

**Documentation of Environmental Indicator Determination
in accordance with EPA Interim Final Guidance 2/5/99**

**RCRA Corrective Action
Environmental Indicator (EI) RCRA Info Code (CA750)**

Migration of Contaminated Groundwater Under Control

Facility Name: Expert Management, Incorporated (formerly ICI Explosives USA, Incorporated)
Facility Address: Joplin, Missouri
Facility EPA ID #: MOD077887909

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?

 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 RCRA Corrective Action)

Environmental Indicators (EIs) 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 "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 EIs 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 groundwater 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 Determination status codes should remain in RCRA Info national database ONLY as long as they remain true (i.e., RCRA Info 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 [e.g., Maximum Contaminant Levels (MCLs), the maximum permissible level of a contaminant in water delivered to any user of a public water system under the Safe Drinking Water Act]) from releases subject to RCRA Corrective Action, 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):

On-site groundwater contaminants of concern (COCs) exceed EPA Region IX Preliminary Remediation Goals (PRGs) for tap water, the department’s Cleanup Action Levels in Missouri (CALM) Groundwater Target Concentrations (GTARC) and/or Missouri Water Quality Standards (MWQS). These COCs are primarily explosives, metals, and inorganics, including perchlorate, although some volatile organic compounds (VOCs), petroleum hydrocarbons, and semi-volatile organic compounds (SVOCs) are also present (see Table 1 through 4 for a comparison of COCs to MWQS, GTARCs, and PRGs). On-site groundwater is not used as a drinking water source.

EPA sampled 22 off-site private wells in the vicinity of the EMI property in June 2003 to gauge overall water quality in the area. All known groundwater COCs that might relate to the EMI facility were evaluated. The results appear to indicate that groundwater contamination from EMI has not impacted off-site wells used for domestic consumption.

The following documents should be consulted for additional information on the nature, extent and concentrations of the site-specific COCs:

December 1995 RCRA Facility Investigation Phase I Report (Woodward-Clyde Consultants)
August 2000 RFI Phase II Report (URS Corporation)
January 2001 RFI Phase II Supplemental Report (URS Corporation)
November 2003 Data Submittal - Groundwater and Surface Water Monitoring Program (ENSR International)
October 2002 Data Submittal - Groundwater and Surface Water Monitoring (ENSR International)
July 2003 Report of Finding for the Fall 2002 Supplemental Groundwater Sampling (ENSR International)
April 2003 Excavation Report SWMU BB-5 (a) (ENSR International)
November 2003 Findings Report for Removal of Former Underground Storage Tank #6 (ENSR International)
August 2003 CAS M-1(a) Report (ENSR International)
Off-site groundwater data from sampling conducted on June 2003 by EPA

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):

There are 18 large plumes of groundwater contamination at the site. These consist of four ammonia, four nitrate, four Dinitrotoluene (DNT), three Trinitrotoluene (TNT), one fluoride, one chloride, and one sulfate plume. In addition, small areas of lead and cadmium contaminated groundwater are scattered throughout the South Area, and there are several perchlorate groundwater plumes throughout the site.

With the exception of perchlorate, groundwater contaminants have been monitored by various wells in these areas since 1995. Monitoring data indicates that, horizontally, these groundwater plumes have stabilized and overall contaminant concentrations are not increasing.

Groundwater analysis for perchlorate began just recently at this site. Perchlorate groundwater sampling data is only available for two sampling events, so concentration trends for perchlorate cannot be determined at this time. However, given the age of the release (use of perchlorate at the site had ceased by the early 1980s) and the fact that concentrations of contaminants in all other contaminant plumes are not increasing and have stabilized, perchlorate concentrations are not expected to be increasing and the sizes of the perchlorate contaminant plumes are considered stabilized.

Groundwater was sampled at nine deep bedrock monitoring wells to determine if contaminants had migrated vertically. Only one of these wells, MW-RI-2C, contained a contaminant at a concentration exceeding MWQS, GTARC, and/or PRGs during its last sampling event. Groundwater at MW-RI-2C has only been sampled once. The 1999 groundwater sample contained DNT at a concentration of 0.15 ppb (GTARC is 0.05 ppb). Due to the low concentration of DNT, and the lack of groundwater contamination at the other deep bedrock wells, this contamination is expected to be very localized and is considered stabilized.

In addition to the nine deep bedrock monitoring wells, one production well, IW-6, (well cased to 1002 feet below ground surface, open from 1002 to 1402 feet bgs) was sampled in 2003. This well is near the confluence of No-Name Creek and Grove Creek, and is near monitoring well GMW-04S (cased to 23 bgs, open from 23 to 46.5 bgs). While GMW-04S contained fluoride at a concentration of 5.5 ppm (PRG is 2.2 ppm) and sulfate at a

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.

concentration of 439 ppm (MWQS is 250 ppm) when last sampled in 2000, IW-6 did not contain any detectable

concentrations of contaminants when sampled in 2003. The lack of contamination in this well further justifies the conclusion that vertical migration of contaminants in groundwater is limited.

The lack of deep groundwater contamination is likely due to the hydraulic separation of the shallow and deep aquifer by the Northview Shale and related strata of the Kinderhookian Series. Where present, the Northview Shale acts as a vertical barrier to migration. The Northview Shale is locally absent in some areas, and where it is present, downward movement of groundwater from the shallow aquifer can occur locally along faults and fractures. The Recourse Conservation and Recovery Act Facility Investigation (RFI) Phase II Supplemental Report measured vertical gradients at ten sets of shallow/deep bedrock well clusters for four quarters. The vertical gradients were relatively low, ranging from an upward gradient of 0.29 ft/ft to a downward gradient of 0.92 ft/ft.

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

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

 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):

Contaminated groundwater potentially discharges into the Grove Creek, Nitrogen Section Ditch, No-Name Creek, and the Constructed Wetlands Ditches (Powderline Ditch and the Acid Area Ditch).

Elevated concentrations of perchlorate are present in monitoring wells near the Nitrogen Section Ditch in the area of the Former Chemical Pond and the Former Burning Ground. Although perchlorate is present in these wells, contaminated groundwater does not appear to discharge to the Nitrogen Section Ditch because the ditch only contains water during storm events. This is likely because the unconfined water elevations in the wells near the ditch have historically been well below the elevation of the bottom of the ditch. During storm events, the ditch appears to lose flow to the subsurface. Therefore, the potential discharge of contaminated groundwater to the Nitrogen Section Ditch is not considered in this evaluation.

5. Is the **discharge** of “contaminated” groundwater into surface water likely to be “**insignificant**” (i.e., the

maximum concentration³ of each contaminant discharging into surface water is less than ten times the appropriate groundwater “level,” and there are no other conditions (e.g., the nature or number of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments or eco-systems at these concentrations)?

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

X If no - (the discharge of “contaminated” groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration³ of each contaminant discharged above its groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations³ greater than 100 times the 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):

The discharge of DNT, 2,4,6-trinitrotoluene, perchlorate, nitrate, and fluoride into surface water is potentially significant because the concentration at which these COCs are discharging to surface water is more than ten times the PRGs, GTARC, and/or MWQS (see Table 5). Groundwater sampling data for DNT, 2,4,6-trinitrotoluene, nitrate, and fluoride indicates that contaminant concentrations are not increasing. For the reasons discussed in question 3, perchlorate concentrations are also not expected to be increasing. Perchlorate is the only COC whose concentration exceeds PRGs, GTARC, and/or MWQS by more than 100 times.

Perchlorate entering Grove Creek appears to originate at the Large Diameter Emulsion Sump and the Small Diameter Emulsion Sump areas. The Large Diameter Emulsion Sump area is estimated to be discharging approximately 2.53 kg/yr of perchlorate to surface water and the Small Diameter Emulsion Sump area is estimated to be discharging approximately 6.62 kg/yr of perchlorate to surface water, for an estimated total perchlorate discharging into Grove Creek of approximately 9.15 kg/yr (see Table 7 for calculations). There is no evidence that the amount of discharging contaminants is increasing. This estimate is based on the groundwater in the vicinity of Grove Creek in the Former Powderline Area moving an average of 83 feet/year (71 ft/yr at MW-28, 95 ft/yr at MW-RI-38) and the average thickness of the saturated alluvium potentially discharging to surface water estimated as five feet in the Large Diameter Emulsion Sump area and two feet in the Small Diameter Emulsion Sump area.

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

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

 X 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 specialist(s), 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 cannot 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):

As stated in the response to question 5, the discharge of DNT, 2,4,6-trinitrotoluene, perchlorate, nitrate, and fluoride into surface water is potentially significant because the concentration at which these COCs discharge to surface water is more than ten times the PRGs, GTARC, and/or MWQS (see Table 5). DNT and 2,4,6-trinitrotoluene do not appear to be problematic as these contaminants have not been detected in surface water samples above analytical detection limits.

Grove Creek, No-Name Creek, and the Constructed Wetlands Ditches are not used as drinking water sources and there are no drinking water intakes on these surface waterways or on any stream they flow into. Due to the lack of a complete human receptor pathway, the discharge of contaminants to surface water is considered to be currently acceptable to human health. The following discussion concerns whether the discharge of contaminants to surface water is currently acceptable for eco-systems.

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.

Grove Creek:

The highest concentration of perchlorate in groundwater that could discharge into Grove Creek was at sample location B-12 at a concentration of 3,200 ppb (PRG is 3.6 ppb). However, according to page 10-6 and 10-7 of the Agency for Toxic Substances and Disease Registry's 2002 Draft Toxicological Report for perchlorate, the surface water tier II secondary chronic and acute concentrations for aquatic life are 5,000 and 600 ppb, respectively. The highest measured concentration of perchlorate in surface water in Grove Creek was during the 2003 surface water sampling event at SW-4 at a concentration of 86 ppb, and at a concentration of 150 ppb in the duplicate sample. These concentrations are well below the 2002 Draft Toxicological Report concentrations for surface water tier II secondary chronic and acute. As a result, the discharge of perchlorate to surface water is considered to be currently acceptable to eco-systems.

The highest concentration of nitrate in groundwater that could discharge to Grove Creek was at sample location MW-RI-EE-9 at a concentration of 140,000 ppb (see Table 5 - MWQS and PRG is 10,000 ppb.) Overall, the discharge of nitrates into surface water is considered currently acceptable to eco-systems based on the measured concentration of nitrates (4,400 ppb) at sample location SW-14, in Grove Creek, which is approximately 300 feet downstream of MW-RI-EE-9.

The highest concentration of fluoride in groundwater that could discharge to Grove Creek was at sample location MW-RI-33 at a concentration of 40,000 ppb (PRG is 2,200 ppb, MWQS is 4,000 ppb). The highest measured concentration of fluoride (8,300 ppb) in Grove Creek occurred during the 2003 surface water sampling event at the confluence of No-Name Creek and Grove Creek at surface water sample location SW-02. The Agency for Toxic Substances and Disease Registry's 2003 Toxicological Report for fluoride does not discuss ecological effects and does not list ecological minimum risk levels. However, the fluoride contamination in Grove Creek is not widespread, and, is less than a magnitude higher than PRGs and MWQS. As a result, the discharge of fluoride to surface water is considered to be currently acceptable to eco-systems.

EPA sampled creek sediments in June 2003. Polychlorinated dibenzodioxins, polychlorinated dibenzofurans, arsenic, barium, cadmium, chromium, lead, and acetone were detected in sediment samples taken both upstream and downstream of the EMI property. The concentrations and the locations of the samples suggest that these contaminants are not a result of activities at this site.

No-Name Creek:

The highest concentration of fluoride in groundwater that could discharge into No-Name Creek was at sample location MW-RI-39 at a concentration of 29,000 ppb (PRG is 2,200 ppb, MWQS is 4,000 ppb). Fluoride was detected downgradient of MW-RI-39 at the confluence of No-Name Creek with Grove Creek at sample location SW-02. Fluoride in Grove Creek is discussed above.

Constructed Wetlands Ditches:

The highest concentration of perchlorate in groundwater that could discharge into the Constructed Wetlands Ditches was at sample location MW-RI-EE-5 at a concentration of 160 ppb (PRG is 3.6 ppb). As stated above, the 2002 Draft Toxicological Report for perchlorate lists the surface water tier II secondary chronic and acute concentration for aquatic life at 5,000 and 600 ppb, respectively. The surface water sample downgradient of the wetlands, SW-5, detected perchlorate at 26 ppb during the 2003 sampling event. This concentration is well below the 2002 Draft Toxicological Report concentrations for surface water tier II secondary chronic and acute. As a result, the discharge of perchlorate to the Acid Area Ditch is considered to be currently acceptable to eco-systems.

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):

Submittal of a Sampling and Analysis Plan (SAP) will be required by the Part I permit soon to be issued. The SAP will propose well/measurement locations to be monitored in the future to verify that the groundwater contamination is not migrating horizontally or vertically beyond the existing area of groundwater contamination. Prior to issuance of the Part I permit, EMI will continue to perform periodic groundwater sampling and analysis.

8. Check the appropriate RCRA Info 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 Expert Management Incorporated, located in Joplin, Missouri. 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) original signed by Julie Pearson Date 9/30/04
(print) Julie Pearson, P.E.
(title) Project Manager

Supervisor: (signature) original signed by Richard Nussbaum Date 9/30/04
(print) Richard A. Nussbaum, P.E., R.G.
(title) Chief, Corrective Action Unit
(EPA Region or State) Missouri

Locations where References may be found:

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