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:	AMT, Inc. (Hypothetical Case Example)	**DRAFT 12/10/99**
Facility Address:	1001 Riverside Dr., Derekwood, BE, USA	
Facility EPA ID #:	BED000000001	

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? **(Note this determination is site-wide and includes all identified contaminated media on- and off-site as shown in AMT, Inc. Reports 1, 2, and 3)**

   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)?

Media Contaminated?	Yes	No	?	Rationale / Key Contaminants
Groundwater	x			TCA, DCA, DCE, Cr+6, Ba, above levels of concern
SoilVapor/Air(indoors)[2]	x			Geoprobe samples verified above volatile gw plume
Surface Soil (e.g., <2 ft)	x			Chromium (Cr+6) in former staging area
Surface Water		x		Unlikely, plume does not contact surface water
Sediment		x		No evidence for surface runoff in visual inspection
Subsurf. Soil (e.g., >2 ft)	x			Metals beneath closed lagoon, organics beneath tank
Air (outdoors)		x		Health & Safety monitoring = low conc. & veg. cover

___ 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):

Media	Contaminant	Levels of Concern	Max. Detected	Times above Std	Location
Groundwater	TCA	200 ug/l	1,900 ug/l	10	MW-5A
Groundwater	DCA	70 ug/l	460 ug/l	7	MW-17A
Groundwater	DCE	7 ug/l	120 ug/l	17	MW-12B
Groundwater	Cr^{+6}	100 ug/l	280 ug/l	3	MW-3A
Groundwater	Ba	1,000 ug/l	4,600 ug/l	5	MW-3A
Surface Soil	Cr^{+6}	230 mg/kg	634 mg/kg	3	B-4
Soil Vapor/Indoor Air	1,1-DCE	1 ppm*	3 ppm (TVOC)	3**	GP-2

*= CT State Soil Vapor Std (ppm by volume) for 1,1 DCE for Residential Land Uses
**=If we assume all vapors in TVOC measurement are 1,1-DCE

[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[3]
Groundwater	no*	no*	no*	no*			no*
Air (indoors) **via**	no*	no*	no*				
Soil (surface, e.g., <2 ft)	no*	yes*	no*	no*	no*	no*	no*
~~Surface Water~~	___	___			___	___	___
~~Sediment~~	___	___			___	___	___
Soil (subsurface e.g., >2 ft)				no*			no*
~~Air (outdoors)~~	___	___	___	___	___		

Instructions for Summary Exposure Pathway Evaluation Table: **(* = see below description of response)**

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

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

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

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

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

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

Rationale and Reference(s): (*) brief description of basis for response for each pathway is provided below:

Residents via "contaminated":
- Groundwater = no complete pathway- Monitoring in adjacent and down gradient home wells has not detected contamination, composite plume is shown to stop short of down gradient (e.g., Smith) home

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

wells, monitoring at plume and nearest home wells will continue (see AMT, Inc., Monitoring Plan A).

- Soil Vapors/Air (indoors)= no complete pathway- No residences are located above or adjacent to volatile contaminated soil or groundwater (AMT will notify agency if changes, see Exposure Controls Report).
- Soil (surface)= no complete pathway- The only surface soil contamination ALC is on-site, and no residences are on-site.

Workers via "contaminated":

- Groundwater = no complete pathway- There are no on-site wells for production or water supply (or other opportunities for production worker contact with contaminated groundwater).
- Soil Vapors/Air (indoors)= no complete pathway- The workplace indoor air is being monitored for the parameters in groundwater and soil, and have been shown to be within OSHA stds and workers are aware of the potential for indoor air contamination from volatile contaminated environmental media (e.g., subfloor).
- Soil (surface)=**yes, a complete pathway can be reasonably expected**- Landscaper/maintenance worker contact with on-site surface soil contamination **is expected (under current conditions)**.

Day-Care (or other non-production and possibly sensitive receptor uses (e.g., schools, hospitals, etc.)) via

- Groundwater = no complete pathway- No Day Care or other non-production (e.g., schools, hospitals, commercial, etc.) uses exist near groundwater contaminated (ALC), and these receptors are not expected to have other contact with contaminated groundwater.
- Soil Vapor/Air (indoors)= no complete pathway- No Day Care or other non-production (e.g., commercial or sensitive) uses exist above or in close proximity to volatile contaminated soil or groundwater.
- Soil (surface)= no complete pathway- No Day Care or other non-production (e.g., commercial or sensitive) uses exist in close proximity to surface soil contaminated ALC (AMT will notify agency if changes).

Construction (workers) via "contaminated":

- Groundwater = no complete pathway- No construction in area of plume is planned or anticipated (see AMT letter that says this, and states they will notify us (regulators) if this changes).
- Soil (surface)= no complete pathway- No construction in area of contamination ALC is planned or anticipated (see AMT letter that says this, and states they will notify us (regulators) if this changes).
- Soil (subsurface)= no complete pathway- No construction in area of contaminated subsurface soil (ALC) is planned or anticipated (see AMT letter that says this, and states they will notify us (regulators) if this changes).

Trespassers via "contaminated":

- Soil (surface)= no complete pathway- No trespassers are expected as facility is surrounded by well maintained fence and inspection of facility has not provided evidence of trespassers being present under current conditions (also see AMT, Inc., Site Report stating this to be the case).

Recreation (users) via "contaminated":

- Soil (surface)= no complete pathway- Recreational users are not expected to come into contact with contamination since the facility is surrounded by well maintained fence and inspection of facility has not provided evidence of recreational users under current conditions (also see AMT Site Report stating this to be the case).

Food contaminated via:

- Groundwater = no complete pathway- No food items are produced/grown in contact with "contaminated" groundwater.
- Soil (surface)= no complete pathway- No food items are produced/grown in contact with "contaminated" surface soil (for example no foods are produced on-site and no off-site surface soil has been identified to be contaminated ALC).
- Soil (subsurface)= no complete pathway- No food items are produced/grown in contact with "contaminated" subsurface soil (for example no foods are produced on-site and no off-site surface soil has been identified to be "contaminated" above levels of concern (ALC)).

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)?

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

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

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

Rationale and Reference(s):
The only complete exposure pathway (contaminated media - receptor combination) was Surface soil and Worker.

While landscaping (grass mowing) and general maintenance workers do conducted work activities in the Staging Pile area of the site, and some contact (exposure) with the metallic contaminants in the surface soils in this area can reasonably be expected, these exposures are not be reasonably expected to be significant (i.e., potentially "unacceptable") because; 1) the duration (and intensity) of these exposures is very low, and 2) the concentrations of contaminants present are only slightly above the standards (which are based on assumptions of much higher exposure durations). (*Note: a made up 500 ppm Cr+6 level of concern "std" is used for educational purposes).

The applicable concentration reference level "standard" for identifying unacceptable exposures is the State of Beryllium's Industrial/Non-Residential surface soil risk-based concentration for Cr+6 is 500* ppm. This concentration "standard" is based on an assumption of an exposure duration of 8 hr/day, five days per week, for 50 weeks per year, over a 30 year career. The landscaping and maintenance activities that are permitted to take place in this area limited to no more than one hr/month and for no more than six months per year (Additionally, 1- workers are aware of this contamination and 2- required to wear protective dust masks while working in this area) (see AMT Report of Exposure Controls). Thus, because the concentrations of contaminants in the Staging Pile area are only slightly above the applicable concentrations standards and the exposures are far less than one percent of that assumed in derivation of standard concentration (0.3% = (6 hr/yr for actual exposure)/(2000 hr/hr assumed in derivation of standard concentration)) this qualitative/semi-quantitative analysis can be used to show that "no" response is appropriate since the exposures can not be reasonably expected to be significant (i.e., unacceptable).

[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):

Note: The time and expense for a Quantitative Risk Assessment was not necessary to demonstrate, to a reasonable degree of certainty, that Current Human Exposures are Under Control at this facility, and therefore this question could be skipped.

Additional information/note [regarding potential new question?].

[5.5 Has the responsible party (RP) committed to conduct monitoring and/or make observations through time to verify that controls for human exposures remain adequate and effective?]

The RP has submitted explanations of the exposure controls in place along with statements of their intent to maintain the effectiveness of these controls through time (see AMT's Exposure Controls submittal).

Additionally, this office will be sending letters periodically (e.g., annually) to remind the facility of their on-going and continuous responsibility to notify their regulatory authorities (State and EPA) of changes in conditions that could affect the accuracy of this determination and/or negatively impact human health or the environment.

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 **AMT, Inc.** facility, EPA ID # **BED000000001**, located at **Derekwood, BE,** 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)	signature on file	Date 12/10/99
	(print)	Henry Schuver	
	(title)	Environmental Scientist, USEPA	

Supervisor	(signature)	signature on file	Date 1/1/00
	(print)	Sue Per Visor	
	(title)	Chief, RCRA CA Program Branch	
	(EPA Region or State)	USEPA Region 00	

Locations where **hard-copy** References may be found:
1) AMT, Inc. facility, (1001 Riverside Dr., Derekwood, BE)

2) Riverside Public Library, Public Repository files, (3001 Riverside Dr., Derekwood, BE)

3) State of Beryllium Dept. of Environ. Protection Office, Central Files, (401 E. State St., BE)

4) USEPA Region 0 office, RCRA files, (290 Broadway, Big City, BE)

Electronic EI Website location: http://www.epa.gov/epawaste/hazard/correctiveaction/eis/index.htm

Contact telephone and e-mail numbers

(name)	Henry Schuver
(phone #)	(703) 308-8656
(e-mail)	Schuver.Henry@EPA.gov

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:	AMT, Inc. (Hypothetical Case Example)	**DRAFT 1/27/00**
Facility Address:	1001 Riverside Dr., Derekwood, BE, USA	
Facility EPA ID #:	BED000000001	

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?
(Note this determination is site-wide and includes all identified contaminated groundwater on- and off-site from releases at the AMT facility, and as is documented in AMT, Inc. Reports 1, 2, and 3)

   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 "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).

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):

Yes the **groundwater is** known to be **"contaminated"** above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria (see footnotes below)).

The table below identifies the contaminants present in groundwater in concentrations greater than their level of concern.

Contaminant	Levels of Concern	Max. Detected	Times above Std	Location
TCA	200 ug/l (1)	1,900 ug/l	10	MW-5A
DCA	70 ug/l (2)	460 ug/l	7	MW-17A
DCE	7 ug/l (3)	120 ug/l	17	MW-12B
Cr+6	100 ug/l (4)	280 ug/l	3	MW-3A
Ba	1,000 ug/l (5)	4,600 ug/l	5	MW-3A

Footnotes (#)
(1) - State DEP Drinking Water Well Groundwater Protection Criteria
(2) - State DEP Drinking Water Well Groundwater Protection Criteria
(3) - State DEP Drinking Water Well Groundwater Protection Criteria
(4) - Federal Clean Water Act Maximum Concentration Limit (MCL)
(5) - Federal Clean Water Act Maximum Concentration Limit (MCL)

[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).

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"[2]).

___ 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):

Yes, the **migration** of contaminated groundwater **can be expected to have stabilized** (such that contaminated groundwater can be reasonably expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]) based on the physical evidence and understanding of the environmental conditions discussed below.

Dissolved Phase Contamination:

Horizontal Migration:
The dissolved phase groundwater contamination plume can be reasonably expected to remain within the horizontal dimensions of the "existing area of groundwater contamination"[2] (identified by the "clean" wells GP-5, GP-7, GP-8, GP-9), based on the following physical evidence and understanding of the environmental setting discussed below:

Evidence Defining Horizontal Dimensions of Contaminant Plume
The concentrations of contaminants in the furthest down gradient on-site (near fence line) monitoring wells (e.g., MW-7A,B, and MW-12A,B) have been slowly decreasing in samples collected over the last four years. The additional GeoProbe investigation (GP-# sample locations) resulted in evidence summarized in the table below showing what is believed to define the front edge of the plume. The concentrations in the furthest down gradient contaminated monitoring wells (e.g., GP-6) are only slightly above the levels of concern and, the concentrations concentration of the contaminants in the each of the four "clean" wells (GP-5, GP-7, GP-8, GP-9) were found to be below the levels of concern.

[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.

Evidence for Stability in Front Edge of Contaminant Plume
While the 16 Qtrs of decreasing concentrations in furthest down gradient on-site wells suggested the front edge of the contaminant plume was likely to be stable, the GeoProbe locations GP-8 and GP-9 were converted to permanent monitoring wells and monitored for two additional quarterly events (for a total of three) and the concentrations were found to remain stable (identical) in each sampling event.

While no duration of monitoring can guarantee the future, it is reasonable to expect that this dissolved phase plume is stable since:

the "clean" wells were monitored over a period (270 days) that should have been sufficient to detect a mobile plume if the contaminants were moving at a rate similar to the groundwater flow (0.35 ft/day x 270 days = 94.5 ft of travel and the front edge of the plume and the "clean" well GP-9 are only 50 ft apart). While it remains possible that the contaminant plume continues to migrate (at a slower (retarded) rate than the groundwater flow) it is reasonable to expect this contaminant plume is stable due to the physical evidence and rationale described above and the additional understanding of the environmental setting described below:

1) concentrations in furthest down gradient on-site (fence line) monitoring wells have been decreasing over the last four years.
2) age of the release (at least 10 yrs.) and the plume is only 700 ft long (while gw went 1,277 ft (0.35 x 3,650)),
3) source (above ground tank) and visibly contaminated near-surface soils were removed 10 yrs ago,
4) groundwater extraction wells have been operating in the source area for the last 3 years (and reducing the mass of contamination heading for the toe of the plume),
5) we expect a final remedial action for groundwater to take place in the near future (near the down gradient fence line) which will further reduce the amount of groundwater contamination flowing to the toe of the contaminant plume, and
6) the less mobile metallic contaminants in the area of the former lagoon are also bound by "clean" wells (see table below).

Also note, additional monitoring will be conducted to continuously verify the accuracy of this determination (see response to Ques.7). For further description of the evidence considered see AMT, Inc. Groundwater Stabilization Report.

Contaminant	Level of Concern	Down Gradient Wells	"Clean" Wells
TC A	200 ug/l	GP-6 = 210 ug/l	GP-9 = 150 ug/l
DCA	70 ug/l	GP-6 = 80 ug/l	GP-9 = 50 ug/l
DCE	7 ug/l	GP-6 = 8 ug/l	GP-9 = ND (<5)
Cr^{+6}	100 ug/l	MW-3A = 280 ug/l	MW-22A, & -18A = ND
Ba	1,000 ug/l	MW-3A=4,600;-2A=2,600	MW-22A, & -18A = ND

Vertical Migration:
Although the monitoring data is somewhat limited, the significant reductions in contaminant concentrations in the bedrock aquifer near the source area (MW-11C) and at the overburden-bedrock interface (in MW-5B) beneath the source area suggests little spreading of contamination into the bedrock aquifer in the upland areas where the highest hydraulic gradient is present. The upward hydraulic flow gradient of groundwater in the lower (downhill) of the plume is believed to limit downward vertical migration of contamination in the bedrock aquifer (although the conditions in wells MW-7 A & B appear anomalous).

Free Product (Non-Aqueous Phase Liquid, NAPL) Contamination:
It is important to consider the mobility of groundwater contamination in the NAPL phase to ensure that this form of groundwater contamination (NAPL): 1) also remains within the boundaries of the dissolved phase contamination discussed above, and 2) does not migrate such that it causes further migration of the front edge of the dissolved phase plume.

Probability of NAPL
A Dense Non-Aqueous Phase Liquid (DNAPL, 1,1,1- Trichloroethane, TCA) was known to have been used in the Above Ground Tank (and associated piping) believed to have been the source of the plume of volatile organic contaminated groundwater. Thus, DNAPL was believed to have been released to the environment, and residual amounts of NAPL in unsaturated soils were observed during the site investigation (and largely removed during tank closure).

Horizontal & Vertical Migration
Throughout the investigation observations were made trying to identify the presence and extent of mobile NAPL contamination. While some residual amounts of NAPL were observed in surface soils and in borehole cuttings from wells (up to 25 ft b.g.s. in MW-5A and MW-5B) immediately beneath the source area, no evidence of mobile NAPL was found during the investigations. NAPL contamination is believed to be limited to residual contamination and (based on the discussion below) is not expected to be mobile such that it could expand the "existing area of contaminated groundwater" as defined above (by the dissolved phase contamination).

The evidence collected is deemed to be sufficient for this determination based on the following understandings. If a sufficient amount NAPL was released such that the NAPL was able to continuously exceed the residual saturation limits of the media encountered the DNAPL would be expected to migrate vertically downward under gravitational forces until it encountered a sufficiently less permeable media, such as the bedrock at the overburden-bedrock interface. Again, assuming sufficient NAPL was released, such that the NAPL would continue to be mobile (continually exceeding residual saturation limits of the media) the DNAPL would then likely travel in the down-dip direction along the NAPL-impermeable surface, such as the overburden-bedrock interface (until the amount of NAPL released was consumed by the media as residual saturation, or still-mobile NAPL ponded in a depression).

No evidence of free flowing (mobile) NAPL was found in any of the boreholes during well construction or sampling events, and while there are conditions that can prevent the observations of NAPL despite its presence, when this evidence is combined with the observations of relatively low maximum dissolved phase concentrations (far below 1% of the aqueous phase solubility limit (4,500 mg/l for 1,1,2- TCA, as per App. VIII web site)), it was concluded that the NAPL present at this site is largely immobile.

Evidence from the monitoring well samples at this site suggests that the DNAPL did not migrate completely through the overburden materials and reach the overburden-bedrock interface in the source area (possibly due to insufficient volume of NAPL release, or due to impermeable zones within the overburden) since the concentrations observed in the deeper well MW-5 which is screened at the interface directly beneath the source area had much lower concentrations (44 ppb) than the shallower MW-5A (1,900 ppb) of TCA. Similarly, in the (approx. 100 ft) further down gradient wells MW-11A and 11B the deeper well (which is screened at the bedrock interface, where we might expect DNAPL to be present) the concentration of TCA in the dissolved phase sample results were less than one-half the concentration in the shallower well MW-11A. Thus, in summary, observations made during the construction and sampling of over 20 groundwater monitoring wells and nine GeoProbe samples did not provide evidence of mobile NAPL threatening the further migration of groundwater contamination at this site.

Overall Statement on Migration of Groundwater Contamination

The expectation of no further (horizontal or vertical) migration of (dissolved and NAPL phase) groundwater contamination is also based on knowledge that the primary sources of contamination have been addressed through interim (tank and contaminated near-surface soil removal, and installation of a groundwater extraction system) and soon-to-be implemented final remedial actions (see Interim and proposed Final Action Reports) that should significantly reduce the concentration and amount of contaminants in groundwater heading for the front of the contaminant plume (where natural attenuation processes of degradation, dilution, and absorption are likely to be operating in equilibrium with the current amount and flow rate of contamination).

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

____ If yes - continue after identifying potentially affected surface water bodies.

__X__ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

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

Rationale and Reference(s):

It is not reasonable to expect that groundwater contaminated above levels of concern discharge into surface water at this site since the contaminant plume has been shown to terminate several hundred feet up gradient of the nearest surface water (in the marina and wetlands area, see Figure 7 in AMT Report 3). Additionally, direct sampling of the surface water body in the marina did not detect groundwater contaminants (see AMT Report)

Workshop Case Example - Variation A

For educational purposes only (does not apply to actual case example) - Let's assume 1,000 ppm of DCE (and not other contaminants) was found in wells 20A and 21A immediately adjacent to the surface water body (i.e., if we had these conditions we would answer Yes to this question and go on to question #5).

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] 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)?

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____ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] 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 concentration[3] 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 concentrations[3] 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):

For the Workshop Case Example there would be no need to address this question. However, if we look at:

Variation A of the Workshop Case Example -

We would answer "No" it is not insignificant since the concentration of contaminants in wells adjacent to the surface water body (1,000 mg/l) was (far) greater than our general rule-of -thumb 10 times factor above the aquifer levels of concern (of 7 ug/l for DCE, in fact it was 10,000 times above the aquifer standard).

Then as per the response criteria above for a "No" response where the discharging groundwater was more than 100 times the aquifer standard we would report the "the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body" which was determined to be 0.4 kg of DCE per year (based on Q=kIA x conc. (Where k=0.4 m/d, I=0.001, A=3000m2 , conc.= 1,000 mg/l)).

We would also document that there is no evidence that the concentrations or discharge rate to be increasing, since earlier sampling also showed 1,000 mg/l. We would then move on the next question to determine if this loading could be considered "currently acceptable."

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

Question 5 cont.

Variation B

If the concentration of DCE in wells adjacent to the surface water was 35 ug/l we would?

Perhaps recognize that the concentrations are less than 10 times the appropriate aquifer "levels" and we could choose to use the 10X rule of thumb to determine that this discharge, of this contaminant, at this site, and under these site conditions would not be likely to significantly impact the surface water body. Then we could respond with a "yes" because the **discharge** of "contaminated" groundwater into surface water is likely to be **"insignificant"** and then provide the response documentation criteria for a "yes" answer, and skip to number 7.

Variation C

If we had these same conditions and the receiving surface water body was an extremely small creek with high ecologic value and rare or endangered species (somewhat sensitive to DCE) we would?

Probably answer "no" the discharge is not likely to be **in**significant and should be considered more closely in the next question.

Variation D

If we had these same relative concentrations (5X levels) and environmental setting conditions as in Variation B above but that the contaminant was mercury (say the aquifer std is 2 ug/l and we have 10 ug/l discharging) we would?

Perhaps recognize that the specific characteristics of this contaminant (a non-degradable and bioaccumulative constituent) could indeed have a significant impact on the surface water, sediment, and ecosystem quality so that we would carry this case forward for more in-depth analysis in the next question.

Variation E

IF we had Light Non-Aqueous Phase Liquids (LNAPL) free product discharging into surface water body (for example with a visible thickness or sheen) we would?

Probably have a hard time calling this an example of migration "under control," or defending this condition as a measure of success, and we would probably want to carry this forward to be explored further in the next question.

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 implemented[4])?

____ 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):

Variation A
Variation C
Variation D
Variation E

[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.

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?"

X 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):

On-going monitoring will be conducted in locations in GP/MW-8, GP/MW-9, and near the location of GP5, as well as in MW-18A, MW-22A, and the Smith home well as is planned on a quarterly frequency in submittals by the AMT facility in their Groundwater Monitoring Plan. These data will be reviewed by the Department upon receipt to ensure that this determination remains accurate.

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).

X 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 **AMT, Inc.** facility , EPA ID # **BE000000001**, located at **Derekwood, BE**. 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)	signature on file	Date 1/27/00
	(print)	Henry Schuver	
	(title)	Environmental Scientist, USEPA	

Supervisor	(signature)	signature on file	Date 2/1/00
	(print)	Manny G. Ment.	
	(title)	Director, RCRA CA Division	
	(EPA Region or State)	Region 00	

Locations where **hard-copy** References may be found:
1) AMT, Inc. facility, (1001 Riverside Dr., Derekwood, BE)

2) Riverside Public Library, Public Repository files, (3001 Riverside Dr., Derekwood, BE)

3) State of Beryllium Dept. of Environ. Protection Office, Central Files, (401 E. State St., BE)

4) USEPA Region 0 office, RCRA files, (290 Broadway, Big City, BE)

Electronic EI Website location: http://www.epa.gov/epawaste/hazard/correctiveaction/eis/index.htm

Contact telephone and e-mail numbers

(name)	Henry Schuver
(phone #)	(703) 308-8656
(e-mail)	Schuver.Henry@EPA.gov