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: Former Handy & Harman Facility
Facility Address: 1770 Kings Highway, Fairfield, Connecticut
Facility EPA ID #: CTD018656819

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			Groundwater samples collected from **Parcel 1** exceeded industrial/commercial volatilization criteria (I/C VC) for 1,1-DCE (RX-9B), TCE (RX-3B, RX-4B and RX-9B) and VC (RX-3B and RX-9B). Note that all buildings on Parcel 1 have been or will be demolished before the end of August 2005. Groundwater samples collected from Parcel 1 exceeded surface water protection criteria (SWPC) for 1,1-DCE (RX-9B). Groundwater samples collected from **Parcel 2** exceeds I/C VC for TCE (RX-5D, RX-6B, RX-6I, RX-6SB, RX-7B and RX-13B) and VC (RX-6I. RX-6SB and RX-13B). Note that all buildings on Parcel 2 are unoccupied and are located behind a locked gate. Groundwater samples collected from Parcel 2 exceeds SWPC for 1,1-DCE (RX-6B, RX-6I, RX-6SB, RX-7B and RX-13B) and for various metals (sporadic exceedances). Groundwater data is summarized in **Tables 1** and **2.**
Air (indoors) [2]		X		Note that all buildings on **Parcel 1** have been or will be demolished during the fall of 2005. As illustrated on the attached photographs, the doors have been removed from the last remaining structure (storage shed) on Parcel 1, which is scheduled for demolition. All buildings on **Parcel 2** (former employee parking area) are unoccupied, are located behind a locked gate with a "no trespassing" sign and are located over 50 feet from wells with I/C VC exceedances.
Surface Soil (e.g., <2 ft)	X			Soil collected from **Parcel 1** prior to demolition activities exceeds Industrial/Commercial Direct Exposure Criteria (I/C DEC) for arsenic, cadmium and lead in four samples as summarized in **Table 3**. However, soils that exceed applicable standards are currently being excavated and transported off-site for proper disposal. Additional delineation is on-going as excavations are expanded until acceptable end-point samples are collected. Soil collected from **Parcel 2** exceeds I/C DEC various metals and SVOCs at various locations as summarized in **Table 4**.
Surface Water	X			Surface water samples collected from Turney Creek, a freshwater tidal SC/SB water body, contained dissolved arsenic and mercury detections above CTDEP human health consumption criteria (**Table 5**). Immediately adjacent to the Site (SW-2), dissolved cadmium, copper and nickel exceeded CTDEP benthic aquatic life water quality criteria (**Table 11**). Further downgradient (SW-7 through SW-10), only dissolved cadmium concentrations in the Turney Creek surface water exceeded CTDEP benthic aquatic life water quality criteria. Samples collected from two low points within the Parcel 2 wetland proper exceeded aquatic life criteria for cadmium, copper, lead, nickel, silver and zinc as summarized in **Table 11**.
Sediment	X			Sediment samples collected from the wetlands and Turney Creek located on Parcel 2 exceed the promulgated I/C DEC for several SVOCs and metals as summarized in **Table 8**. However, based on the results of a human health risk characterization utilizing reasonable exposure durations for trespassers only one exceedance of a site-specific direct exposure criteria within the wetlands (lead at location SS-10).
Subsurf. Soil (e.g., >2 ft)	X			Soil collected from **Parcel 1** prior to demolition activities exceeds Industrial/Commercial Direct Exposure Criteria (I/C DEC) for arsenic, cadmium and lead in four samples as summarized in **Table 3**. Soil collected from **Parcel 2** exceeds I/C DEC various metals and SVOCs at various locations as summarized in **Table 4**.
Air (outdoors)		X		Although no outdoor air samples have been collected, only several groundwater samples have exceeded the I/C VC standards on both parcels. Based upon the fact that impacted soil is currently being removed from Parcel 1 for off-site disposal and Parcel 2 is covered by an asphalt parking lot and wetlands, it is reasonable to expect that outdoor air is not impacted.

_____ 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):

Figures illustrating sample locations and current site features are included as **Figures 1** and **2**. Figures illustrating groundwater flow directions are included in **Figures 3** though **6**. Data tables summarizing data noted above are included as **Tables 1** though **11**. A Remedial Action Plan prepared in April 2004 for the Parcel 1 soil excavation and facility demolition remedy has been submitted to the Connecticut Department of Environmental Protection (CTDEP) and the City of Fairfield Conservation Department. A copy of the Environmental Conditions Assessment Form (ECAF) completed in January 2004 for the transfer of Parcel 1 to new owners, which includes a conceptual site model, is on file at the CTDEP and is attached.

Groundwater: Groundwater samples collected from monitoring wells located on Parcel 1 (i.e., the eastern parcel formally occupied by the manufacturing facility) revealed I/C VC exceedances in three wells screened in bedrock (groundwater is generally first encountered in bedrock on Parcel 1). However, as all buildings located on Parcel 1 will be demolished by the end of August 2005 (only one unoccupied shed without doors currently exists on the parcel), I/C VC criteria are not applicable. Only one groundwater sample collected from Parcel 1 exceed the SWPC, however as groundwater located on Parcel 1 does not discharge directly to surface water, this criteria is not applicable. Groundwater beneath the facility has been classified as GB by the CTDEP and as a result, drinking water standards are not applicable. Drinking water for the former facility and the surrounding properties is supplied by the Bridgeport Hydraulic Company as verified in a 2002 receptor survey completed by HRP Associates (attached). Groundwater samples collected from Parcel 2 (i.e., the western parcel containing a dense wetland, Turney Creek and formerly occupied by the employee parking lot) revealed I/C VC exceedances in six wells only one of which is screened in the overburden. As no occupied structure currently exists on Parcel 2 and as access is control with a locked gate and given the fact that no structure is located closer than 50 feet to a monitoring well exhibiting an I/C VC exceedances, the I/C VC criteria are not applicable. Groundwater samples collected from five monitoring wells on Parcel 2 exhibited sporadic exceedances of the SWPC.

Soil (surface and subsurface): Soil samples collected from 0 to 2 feet below ground surface and from greater than 2 feet from ground surface on Parcel 1 exceed the I/C DEC for arsenic, cadmium and lead in four. Please note that the RAP prepared for Parcel 1 includes the excavation and off-site disposal of soils exceeding either the I/C DEC or the GA PMC. Soil collected from 0 to 2 feet below ground surface and from greater than 2 feet from ground surface on Parcel 2 exceeds I/C DEC various metals and SVOCs at various locations.

Surface Water: Surface water samples collected from the Site wetland and Turney Creek, a freshwater tidal SC/SB water body, were evaluated based upon the applicable CTDEP human health consumption and aquatic life protection criteria for acute and chronic toxicity (**Tables 5** and **11**). Surface water samples collected from the Parcel 2 wetlands and immediately adjacent to the Site in Turney Creek (SW-2) contained dissolved arsenic and mercury detections above CTDEP human health consumption criteria (**Table 5**). As noted in response to Questions #3, Turney Creek is a shallow tidally influenced freshwater creek that is unsuitable for recreational bathing and boating due to its limited depth. Recreational fishing is also unlikely due to limited access and flow. No food is grown on either parcel. Fishing in Turney Creek is unlikely due to the lack of fish, suitable in size to eat, in the shallow waters adjacent to the Site.

Dissolved cadmium, copper, lead, nickel, silver and zinc were detected above CTDEP acute and/or chronic toxicity criteria in the surface water samples (ponded water within the wetland) collected from within the Parcel 2 wetlands (SW-3 and SW-4; **Table 11**). Within Turney Creek immediately adjacent to the Site (SW-2), dissolved cadmium, copper and nickel exceeded CTDEP surface water quality criteria. Further downgradient (SW-7 through SW-10), only dissolved cadmium concentrations in the Turney Creek surface water exceeded CTDEP surface water quality criteria (**Table 11**).

Sediment: Sediment samples collected from the wetlands and Turney Creek located on Parcel 2 exceed the promulgated I/C DEC for several SVOCs and metals.

Air (indoor and outdoor): Only one unoccupied shed, which will be demolished during the fall of 2005, currently exists on Parcel 1. As illustrated in the attached photographs, the doors have been removed from this storage shed. As a result, no indoor spaces currently exist on Parcel 1. All buildings on Parcel 2, which are located within the footprint of the former employee parking area are unoccupied, are located behind a locked gate with a "no trespassing" sign and are located over 50 feet from wells with I/C VC exceedances. As a result, no exposure to impacted indoor air exists on Parcel 2. It is noted that groundwater samples collected from monitoring well RX-9B, a bedrock well located along the western property line on Parcel 1, contains 1,1,-DCE, TCE and vinyl chloride above the I/C VC. It should be noted that RX-9B is screened from 28 feet below grade (fbg) to 38 feet fbg. Depth to bedrock in this area of Parcel 1 is approximately 25 fbg . As illustrated on the groundwater elevation figures, groundwater generally flows towards the Parcel 2 wetlands and Turney Creek or west-southwest. An asphalt parking lot servicing the neighboring Home Depot store is located immediately to the west, northwest and north of monitoring well RX-9b. The Home Depot store is located over 500 feet to the north of monitoring well RX-9B. The nearest residence is located approximately 200 feet to the west of RX-9B. Although no monitoring wells exist west of RX-9B, based upon the fact that bedrock fractures have been found to strike in a north-south direction contaminants observed in bedrock monitoring well RX-9B would be expected to migrate towards Parcel 2. As a result, off-site impact to indoor air is not expected.

Outdoor air is not an impacted medium on either Parcel 1 or parcel 2. Based upon the fact that impacted soil is currently being removed from Parcel 1 for off-site disposal and Parcel 2 is covered by an asphalt parking lot and wetlands, it is reasonable to expect that migration of contaminants to outdoor air is not occurring at significant levels.

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.

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
Groundwater	No	No	No	No	No	No	No
~~Air (indoors)~~	-----	-----	-----	-----	-----	-----	-----
Soil (surface, e.g., <2 ft)	No	No	No	No	No	No	No
Surface Water	No	No	No	No	No	No	No
Sediment	No	No	No	No	No	No	No
Soil (subsurface e.g., >2 ft)	No	No	No	No	No	No	No
~~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.

__X_ 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):
Commercial operations ceased in late 2002 and as a result, the Handy & Harman facility has been unoccupied for over two years. Current facility demolition and soil remediation activities occurring on Parcel 1 may result in potential human receptors, however as discussed below, engineering controls are used to eliminate potential unacceptable exposures. Parcel 1 is secured by construction fencing and locking gates during non-working hours. No activity is currently occurring on Parcel 2, which contains a vacant asphalt covered parking lot, unoccupied utility buildings, dense wetlands and Turney Creek. Parcel 2 is secured on three sides by a chain-link fence and a locking traffic gate on Grassmere Avenue. The fourth side of Parcel 2 is bounded by Turney Creek. No trespassing signs are located along Turney Creek and adjacent to the locking gate. Photographs of the signs and locking gate are attached. Limited to no trespassing is expected within Parcel 2 wetlands due to fact that the wetlands are virtually impenetrable due to the growth of vegetation and the muddy conditions (see wetland photographs 1 through 5). The sharp *Phragmities* present at the wetland also make passage through the wetlands difficult (Photograph 4). Turney Creek, located along the southwestern boundary of Parcel 2 is a shallow tidally influenced freshwater creek that is unsuitable for recreational bathing and boating due to its limited depth. Recreational fishing is also unlikely due to limited access and flow. No food is grown on either parcel. Fishing in Turney Creek is unlikely due to the lack of fish, suitable in size to eat, in the shallow waters adjacent to the Site.

Resident Pathways – As discussed above, both Parcel 1 and Parcel 2 of the subject site are currently unoccupied and have never been used for residences. Although nearby off-site residences exist, institutional controls are in

place to prevent trespassers from entering the site. Access to Parcel 1 during normal working hours is limited to authorized personnel associated with demolition and soil remediation activities. Parcel 1 is secured by construction fencing and locking gates during non-working hours. Parcel 2 is secured on three sides by a chain-link fence and a locking traffic gate on Grassmere Avenue. The fourth side of Parcel 2 is bounded by Turney Creek. No trespassing signs are located along Turney Creek and adjacent to the locking gate. Photographs of the signs and locking gate are attached. Limited to no trespassing is expected within Parcel 2 wetlands due to fact that the wetlands are virtually impenetrable due to the growth of vegetation and the muddy conditions (see wetland photographs 1 through 5).

Construction/Groundwater Pathway – Construction workers (i.e., remediation contractors) may be exposed to impacted groundwater during soil excavation activities currently underway on Parcel 1. However, engineering controls specified in site-specific health and safety plans, (i.e., personal protection equipment) are used to prevent exposure to impacted groundwater in the unlikely case that it is encountered (groundwater is generally first encountered in bedrock on Parcel 1. No construction activity is currently occurring on Parcel 2.

Construction/Soil Pathway - Construction workers (i.e., remediation contractors) may be exposed to impacted soil during soil excavation activities currently underway on Parcel 1. However, engineering controls specified in site-specific health and Safety plans and the erosion control plan, (i.e., personal protection equipment, dust suppression, etc.) are used to prevent unacceptable exposures. No construction activity is currently occurring on Parcel 2.

Trespasser/Surface Water Pathway – Unacceptable trespasser exposure to impacted surface water is not expected as access to the surface water located on Parcel 2 is controlled on three sides by a chain-link fence and a locking traffic gate on Grassmere Avenue. The fourth side of Parcel 2 is bounded by Turney Creek. No trespassing signs are located along Turney Creek and adjacent to the locking gate. Limited trespassing is expected within Parcel 2 wetlands due to fact that the wetlands are virtually impenetrable as described above.

Trespasser/Sediment Pathway - Unacceptable trespasser exposure to impacted sediment is not expected as access to the surface water located on Parcel 2 is controlled on three sides by a chain-link fence and a locking traffic gate on Grassmere Avenue. The fourth side of Parcel 2 is bounded by Turney Creek. No trespassing signs are located along Turney Creek and adjacent to the locking gate. Limited trespassing is expected within Parcel 2 wetlands due to fact that the wetlands are virtually impenetrable as described above.

Recreation/ Surface Water Pathway – Parcel 2 is private property with secure access as described above preventing recreational use. Additionally, Turney Creek is a shallow tidally influence freshwater creek that is unsuitable for recreational bathing and boating due to its limited depth. Recreational fishing is also unlikely due to limited access and flow.

Recreation/ Sediment Pathway – Parcel 2 is private property with secure access as described above preventing recreational use.

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

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."

_____ 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):

[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.

5 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 Former Handy & Harman Facility, EPA ID # CTD018656819, located at 1770 Kings Highway, Fairfield, Connecticut 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) _____ Date 9/26/05
(print) Mitchell A Wiest, PG, LEP
(title)Principal Hydrogeologist / Project Manager

Accepted by
David Lim
EPA Region 1
9/29/05

Locations where References may be found:
Attached data tables;
Attached figures;
Attached ECAF;
Attached 2002 Receptor Survey: and
Supporting data and reports have been submitted to the CTDEP and the City of Fairfield Conservation Department

Contact telephone and e-mail numbers
(name) Mitchell A Wiest
(phone #) 781-270-6600
(e-mail) mwiest@rouxinc.com

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.