DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)
Current Human Exposures Under Control

Facility Name: Virginia Department of Transportation (VDOT) Elko Materials Lab
Facility Address: 6200 Elko Tract Road
Facility EPA ID #: VAD980918189

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 #8 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 EIs 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"**[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			Constituents of Concern in water table aquifer exceed MCLs beneath source area and down-gradient (see Table 1).
Air (indoors)[2]		X		
Surface Soil (e.g., <2 ft)		X		
Surface Water		X		
Sediment		X		
Subsurf. Soil (e.g., >2 ft)		X		
Air (outdoors)		X		

☐ 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.

☒ 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):

The 2012 "*Interim Measures Progress Report*" identified 25 chemicals of concern (CoCs) in on-site groundwater that exceeded applicable standards including US EPA Maximum Contaminant Levels (MCLs) and US EPA Region III Risk-Based Regional Screening Levels (Tap Water Standards). Follow-up site investigations conducted in 2012 augment the data collected in the Progress Report. The detected constituents appear related to industrial solvents released from the on-site former waste management unit. **Table 1** below summarizes the constituents, maximum detected concentration of detected chemicals on and off site with comparisons to regulatory and health based screening levels. The table composites results from three groundwater sampling events undertaken between March and July 2012.

CoCs occur at their highest concentrations in on-site groundwater directly beneath the former waste management unit **(Map 1)**. Recent cleanup efforts have focused on removing free product and high concentration residuals from the waste unit sub-liner horizon. Impacts in the underlying water table aquifer extend from 10 to 25 feet below grade. A plume of impacted groundwater extends down-gradient from the unit off-site towards the southwest for a distance of at least 330 feet. The off-site area above this impacted groundwater is occupied by a four-lane public roadway and right of way with no occupied buildings. There is no indication the constituents have moved into deeper aquifers including that from which VDOT periodically withdraws water for selective testing at its lab facilities. No off-site groundwater supplies are threatened. The nearest residence is 2,000 feet up gradient and the nearest down gradient residence is 4,200 feet away. To date no samples of surface water have been collected although groundwater sampling near the down-gradient edge of the plume indicates surface water concentrations are not likely to exceed applicable standards.

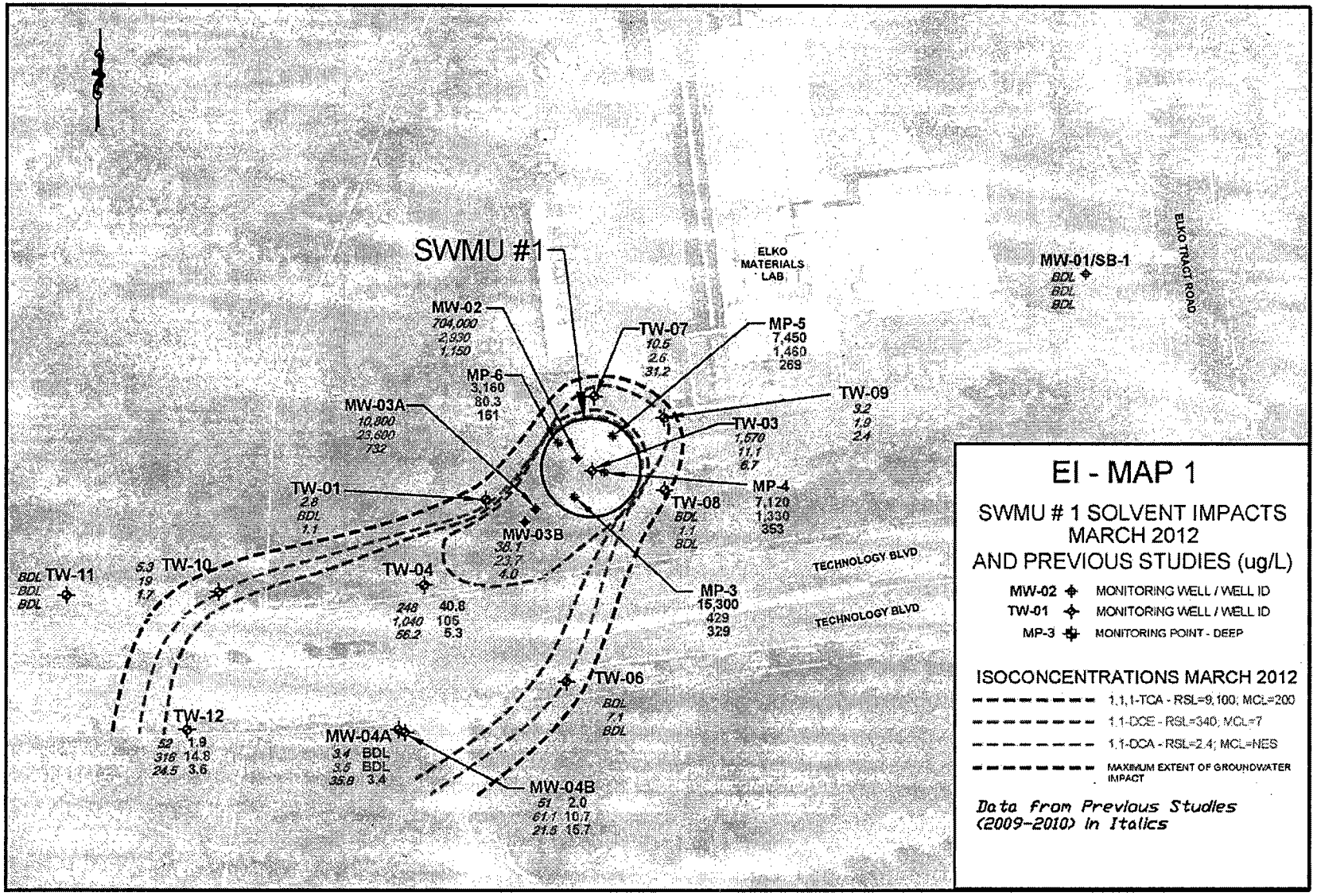
SWMU #1
ELKO MATERIALS LAB
ELKO TRACT ROAD
MW-01/SB-1
BDL
BDL
BDL
MW-02
704,000
2,930
1,150
TW-07
10.5
2.6
31.2
MP-5
7,450
1,460
269
MP-6
3,160
80.3
161
TW-09
9.2
1.9
2.4
MW-03A
10,800
23,600
732
TW-03
1,570
11.1
6.7
TW-01
2.8
BDL
1.1
MP-4
7,120
1,330
353
TW-08
BDL
1.1
BDL
MW-03B
38.1
23.7
4.0
TECHNOLOGY BLVD
TECHNOLOGY BLVD
BDL TW-11
BDL
BDL
5.3 TW-10
19
1.7
TW-04
248 40.8
1,040 105
56.2 5.3
MP-3
15,300
429
329
TW-06
BDL
1.1
BDL
TW-12
52 1.9
316 14.8
24.5 3.6
MW-04A
3.4 BDL
3.5 BDL
35.8 3.4
MW-04B
51 2.0
61.1 10.7
21.5 16.7
EI - MAP 1
SWMU # 1 SOLVENT IMPACTS
MARCH 2012
AND PREVIOUS STUDIES (ug/L)
MW-02 MONITORING WELL / WELL ID
TW-01 MONITORING WELL / WELL ID
MP-3 MONITORING POINT - DEEP
ISOCONCENTRATIONS MARCH 2012
1,1,1-TCA - RSL=9,100; MCL=200
1,1-DCE - RSL=340; MCL=7
1,1-DCA - RSL=2.4; MCL=NES
MAXIMUM EXTENT OF GROUNDWATER IMPACT
Data from Previous Studies (2009-2010) in Italics

Table 1 Summary of Volatile Organic Compounds Exceedances in Water Table Aquifer Beneath the VDOT				
Constituent	Maximum On-Site Concentration (µg/L)	Maximum Off-Site Concentration (µg/L)	US EPA Region III RSL Tap Water (µg/L)	US EPA MCL (µg/L)
Benzene	464	<1	0.41	5
1,1-Dichloroethane	1,790	32.5	2.4	NES
1,1-Dichloroethylene	29,900	107	340	7
1,2-Dichloroethane	77.1	<1	0.43	75
1,4-Dioxane	423	<1	6.1	NES
Carbon Tetrachloride	32.7	<1	0.20	5
Chloroform	34.4	<1	0.19	80
Ethylbenzene	4.7	<1	1.5	700
Methylene Chloride	17.8	<4	4.8	5
Tetrachloroethylene (PCE)	41.3	<1	0.11	5
1,1,1-Trichloroethane	135,000	55.9	9,100	200
Trichloroethylene (TCE)	374	1.4	2	5
Vinyl Chloride	5.9	<1	0.016	2

NES = No established regulatory limit; MCL=Maximum Contaminant Limit; RSL=Regional Screening Level

References:

Marshall Miller and Associates, 2012, Amendment to VDOT Elko Materials Lab, Facility Lead Agreement – Interim Measures – Sub-liner Horizon Surfactant Washing, Virginia Department of Transportation, US EPA ID No. VAD9800118189, Submitted to US EPA Region III July 26, 2012.

Footnotes:

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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
~~Air (indoors)~~							
~~Soil (surface, e.g., <2 ft)~~							
~~Surface Water~~							
~~Sediment~~							
~~Soil (subsurface e.g., >2 ft)~~							
~~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):
Impacted groundwater occurs on-site at depths as shallow as five feet below grade. Off site, beneath the public right of way of Technology Boulevard groundwater occurs as shallow as 8 to 10 feet below grade and could be encountered by construction workers in the event excavations are advanced beyond these depths. Potential exposures for workers would likely follow the dermal and inhalation pathways. Exposure through the inhalation pathway would also be possible in the event underground utility vaults were occasionally occupied by workers during repair work. These potential exposure pathways will be evaluated further during future site work.

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).

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

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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):

Based on the human health screening criteria presented in **Table 2** below exposures for off-site construction workers involved in subsurface work (in a trench) could potentially result in unacceptable exposures to 1,1- DCE via the inhalation pathway. This conclusion is based on screening the maximum groundwater concentrations of volatile organic compounds (VOCs) at well TW-4, which is located just off site in the public right of way of Technology Boulevard. Exposure would potentially occur if fugitive vapors from impacted groundwater entered a trench occupied by workers. While such exposures are also possible on site in the vicinity of the Elko Materials Lab, it is expected controlled site access by VDOT and restricted subsurface activity lessens the probability of un-mitigated exposure under current conditions. The potential vapor exposure pathways will be evaluated further during future site work.

Table 2
Groundwater Risk Screening For Elko Materials Lab Test Site Based on March 2012 Data
Construction Worker in A Trench (Off-Site)

Depth to Groundwater:		5	feet						
Selection of Contaminants of Concern Groundwater: Construction Worker in a Trench Revised 7/23/12 Source: Virginia DEQ Voluntary Remediation Program Risk Assesment Screening Table 2.13	CAS No.	Water Table Not Contacted	Water Table Contacted		Tier III	Tier III (a)	Tier II Screening Level	Maximum Groundwater Concentration (b)	Contaminant of Concern
		Tier III Groundwater Concentration	Dermal Contact and	Inhalation					
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	
TAL Inorganics									
1,1-Dichloroethane	75-34-3	6,839	20,323	92.3	92.3	92.3	2.4	5.3	
1,1-Dichloroethene	75-35-4	555	5,229	41.4	41.4	41.4	7.0	105.0	yes
1,1,1-Trichloroethane	71-55-6	24,296	179,989	1,215	1,215	1,215	200	40.8	
Trichloroethene	79-01-6	16.0	48.6	0.5	5.0	0.48	5.0	1.8	

(a) The Tier II Screening Level was substituted for the model estimate when the model was less than the Tier II level
(b) Maximum groundwater concentrations obtained from March 13, 2012 sampling event.

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.

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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):

Based on the calculated risk the maximum off-site contaminant concentrations under the current land use scenario are within the 10^{-4} to 10^{-6} excess cancer risk range. It can be concluded that exposure to air in the utility vaults will not pose an unacceptable risk to workers accessing the vaults.

Reference Utility Vault Risk Assessment Update, dated September 20, 2013

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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 (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 Elko Materials Lab facility, EPA ID # VAD980018189, located at 6,200 Elko Tract Road, Sandston, VA 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) Estena McGhee Date 9/30/13
(print) Estena McGhee
(title) RPM, Environmental Engineer

Supervisor (signature) Date 10/21/13
(print) Luis Pizarro
(title)
(EPA Region or State)