

## DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

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

#### Current Human Exposures Under Control

**Facility Name:** Clariant LSM (Missouri) Inc. (formerly Archimica (Missouri) Inc.)  
**Facility Address:** 2460 W. Bennett Street, Springfield, Missouri 65807  
**Facility EPA ID #:** MOD095038329

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).

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2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **“contaminated”**<sup>1</sup> above appropriately protective risk-based “levels” (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria (e.g., Maximum Contaminant Levels (MCLs), the maximum permissible level of a contaminant in water delivered to any user of a public water system under the Safe Drinking Water Act) ) 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>ü</u>	___	___	<u>On-site sampling confirms the presence of several chemicals of concern, i.e., benzene, chloroform, 1,2-dichloroethane, dichloromethane, ethylbenzene, toluene, xylenes, above MCLs.</u> <sup>(Rationale 1)</sup>
Air (indoors) <sup>2</sup>	___	<u>ü</u>	___	<u>Risk assessment shows little potential for “unacceptable” exposure to volatilized chemicals of concern (see those listed in “Groundwater” above).</u> <sup>(Rationale 2)</sup>
Surface Soil (e.g., <2 ft)	___	<u>ü</u>	___	<u>On-site sampling indicates the presence of most of the chemicals of concern, including 2,3,7,8-tetrachlorodibenzo-p-dioxin (dioxin), noted above, but no “unacceptable” human exposures, under current land use conditions in surface soils.</u> <sup>(Rationale 3)</sup>
Surface Water	___	<u>ü</u>	___	<u>Surface water sampling showed non-detect for chemicals of concern.</u> <sup>(Rationale 4)</sup>
Sediment	___	<u>ü</u>	___	<u>Historic sampling of stream sediments did not show any contamination with dioxin or other chemicals of concern.</u> <sup>(Rationale 5)</sup>
Subsurf. Soil (e.g., >2 ft)	<u>ü</u>	___	___	<u>On-site sampling confirms the presence of several chemicals of concern in subsurface soils above risk-based levels.</u> <sup>(Rationale 3)</sup>
Air (outdoors)	___	<u>ü</u>	___	<u>Risk assessment show little potential for “unacceptable” exposure chemicals of concern.</u> <sup>(Rationale 6)</sup>

\_\_\_ 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.

ü 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.

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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.

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**Rationale and Reference(s) Attached to #2 above**

**Rationale 1—Groundwater:** On-site sampling confirms the presence of several chemicals of concern: benzene (0.005-2.4 ppm), chloroform (0.005-0.57 ppm), 1,2-dichloroethane (0.005-410 ppm), dichloromethane (0.028-1,500 ppm), ethylbenzene (0.015-2.7 ppm), 2,3,7,8-TCDD (1.7-540 ppt), toluene (0.046-75 ppm), xylenes (0.019-62 ppm) above MCLs. See Tables 3-15 and 3-16, Section 3, RCRA Facility Investigation, Final Report, dated 17 June, 1996, and Table 1, Groundwater Sampling and Analysis Data, April 2001. Concentration range values are cited from Table 6: Summary of 1999 Performance Well Chemical Monitoring Data, “1999 Annual Groundwater Report,” dated 1 March 2000, and Table 1, Groundwater Sampling and Analysis Data, April 2001 (attachment to letter dated August 10, 2001, from T. Scott Barton/Clariant LSM (Missouri), Inc. to R. Bruce Stuart, P.E., R.G./Missouri Department of Natural Resources, RE: Groundwater Sampling and Analysis Data, April 2001.

**Rationale 2—Air (indoors):** The risk assessment of the Corrective Measures Study, dated 15 February 1999 for the Clariant LSM (Missouri) Inc. site, show that adequate protection of on-site workers against inhalation of volatilized chemicals of concern is afforded by existing barriers (asphalt and concrete caps) over contaminated soils and groundwater. See Section 5.5.2.1 and Technical Summary 3, Corrective Measures Study Final Report (draft), dated 15 February 1999. This evaluation used the Johnson-Ettinger model to estimate indoor & outdoor air concentrations from VOC contaminated soil and groundwater, then compared those values to values calculated based on a target risk level of  $1 \times 10^{-5}$  for carcinogens and a target hazard quotient of 1 for noncarcinogenic effects.

**Rationale 3—Surface Soil (e.g., <2 ft):** On-site sampling shows that concentrations of chemicals of concern are below risk-based levels in the surface soil (<2 ft.), because most of the site has been filled for construction of buildings and manufacturing operations, or has been extensively paved with asphalt or concrete. See Figures 3-20 through 3-22, Section 3, RCRA Facility Investigation, Final Report, dated 17 June, 1996, and Table 2-4 and Technical Summary 3, Corrective Measures Study Final Report (draft), dated 15 February 1999.

**Rationale 3—Subsurface Soil (e.g., >2 ft):** On-site sampling shows that concentrations of chemicals of concern are above risk-based levels in subsurface soils (>2 ft.). See Figures 3-20 through 3-22, Section 3, RCRA Facility Investigation, Final Report, dated 17 June, 1996, and Table 2-4 and Technical Summary 3, Corrective Measures Study Final Report (draft), dated 15 February 1999.

**Rationale 4—Surface Water:** Surface water sampling performed in the preparation of the RCRA Facility Investigation showed non-detect for chemicals of concern. See Section 3.5.2.1 and Figure 3-23, Section 3, RCRA Facility Investigation, Final Report, dated 17 June, 1996.

**Rationale 5—Sediment:** Sampling and analysis of sediments in October 1983 by MDNR did not show any contamination with 2,3,7,8-tetrachlorodibenzo-p-dioxin (dioxin) at or above the detection limit (0.14 ug/kg) or other chemicals of concern (detection limit of 5.4 ug/kg).

**Rationale 6—Air (outdoors):** The risk assessment of the Corrective Measures Study, dated 15 February 1999 for the Clariant LSM (Missouri) Inc. site show that adequate protection of on-site workers against inhalation of volatilized vapor and particulate of chemicals of concern is afforded by existing barriers (asphalt and concrete caps) over contaminated soils and groundwater. See Section 5.5.2.1 and Technical Summary 3, Corrective Measures Study Final Report (draft), dated 15 February 1999.

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? No, however, the Corrective Measures Study evaluated four “*potentially*” complete on-site and one “*potentially*” complete off-site exposure pathways.<sup>(1)</sup>

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

<b><u>“Contaminated” Media</u></b>	<u>Residents</u>	<u>Workers</u>	<u>Day-Care</u>	<u>Construction</u>	<u>Trespassers</u>
Recreation Food <sup>3</sup>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>
Groundwater	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>
Air (indoors) <sup>4</sup> — Inhalation of volatilized Chemicals of Concern:					
▪ Inhalation by On-site Workers of volatilized COCs from subsurface soils in <b><u>indoor</u></b> air:	<u>no</u>	<u>yes</u>	<u>no</u>	<u>no</u>	<u>no</u>
▪ Inhalation by On-site Workers of volatilized COCs from A and B1-zone groundwater in <b><u>indoor</u></b> air:	<u>no</u>	<u>yes</u>	<u>no</u>	<u>no</u>	<u>no</u>
Soil (surface, e.g., <2 ft)	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>
Surface Water	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>
Sediment	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>
Soil (subsurface e.g., >2 ft) <sup>5</sup> — Ingestion of airborne dust by Off-site Resident Only:					
	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>
Air (outdoors) <sup>4</sup>					
▪ Inhalation by On-site Workers of volatilized COCs from subsurface soils in <b><u>outdoor</u></b> air:	<u>no</u>	<u>yes</u>	<u>no</u>	<u>no</u>	<u>no</u>
▪ Inhalation by On-site Workers of volatilized COCs from A and B1-zone groundwater in <b><u>outdoor</u></b> air:	<u>no</u>	<u>yes</u>	<u>no</u>	<u>no</u>	<u>no</u>

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

<sup>4</sup> Although no actual exposure is known, the potential for an exposure exists. Under existing conditions, barriers and building ventilation prevent an actual exposure, therefore, the positive response for this media is only a potential exposure. See Section 2.1, “Risk-Based Evaluations,” and Technical Summary 3, Corrective Measures (draft) Final Report, dated 15 February 1999.

<sup>5</sup> Barriers and institutional controls effectively prevent off-site exposure to ingestion of airborne dust, however, the positive response is based on potential exposure under a certain “break-down” scenario. See Section 2.1, “Risk-Based Evaluations,” and Technical Summary 3, Corrective Measures (draft) Final Report, dated 15 February 1999.

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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).

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

**Supporting explanation: Although no complete exposure pathways exist under current conditions, several potentially complete pathways were identified as part of a risk assessment performed as part of the Corrective Measures Study. Responses to this question are based on these future, potential exposure scenarios. See Section 2.1, "Risk-Based Evaluations," and Technical Summary 3, Corrective Measures (draft) Final Report, dated 15 February 1999.**

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

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4 Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be “**significant**”<sup>6</sup> (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.”

\_\_\_\_\_ 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):

Contaminated Media—Air (indoors)

Potentially Complete Exposure Pathway 1: Inhalation of volatilized Chemicals of Concern by On-site Workers from subsurface soils.

Exposures can not be reasonably expected to be significant, i.e., potentially “unacceptable,” for this potentially complete exposure pathway under current conditions. The integrity of existing barriers to exposure, i.e., asphalt paving and concrete floors, is high. Significant number and severity of cracks in these covers do not exist at present. In addition, adequate building ventilation would protect workers from the buildup of concentrations in a range to be potentially hazardous to human health. Thus, the potential for exposure is low. See Section 5.5.2.1 and Technical Summary 3, Corrective Measures Study Final Report (draft), dated 15 February 1999, for an assessment of this exposure pathway.

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<sup>6</sup> 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.

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Potentially Complete Exposure Pathway 2: Inhalation by On-site Workers of volatilized COCs from A and B1-zone groundwater in *indoor* air.

The same rationale as for Pathway 1 above also applies in that the COCs are the same, except there would be even less potential, under current conditions, for this to be considered potentially “unacceptable.” See Section 5.5.2.1 and Technical Summary 3, Corrective Measures Study Final Report (draft), dated 15 February 1999, for an assessment of this exposure pathway.

Contaminated Media—Soil (subsurface e.g., >2 ft)

Potentially Complete Exposure Pathway 3: Ingestion of airborne dust by Off-site Resident.

Exposures can not be reasonably expected to be significant, i.e., potentially “unacceptable,” for this potentially complete exposure pathway under current conditions. Intrusive soil excavation projects in an area and at a depth of potential dioxin contamination occur very infrequently. If they were to occur, existing internal guidelines and procedures (SOPs) would require an evaluation of both the work to be done and the potential human exposures to wastes. Appropriate controls would be prescribed, if appropriate, including monitoring and PPE. The draft CMS includes preparation of a specific SOP for intrusive construction activities in areas where contamination exists (see sections 5.4.1.1, 5.5.1, and 6.1.1 of the draft CMS).

Contaminated Media—Air (outdoors)

Potentially Complete Exposure Pathway 4: Inhalation by On-site Workers of volatilized COCs from subsurface soils in *outdoor* air.

The same rationale as for Pathway 1 above also applies in that the COCs are the same, except there would be even less potential, under current conditions, for this to be considered potentially “unacceptable.” See Section 5.5.2.1 and Technical Summary 3, Corrective Measures Study Final Report (draft), dated 15 February 1999, for an assessment of this exposure pathway.

Potentially Complete Exposure Pathway 5: Inhalation by On-site Workers of volatilized COCs from A and B1-zone groundwater in *outdoor* air.

The same rationale as for Pathway 1 above also applies in that the COCs are the same, except there would be even less potential, under current conditions, for this to be considered potentially “unacceptable.” See Section 5.5.2.1 and Technical Summary 3, Corrective Measures Study Final Report (draft), dated 15 February 1999, for an assessment of this exposure pathway.





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The referenced documents in this report are available in the records holding area of the Missouri Department of Natural Resources offices located at 1738 East Elm Street, Jefferson City, MO 65109

**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.**