaminated" Media</u>	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food ³
Groundwater	<u>NO</u>	YES	<u>NO</u>	—			<u>NO</u>
Air (indoors)	<u>NO</u>	YES	<u>NO</u>				
Soil (surface, e.g., <2 ft)	<u>NO</u>	YES	<u>NO</u>		<u>NO</u>	<u>NO</u>	<u>NO</u>
Surface Water	<u>NO</u>	YES			<u>NO</u>	<u>NO</u>	<u>NO</u>
Sediment							
Soil (subsurface e.g., >2 ft)							<u>NO</u>
Air (outdoors)							

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).
- 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): See attached Appendix B for a diaigram illustrating the complete pathways for contaminated media. This figure was extracted from the July 12, 1998 RECAP report submitted to LDEQ by Lockheed Martin.

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

APPENDIX B

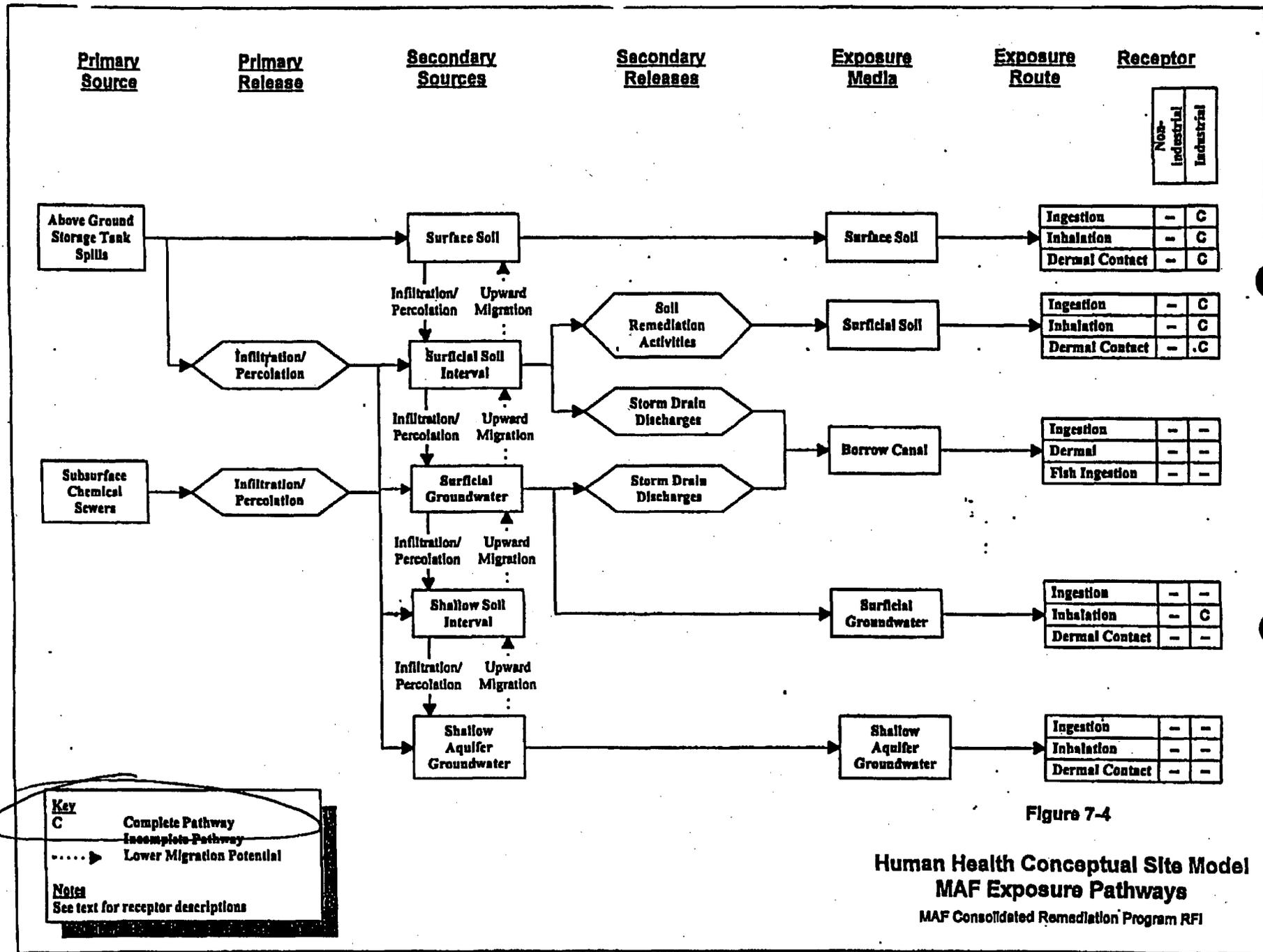


Figure 7-4

**Human Health Conceptual Site Model
 MAF Exposure Pathways**
 MAF Consolidated Remediation Program RFI

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

Page 4

4. 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)?

_____ 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."

X 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): The potential unacceptable human exposures identified in #3 above are applicable only during disturbance of contaminated media for a limited time. These potential exposures are prevented through appropriate monitoring of work areas and construction areas and the use of appropriate personal protective equipment (PPE). Potential indoor air exposures are prevented under normal working conditions by sealed concrete floors, very high ceilings, and high rate of indoor air exchange consistent with air quality requirements for a fabrication facility.

References: Lockheed Martin correspondence to LDEQ dated July 12, 1998 documents results of the MAF risk-based corrective action program evaluation for the areas of concern associated with chlorinated ethenes (July 12, 1998 RECAP report submitted to LDEQ by Lockheed Martin)

Documentation on indoor air circulation and exchange provided by Lockheed Martin Health and Safety.

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)

Page 6

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):

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 Lockheed Martin (formerly Michoud Assembly) facility, EPA ID #LA4 800014587, located at New Orleans, 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) *Douglas Bradford* Date March 30, 2001
(print) Douglas Bradford
(title) Geologist

Supervisor (signature) *Narendra M. Dave* Date 3/30/2001
(print) Narendra M. Dave
(title) Geological Manager
(EPA Region or State) Louisiana

Revised 6/9/04 B. Stueferwald EPARL6

Locations where References may be found:

- 1) Lockheed Martin, Michoud Assembly Facility, New Orleans, LA
- 2) Louisiana Department of Environmental Quality- Baton Rouge, Louisiana- Environmental Technology Division.

Contact telephone and e-mail numbers

(name) Douglas Bradford- LDEQ- ETD
(phone #) (225) 765-0489
(e-mail) douglasb@deq.state.la.us

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.

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name: Lockheed Martin - Michoud Assembly Facility (MAF).
Facility Address: 13800 Old Gentilly Road, New Orleans, LA 70129
Facility EPA ID #: LA 4 800 014 587

1. Has all available relevant/significant information on known and reasonably suspected releases to the groundwater media, 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?

- If yes - check here and continue with #2 below.
 If no - re-evaluate existing data, or
 If data are not available, skip to #8 and enter "TN" (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 "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "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 "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

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).

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)

Page 2

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**¹ above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

X If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s): Lockheed Martin correspondence to LDEQ dated July 12, 1998 documents results of the MAF risk-based corrective action program evaluation for the areas of concern associated with chlorinated ethenes

See attached Appendix A (from above reference) tables for representative contaminant concentrations and risk-based protective concentrations for groundwater.

Footnotes:

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 appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

APPENDIX A

Table 7-47
Group 3 AOC RBCA Assessment
Proposed Alternate Concentration Limits
Shallow Groundwater

Constituent Of Concern	CAS ID	Surficial C _w (mg/L)	Shallow C _w (mg/L)	Proposed ACL (mg/L)
cis-1,2-Dichloroethene (DCE)	156-59-2	262	340	70.3 to 3,500
Trichloroethene (TCE)	79-01-6	693	1,000	2.60 to 1,100
Vinyl Chloride (VC)	75-01-4	32.3	41.2	4.46 to 2,760

Notes:

C_w – Representative surficial and Shallow Aquifer groundwater concentrations from Data statistics for Group 3 AOC RBCA Assessment (see Table 7-2, pg. 7-14 and Table 7-3, pg. 7-15, respectively).

ACL – Alternate concentration limit based on CO-1 CALs (see Table 7-11, pg. 7-40 and Table 7-12, pg. 7-41)

Lower value is based on the CO-1 CAL multiplied by a Natural Attenuation Factor (XNAF) of 124 for application at industrial sites with LDEQ RBCA groundwater classification 3 (gw3).

Upper value is based on the CO-1 CAL protective of groundwater with a site-specific infinite Natural Attenuation Factor (NAF), as justified in Section 7.5.2.4, pg 7-59. The conclusion of this assessment is that shallow groundwater contaminants will never be transported via shallow groundwater to a point of exposure for any receptor. Therefore, the solubility limit of the constituent of concern in water (reported in the technical literature, and used by the LDEQ in calculating CO-1 groundwater CALs) is used as the proposed upper range ACL concentration for shallow groundwater. The solubility limit is the highest expected concentration of the COC dissolved in groundwater; higher concentrations will separate into a separate dense non-aqueous phase liquid (DNAPL) that is not subject to the same fate and transport dynamics in the environment.

**Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)**

Page 3

3. Has the migration of contaminated groundwater stabilized (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"² as defined by the monitoring locations designated at the time of this determination)?

 X If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"³.

 If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"²) - skip to #8 and enter "NO" status code, after providing an explanation.

 If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s): See attached **Appendix B** for an estimate of the pounds of TCE discharged offsite annually. This migration is associated with TCE contaminated groundwater in surficial soils (0-18 feet below ground surface) that infiltrates the below ground storm drainage system, and then enters the MAF perimeter drainage canal before offsite discharge.

 See attached **Appendix C** for documentation that the Shallow Aquifer contaminated groundwater is stabilized and is not migrating beyond the existing area of contamination. Information in this appendix is extracted from the 2000 Annual Report for the MAF Groundwater Monitoring and Corrective Action Programs diagram illustrating the complete pathways for contaminated media. This figure was extracted from the July 12, 1998 RECAP report submitted to LDEQ by Lockheed Martin.

² "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

APPENDIX B

1999 EI SUBMITTAL

September 2001

In the July 22, 1999 submittal (99MO-0569), we reported a "conservative" estimate of 144 pounds of TCE is discharged offsite per year at Outfall 001.* A thorough review of data suggests a total of 4.9 pounds of chlorinated ethenes were discharged offsite in three years, from 1998 through early 2001, or 1.6 lb/year.

Year	Quarter	Contaminat Conc. (mg/l)		MG Pumped	Flow-wt'd Avg Conc. (mg/l) per 57.8 MG		Est'd Pounds of Chl'd Ethenes
		TCE	DCE		TCE	DCE	
1998	2Q-June	0.012	0.008	8.3 ¹	0.00172	0.00114	1.4
1999	1Q-February	0.016	ND	9.4 ²	0.00260	0.00000	1.3
	3Q-July	0.006	0.006	8.0 ³	0.00083	0.00083	0.8
	3Q-August	0.006	ND	8.6 ⁴	0.00089	0.00000	0.4
2001	1Q-February	ND	0.005	23.5 ⁵	0.00000	0.00203	1.0
				57.8	0.006	0.004	4.9

Note: This is 57.8 million gallons (MG) out of 3,310 MG pumped at Outfall 001, or 1.7%, over an approximate 3 year period (average of 943 MG per year). ND means non-detect at 0.005 mg/l.

* Outfall 101, an internal outfall to Outfall 001, has an average annual discharge of 43.3 MG.

There are no discharge limits for chloroethenes for Outfall 001.

- (1) Each of 2 discharges sampled; only one had a contaminant detection; calculation used average discharge of 8.3 MG
- (2) Only 1 of 2 discharges sampled; assumed both had contaminants detected; calculation used average discharge of 4.7 MG
- (3) Four of 5 discharges sampled; assumed detection in one applied only to that one discharge; calculation used average discharge of 8.0 MG
- (4) Six of 7 discharges sampled; assumed detection in one applied only to that one discharge; calculation used average discharge of 8.6 MG
- (5) Only 1 of 5 discharges sampled; assumed all 5 discharges had contaminants detected; calculation used average discharge of 4.69 MG

Calculation based on:
 1 mg/l = 8.345 lb per MG
 1 mg/l = 0.68 gal. TCE/MG; 0.78 gal. DCE/MG; 1.09 gal. VC/MG

DOCUMENTATION OF WATER QUALITY September 2001

The following list of correspondence includes four quarterly Discharge Monitoring Reports, submitted in compliance with the Michoud Assembly Facility NPDES and LPDES Permits. These reports are the source of data for the table on page 2.

<u>Year</u>	<u>Quarter</u>	<u>Month</u>	<u>Report ID</u>
1998	2Q	June	98MO-0663
1999	1Q	February	99MO-0303
1999	3Q	July	99MO-0804
1999	3Q	August	“
2001	1Q	February	01MO-0321

COMPARISON WITH RECAP STANDARD September 2001

On page 7-119 of the Michoud Assembly Facility Phase 3 RFI report (98MO-0710, dated July 24, 1998), Lockheed Martin presented proposed alternate concentration limits (ACLs) for stormdrain surface water.

The lower limits assume no natural attenuation, and the upper limit assumes a 10 times natural attenuation factor, from dilution.

Contaminant	Proposed ACL (mg/l)		3-year Avg Concentration (mg/l)
	Lower	Upper	
TCE	1.70	17.0	0.006
DCE	0.021	0.21	0.004
Vinyl Chloride	0.036	0.36	0.000

As illustrated above, the 3-year average contaminant concentration in the storm drainage system is much less than the proposed lower limit ACL.

Lockheed Martin therefore presents this information as documentation that we have the migration of contaminated groundwater under control.

The following calculations are for:

[TASK 1] "pounds of contaminant discharged per mg/l and per million gallons (MG)"

[TASK 2] "gallons of contaminant per MG discharged."

TASK 1

Given: (a) 1kg = 2.20462 lb
1 lb = 0.4536 kg
1 lb = 453.6E+3 mg
1 mg = 2.2E-6 lb

Given: (b) 1 gallon = 3.7854 liters

Given: (c) 1 gallon (water) = 8.354 lb
1 gallon (TCE) = 12.22 lb
1 gallon (DCE) = 10.63 lb
1 gallon (vinyl chloride) = 7.67 lb

Computation: (a) 1 liter (water) = (1gal/3.7854) (8.345 lb water/gallon) = 2.2 lb (water)

Computation: (b) 1mg (contaminant)/liter (water) = (2.2E-6 lb/2.2 lb water)(8.345 lb water/1 gallon water) =
8.345 lb (contaminant)/1.0E6 gallon =

$$1 \text{ mg/l} = 8.345 \text{ lb/MG, or}$$

$$8.345 \text{ lb} = \text{MG}(\text{mg/l})$$

TASK 2

Given: (a) 1kg = 2.20462 lb
 1 lb = 0.4536 kg
 1 lb = 453.6E+3 mg
 1 mg = 2.2E-6 lb

Given: (b) 1 gallon = 3.7854 liters

Given: (c) 1 gallon (water) = 8.354 lb
 1 gallon (TCE) = 12.22 lb
 1 gallon (DCE) = 10.63 lb
 1 gallon (vinyl chloride) = 7.67 lb

Computation: (a) 1 liter (water) = (1gal/3.7854) (8.345 lb/gallon) = 2.2 lb (water)

Computation: (b) *1mg (TCE)/liter (water) =*
 8.345 lb TCE/1.0E6 gallon) (1 gallon TCE/12.22 lb TCE)=
 0.683 gal (TCE)/1.0E6 gallon = **0.68 gallon TCE/MG**

*1mg (DCE)/liter (water) = 0.785 gal (DCE)/1.0E6 gallon = **0.79 gallon TCE/MG***

*1mg (VC)/liter (water) = 1.088 gal (vinyl chloride)/1.0E6 gallon = **1.09 gallon TCE/MG***

APPENDIX C

**Correlation of 3Q98 Groundwater Data with
Phase 3 RFI Groundwater Data for Monitored Natural Attenuation Assessment**

Michoud Assembly Facility

Well	Phase 3 RFI						Fe(II)	Cl	Eh
	TCE	DCE	3Q98 VC	TOC	Sulfate	Nitrate			
D-1R2	0.4/0.3*	16.8/1.3	19.7/1.8	46.3/52.0	-/-	-/-	1.7	4,680	-119.0
D-2R	-/-	0.14/0.04	3.9/3.4	53.8/89.5	-/-	-/-	-	9,820	-113.7
D-3	-/-	-/-	-/-	NS/45.0	NS / -	NS / -	NS	NS	-101.4
D-4R	-/-	0.002/ -	0.001/ -	54.2/57.7	-/-	-/-	3.2	3,300	-86.4
D-5	-/-	-/-	-/-	NS/47.0	NS / -	NS / -	NS	NS	-136.2
D-6	NS / -	NS / -	NS / -	NS/40.0	NS / -	NS / -	NS	NS	NS
E-1	-/-	-/-	-/-	48.3/57.0	-/-	-/-	-	7,500	+46.7
E-2	-/-	-/-	-/-	52.3/62.5	-/-	-/-	1.84	6,980	-35.1
E-3	-/-	4.4/5.1	10.5/8.5	52.7/57.0	-/-	-/-	-	4,380	-112.1
E-5	-/-	-/-	-/-	NS/37.0	NS / 6.6	NS / -	NS	NS	-133.1
E-6	-/-	-/-	-/-	NS/52.8	NS / -	NS / 0.02	NS	NS	-97.4
E-8	-/-	-/-	-/-	28.1/39.0	-/-	-/0.01	-	14,500	-71.0
E-9R	-	-	-	13.4	957	0.4	5.2	5,530	NS
E-10	-/-	-/-	-/-	NS/38.0	NS / -	NS / -	NS	NS	-75.2
E-13	-/-	-/-	-/-	50.9/63.0	-/-	-/0.01	-	6,270	-5.9
E-14	-/-	-/-	-/-	55.1/62.0	-/-	-/0.01	-	7,030	-20.0
F-1S	-/-	0.004/ -	0.002/ -	8.6/9.4	766/263	0.07/0.15	-	3,420	+24.2

Note: * Phase 3 RFI data/3Q98 data; otherwise the data is for Phase 3 RFI
 NS Not Sampled
 - Not Detected
 All concentrations in mg/l (ppm) except for redox potential (Eh, volts)

E0924a

2098 Volatile Organic Compounds Detected in Samples (mg/l)

Monitor Well No.	Well Type	1,1-Dichloroethane	Xylene (1)	Benzene (1)	Ethylbenzene (1)	Trichloroethylene (1)	Total 1,2-Dichloroethene (1)	Vinyl Chloride (2)
D-1R2	c	-	-	-	-	0.2	1.8	2.6
D-2R	c	-	-	-	-	-	1.2	7.2
D-1S	d	-	1.3	-	-	31.7	24.9	4.1
D-2S	d	-	-	-	-	-	0.10	0.10
D-3S	d	-	-	-	-	0.005	-	-
D-4S	d	-	-	-	-	-	-	-
RW-1	ca	-	-	-	-	68.1	21.2	-
RW-2	ca	-	-	-	-	71.8	129.0	18.9
RW-3	ca	-	-	-	-	92.0	142.0	46.3
E-4	d	-	-	-	-	-	-	-
E-6	d	-	-	-	-	-	-	-
E-9R	d	-	-	-	-	-	-	-
E-13	d	-	-	-	-	-	-	-
E-7	d	-	0.022	0.034	0.014	-	-	-
B-4	ca	-	-	-	-	-	-	18.2
B-5	ca	-	-	-	-	103.0	88.0	15.2
E-14	d	-	-	-	-	-	-	-
E-10	d	-	-	-	-	-	-	-
E-11	d	-	-	-	-	-	-	-
E-12	d	-	-	-	-	-	-	-
E-5	d	-	-	-	-	-	-	-
E-8	d	-	-	-	-	-	-	-
E-1	d	-	-	-	-	-	-	-
B-7A	ca	-	-	-	-	554.0	162.0	-
B-7B	ca	0.007	-	-	-	-	0.02	0.04
B-2AR	d	-	-	-	-	-	-	-
B-2B	d	-	-	-	-	-	-	-
B-3AR	ca	-	-	-	-	183.0	101.0	15.5
B-3B	d	-	-	-	-	-	-	-
B-4D	d	-	-	-	-	-	-	-
B-14D	d	-	-	-	-	-	-	-
E-12D	d	-	-	-	-	-	-	-
E-8D	d	-	-	-	-	-	-	-
E-3	d	-	-	-	-	-	4.9	9.4

Note: - Not Detected
 c Compliance
 D Detection

ca Corrective Action
 (1) Reporting Limit is 0.005 mg/l
 (2) Reporting Limit is 0.010 mg/l

**Correlation of 4Q98 Groundwater Data with
Phase 3 RFI Groundwater Data for Monitored Natural Attenuation Assessment**

Michoud Assembly Facility

Well	Phase 3 RFI						Fe(II)	Cl	Eh
	TCE	DCE	VC	TOC	Sulfate	Nitrate			
D-1R2	0.4/0.8	18.8/1.4	19.7/4.1	46.3/59.2	-/-	-/-	1.7	4,680	-119.0
D-2R	-/-	0.1/1.3	3.9/8.9	53.8/67.0	-/-	-/0.02	-	9,820	-113.7
D-1S	7.7/34.3	12.6/25.3	2.1/8.1	NS/22.0	NS/-	NS/0.16	NS	NS	NS
D-2S	-/-	0.1/1.5	0.1/0.8	31.7/66.0	-/-	-/-	9.6	94	-60.9
D-3S	-/-	-/-	-/-	79.3/65.0	-/-	-/0.04	-	379	-216.0
D-4S	-/-	-/-	-/-	33.0/45.0	-/-	0.90/0.07	0.3	554	-202.3
RW-1	82.5/53.9	23.8/17.1	2.6/2.5	NS/54.1	NS/-	NS/0.02	NS	NS	NS
E-3	-/-	4.4/10.6	10.5/21.9	52.7/62.6	-/-	-/-	-	4,380	-112.1
B-1A	NS/116	NS/48.8	NS/55.0	NS/NS	NS/NS	NS/NS	NS	NS	NS
B-2AR	-/-	-/-	-/-	44.4/NS	-/NS	-/NS	6.5	3,720	-36.0
B-2B	-/-	-/-	-/-	119/NS	-/NS	-/NS	-	12,800	-49.0
B-3AR	241/145	144/76.2	26.6/17.3	101/NS	113/NS	-/NS	16.2	2,200	-74.0
B-3B	-/-	-/-	-/-	39.1/NS	-/NS	-/NS	-	8,720	-114.3
B-4	-/-	-/-	6.5/35.4	49.3/NS	-/NS	-/NS	18.2	6,000	-51.1
B-5	369/269	340/209	35.3/35.2	44.5/NS	-/NS	-/NS	-	8,270	-61.5
B-7A	294/624	155/202	17.8/30.9	NS/NS	NS/NS	NS/NS	NS	NS	-90.6
B-7B	-/-	1.7/3.6	22.3/4.5	NS/NS	NS/NS	NS/NS	NS	NS	-236.7
RW-3	114/83.4	119/112.0	15.4/-	NS/58.1	NS/18.2	NS/-	NS	NS	-63.4
E-7	-/-	-/-	-/-	31.4/NS	-/NS	-/NS	-	12,800	-94.0

Note: * Phase 3 RFI data/4Q98 data; otherwise the data is for Phase 3 RFI (March 1997 sampling event)
 NS Not Sampled
 - Not Detected
 All concentrations in mg/l (ppm) except for redox potential (Eh, millivolts)

**Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)**

5. Is the discharge of "contaminated" groundwater into surface water likely to be "insignificant" (i.e., the maximum concentration³ of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

_____ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration³ of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration³ of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations³ greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s): _____

³ As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)
Page 6

6. Can the discharge of "contaminated" groundwater into surface water be shown to be "currently acceptable" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented⁴)?

_____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment,⁵ appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of "contaminated" groundwater can not be shown to be "currently acceptable") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown - skip to 8 and enter "IN" status code.

Rationale and Reference(s): _____

⁴ Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

⁵ The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)

Page 7

7. Will groundwater monitoring / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

If no - enter "NO" status code in #8.

If unknown - enter "IN" status code in #8.

Rationale and Reference(s): See attached **Appendix C** for documentation that the Shallow Aquifer contaminated groundwater is stabilized and is not migrating beyond the existing area of contamination. Information in this appendix is extracted from the 2000 Annual Report for the MAF Groundwater Monitoring and Corrective Action Programs diagram illustrating the complete pathways for contaminated media. This figure was extracted from the July 12, 1998 RECAP report submitted to LDEQ by Lockheed Martin. Lockheed Martin has an effective operating groundwater recovery system in place that creates a cone of depression resulting in inward gradient of groundwater flow. A sitewide groundwater monitoring system is in place that verifies the horizontal and vertical extent of contaminated groundwater. Groundwater monitoring is conducted and reported to LDEQ.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)
Page 8

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

- YE** - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the Lockheed Martin (formerly Michoud Assembly) facility, EPA ID #LA4 800014587, located at New Orleans, Louisiana. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.
- NO** - Unacceptable migration of contaminated groundwater is observed or expected.
- IN** - More information is needed to make a determination.

Completed by (signature)  Date September 20, 2001
(print) Douglas Bradford
(title) Geologist

Supervisor (signature) _____ Date September 20, 2001
(print) Narendra M. Dave
(title) Geological Manager
(EPA Region or State) Louisiana

Revised 6/9/04 B Stueferman EPAR6
Locations where References may be found:

- 1) Lockheed Martin, Michoud Assembly Facility, New Orleans, LA
- 2) Louisiana Department of Environmental Quality- Baton Rouge, Louisiana- Environmental Technology Division.

Contact telephone and e-mail numbers

(name) Douglas Bradford- LDEQ- ETD
(phone #) (225) 765-0489
(e-mail) douglasb@deq.state.la.us