

# Remedy Selection and Implementation

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## 12.1 Introduction

A **remedy** consists of one or more measures taken to control unacceptable risks to human health and/or the environment arising from a contaminant release. Examples include:

- Contaminant removal
- Contaminant treatment
- Natural or enhanced biodegradation
- Contaminant containment, immobilization, or stabilization
- Thermal destruction
- Treatment at the point of exposure
- Land use and activity restrictions, including environmental restrictive covenants (ERCs) and environmental restrictive ordinances (EROs)
- Long-term monitoring or periodic reporting
- Engineering controls (ECs)
- Combinations of the above, or other options

This section provides guidance on the process of choosing and implementing a remedy. It also provides guidance on institutional controls (ICs), mainly ERCs and EROs. The most effective ICs often work in conjunction with other controls and active treatment of contaminants (U.S. EPA 2010d).<sup>59</sup>

## 12.2 Applicability

Some releases do not require a remedy. For example, areas that meet residential remediation objectives (e.g., screening levels or site-specific levels) are generally eligible for unconditional closure.<sup>60</sup> Similarly, a site that undergoes remediation and subsequently meets residential remediation objectives no longer requires a remedy, and will be eligible for unconditional closure.<sup>61</sup> An **unconditional closure** is a true “walk away” closure that adequately addresses risk from a release without relying on any continuing activity and/or activity restriction. All other closures are **conditional closures**. That is, they require a remedy of some sort.

## 12.3 Interim Remedial Action

Interim remedial action may be necessary in some cases to reduce or eliminate an immediate threat which could pose an unacceptable risk of harm to human health or the environment if present for even a short amount of time. It may also prove prudent and cost effective to use an interim remedial action to reduce contaminant mass during the conceptual site model (CSM) development and remedy selection processes. The interim remedial action may include removal or treatment of free product, or addressing sources of contamination with complete exposure

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<sup>59</sup> 40 CFR 300.430(a)(1)(iii)(C); 40 CFR 300.430(a)(1)(iii)(D)

<sup>60</sup> The Indiana Department of Environmental Management (IDEM) may require a remedy to protect natural resources or the environment, even at sites where potential contaminant concentrations do not exceed human health remediation objectives. Prior closure determinations may no longer be valid if new information indicates a potential threat to human health and/or the environment.

<sup>61</sup> Certain land uses (e.g., highways, railroads) *may* not require ERCs or EROs for closure, even when underlying contamination exceeds residential remediation objectives.

pathways or imminent likelihood of a completed pathway (acute vapor intrusion (VI) levels, impacts to well head, etc.)

## 12.4 Remedy Selection

The formal remedy selection process is typically undertaken after characterization of the release has been performed, the risks to human health and the environment have been assessed, and the CSM indicates that there are one or more exposure scenarios with an unacceptable risk.

However, the formal remedy selection process need not prevent implementation of suitable interim remedial actions (Section 12.3).

As discussed in Section 1.3, Indiana Code (IC) 13-25-5-8.5 directs responsible parties to specify remediation objectives for sites where releases occur, and states that they shall be based on one of the following:

- *IC 13-25-5-8.5(b)(1) background levels of hazardous substances and petroleum that occur naturally on the site;*
- *IC 13-25-5-8.5(d)(1) Levels of hazardous substances and petroleum calculated by the department using standard equations and default values for particular hazardous substances or petroleum;*
- *IC 13-25-5-8.5(d)(2) Levels of hazardous substances and petroleum calculated using site specific data for the default values in the department's standard equations; or*
- *IC 13-25-5-8.5(d)(3) Levels of hazardous substances and petroleum developed based on site specific risk assessments that take into account site specific factors, including remedial measures, restrictive covenants, and environmental restrictive ordinances that: (A) manage risk; and (B) control completed or potential exposure pathways.*

An effective remedy will adequately address risks to human health and the environment, and may require multiple components and more than one remediation objective. Exposure can be reduced by decreasing contaminant levels, reducing the mass or volume of contamination, reducing the mobility of the contamination, or by restricting or controlling activities or access to the contamination by receptors. There may be many possible effective remedies for a release, and they can vary dramatically in scope and expense.

The nature of the remediation technology proposed is contingent on site-specific factors. Commonly used, well documented remedial techniques are more likely to be approved by IDEM with less data than experimental techniques, although various alternatives may be proposed. In some cases, remedial alternatives proposed will need to be modified and resubmitted to IDEM.

There are many potential active remedies (e.g., removal and disposal, bioremediation, pump and treat, chemical oxidation, etc.). It is beyond the scope of this document to list all possible remedial technologies. Active remediation includes approaches that reduce the mass, toxicity, mobility, or concentration of contaminants in soil and ground water, or contains them to physically prevent exposure or migration. The benefits of active remediation include:

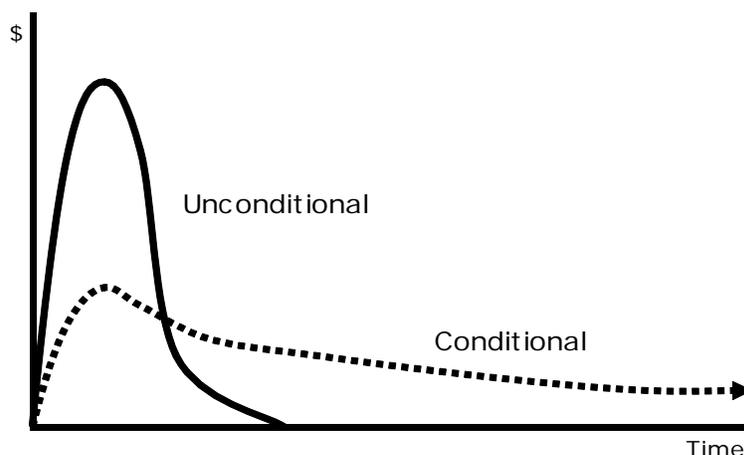
- Possible unconditional closure of site
- Shortening the length of time that the site will need to be monitored or maintained or otherwise restricted
- Wider variety of beneficial future uses
- Lower risk of future liability

## 12.5 Remedy Evaluation

When considering approval of potential remedies, IDEM will take several factors into account<sup>62</sup>, including many of those listed below. However, entities implementing remedies are generally free to consider the advantages and disadvantages of various options for themselves<sup>63</sup>. Important factors include:

- Effectiveness (i.e., will the remedy sufficiently reduce exposure, and continue to do so over the likely lifetime of the contaminant?)
- Cost, including cost over time (Figure 12-A). Long-term costs associated with a conditional closure may ultimately prove more expensive than achieving an unconditional closure. IDEM will take a special interest in this factor when the state (e.g., the Excess Liability Trust Fund) pays for some or all of the remedy cost.
- Acceptability to affected parties
- Potential, if any, to make the original situation worse (e.g., by facilitating the spread of contamination, or its transformation into a more toxic form)
- Planned use<sup>64</sup> (Section 2.4) of the site and all impacted properties. The level of confidence in future planned use is important when assessing potential risk posed by the site contamination and selecting the appropriate remedy.

**Figure 12-A: Projected Expense Over Time**



Remedy proposals should include, among other things, a description of the risk exposure assumptions developed from the CSM, the proposed remedy, and the logic for its selection. The proposals should also demonstrate how the remedies meet the remediation objectives defined in IC 13-25-5-8.5.

<sup>62</sup> Some programs [e.g. Leaking Underground Storage Tank (LUST), RCRA] also have rules that must be followed (ex. free product abatement for LUST sites).

<sup>63</sup> Those seeking liability protection under CERCLA, IC 13-23, IC 13-24, and IC 13-25-4 will generally have additional obligations as criteria that must be met.

<sup>64</sup> Local governments generally have jurisdiction in land use decisions.

## 12.6 Remedy Implementation and Decision Documentation

The selected site remedy decision should be clearly documented. IDEM has developed two new state forms to ensure that remedy decisions are clearly presented, and weighed against the appropriate criteria. These forms are intended to serve as an executive summary of the remedy selection and remedy implementation, and should be completed by the responsible party (or their environmental contractor.). The forms should be submitted with any corrective action plan or remediation work plan, or any request to approve site closure. IDEM staff will indicate approval by signing and returning a copy of the form to the requestor.

The [Record of Remedy Selection](#)<sup>65</sup> (RRS) (State Form 54471) presents the remedial or corrective action plan when IDEM must approve the selection of the remedial (or corrective) action. It certifies that the remedy selection process was carried out properly; describes the technical parameters; specifies the remedy components and remediation goals; and provides a consolidated source of information - including the rationale behind the selection.

The [Record of Site Closure](#)<sup>66</sup> (RSC) (State Form 54472) presents the site closure decision. It describes the technical parameters; specifies the remedy components and remediation goals; and provides a consolidated source of information - including the rationale behind the selection.<sup>67</sup>

## 12.7 Risk Management

Risk management strategies reduce or eliminate specific exposure pathways through ECs or ICs. ICs include legal restrictions on the use of a property. There are many kinds of ICs, including ERCs and EROs.

Effective ICs or ECs reduce or eliminate exposure via specific exposure pathways. Where remedies incorporate controls that effectively reduce exposures, one option is to use the equations in U.S. EPA (2011) to calculate site-specific levels that take the effect of those exposure controls into account. Another is to perform a site-specific risk assessment.

Risk management remedies that eliminate exposure via a specific pathway simply remove that pathway from the risk evaluation. However, effective risk management strategies require compliance with selected land use, ground water, and/or activity restrictions, and may require an ongoing commitment to operation and/or maintenance of the remedy. When applicable, the ongoing commitment will vary with the nature of the remedy, and could range from periodic inspections designed to monitor compliance with the terms of an ERC all the way up to operation and maintenance of a complex engineered system.

*When the responsible party or participant does not own the property, IDEM may consider lines of evidence (LOEs) to demonstrate that an ERC or ERO is not necessary to protect human health and the environment. LOEs may include the location, extent, toxicity, or persistence of the contamination. In situations where a third party owns the property and is unwilling to agree to an ERC, evidence of unsuccessful attempts to obtain the ERC should be provided to IDEM for its consideration. In lieu of an ERC or an ERO, IDEM may, at its discretion, provide a conditional site closure that identifies conditions that must be maintained or performed after site closure.*

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<sup>65</sup> <https://forms.in.gov/Download.aspx?id=8834>

<sup>66</sup> <https://forms.in.gov/Download.aspx?id=8845>

<sup>67</sup> In cases where IDEM can approve the remedy selection and site closure simultaneously, the RSC may present all information about the remedy selection and remedial action(s) performed, so an RRS would not be necessary.

## 12.8 Environmental Restrictive Covenants (ERCs)

IC 13-25-5-8.5(e) directs IDEM to consider and give effect to ERCs in evaluating risk-based remediation proposals. An ERC is a legal measure designed to protect human health by limiting exposure to contamination at sites where contamination remains in place. ERCs limit human exposure by restricting activity on, use of, and/or access to contaminated properties, or by requiring the maintenance of an EC. ERCs should be recorded in the office of the recorder of the county in which the real property is located, and the ERC must cross-reference the most recent deed of record in the recorder's office.

When an ERC is proposed as a remedy or component of a remedy, IDEM will evaluate it to determine (a) whether the activities, land use restrictions, and obligations proposed are sufficient to protect human health and the environment, and (b) whether it attaches to the correct real estate and includes all the necessary elements of a restrictive covenant as defined in 13-11-2-193.5. IDEM recommends submission of a draft for review prior to recording an ERC. IDEM may suggest changes to proposed ERC language, and may deny closure if IDEM determines the restrictions are not sufficiently protective or the ERC is not enforceable by IDEM.

### 12.8.1 Legal Requirements for ERCs

IDEM will evaluate a proposed ERC to determine whether it meets the statutory criteria set out in the definition of "restrictive covenant" in IC 13-11-2-193.5. An ERC executed after June 30, 2009:

- (A) limits the use of the land or the activities that may be performed on or at the land or requires the maintenance of any engineering control on the land designed to protect human health or the environment;*
- (B) by its terms is intended to run with the land and be binding on successors;*
- (C) is recorded with the county recorder's office in the county in which the land is located;*
- (D) explains how it can be modified or terminated;*
- (E) grants the department access to the land;*
- (F) requires notice to a transferee of:*
  - (i) the land; or*
  - (ii) an interest in the land;**of the existence of the restrictive covenant; and*
- (G) identifies the means by which the environmental files at the department that apply to the land can be located.*

The actual property owner must execute an ERC in order for IDEM to consider the ERC as a remedy or a component of a remedy. Optional ERC templates that meet these requirements are available on [IDEM's remediation program web pages](http://www.in.gov/idem/5371.htm).<sup>68</sup>

<sup>68</sup> <http://www.in.gov/idem/5371.htm>

### **12.8.2 Selection of Restrictions and Obligations**

IC 13-25-5-8.5(d)(3) allows ERCs that manage risk or control completed or potential exposure pathways to be considered as a part of a risk based remediation proposal. IDEM will review and consider the effect of proposed use or activity restrictions and obligations in addressing the risks identified in the CSM. IDEM may approve or disapprove of use or activity restrictions and obligations based on this evaluation.

When determining the appropriate restriction or obligation to require at a site, consider the following:

- The contaminated media
- Current and reasonably expected future use of the ground water
- Current and reasonably expected future use of the site and neighboring properties
- Contaminant mobility
- The nature of the contamination (e.g., naturally attenuating?)
- Current and potential receptors
- Availability of public water supply systems

In some cases, IDEM may request maps, GPS coordinates, and/or legal surveys that describe certain ECs or restrictions that apply to a portion of a property. Table 12-A illustrates some of the factors to consider when selecting appropriate restrictions for a site. The table is not comprehensive - other site-specific restrictions may be necessary.

**Table 12-A: Restrictions and Remedies**

<b>Type</b>	<b>Exposure Pathway</b>	<b>Comments</b>
Ground water use restriction	Ground water direct contact	<b>Use when:</b> Ground water exceeds residential remediation objectives.
Residential use restrictions	Soil direct contact	<b>Use when:</b> Easily accessible soils exceed residential soil direct contact remediation objectives. The remedy includes caps, covers, or the possibility of methane generation. Unexploded ordnance may be present. <b>Consider when:</b> Multiple exposure pathways may present increased long-term exposure risk (e.g., a combination of highly contaminated soil, ground water, and soil gas).
Excavation prohibition, restrictions, or notice	Soil direct contact: excavation worker	<b>Use when:</b> Unexploded ordnance may be present. The remedy includes an engineered cap. The remedy includes a soil or vegetative cover. Contamination remains above excavation worker remediation objectives. <b>Consider when:</b> Residual contamination remains at residential properties (e.g., fuel oil contamination beneath a house).
Prohibition on building construction	Soil direct contact, ground water direct contact, and VI	<b>Consider when:</b> Very high levels of contamination will remain in place for a long time (particularly chlorinated volatile organic compounds (VOCs)). Hazardous waste or contamination remains contained in place. Landfills produce methane (additional regulations may apply).
Vapor mitigation systems <sup>69</sup>	VI	<b>Use when:</b> Indoor air contamination is confirmed, particularly for residences. <b>Consider when:</b> Ground water contamination exceeds VI screening levels.
Capping/covers <sup>70</sup>	Soil direct contact; migration to ground water	<b>Use when:</b> Easily accessible soil exceeds remediation objectives. <b>Consider when:</b> Vadose zone soils exceed migration to ground water remediation objectives in wellhead protection areas, susceptible areas, or landfills. The site or surrounding property contains potable water wells.
Agricultural use restriction	Ingestion; possible soil direct contact	<b>Use when:</b> Contaminants may bioaccumulate in food chain. Unexploded ordnance may be present. Engineered cap or cover must be maintained. <b>Consider when:</b> Easily accessible soils exceed residential soil direct contact remediation objectives. Agricultural use or gardening seems likely.

<sup>69</sup> Occupational Safety and Health Administration regulations may apply at commercial/industrial sites

<sup>70</sup> Caps may involve other obligations, such as storm water management. Restriction wording should include prohibition on disturbing the cap, and describe operation, maintenance, and possible monitoring of the cap.

### 12.8.3 Recording ERCs

ERCs are typically recorded at the end of remedy implementation process. However, there are instances (e.g., when the property is going to be transferred or when full implementation of a remedy may take a long time) in which it may be appropriate to record an ERC prior to the end of the remedial process.

The following documentation will typically be necessary before IDEM will grant closure:

- Copies of the most recent deed for the property to verify property ownership. The deed may also be used as the legal description to be attached to the ERC as an exhibit.
- Copies of recorded ERCs, signed by the property owner, which are part of the approved remedy.

The appropriate county health department and any relevant well permitting authority should each receive a copy of any recorded ERC that prohibits ground water use.

IDEM may require the owner of an existing or former hazardous waste facility [Resource Conservation and Recovery Act (RCRA)] or Comprehensive Environmental Response, Compensation, and Liability Information Site (CERCLIS) site to record an ERC on the property if the commissioner determines an ERC is necessary to protect human health and the environment. IDEM may require that such ERCs include a description of the identity, quantity, and location of hazardous substances remaining on the property<sup>71</sup> and include provisions ensuring that ECs are undisturbed and effectively maintained.

### 12.8.4 ERC Modification or Termination

Certain circumstances may warrant modification or termination of an ERC. Some examples include site contamination no longer in excess of residential remediation objectives (through natural attenuation), the need to enhance restrictions due to a change in land use, or the complete or partial cleanup of a site (e.g., removing contaminated soil after a building is demolished). In most instances, confirmatory sampling will be necessary; therefore, advance coordination with IDEM is recommended.

Requests for an ERC modification or termination must be made in writing to the appropriate remediation program at IDEM. If IDEM concurs, a modification or termination document stating the reasons for the change, and IDEM's approval of the change, will need to be recorded in the same manner as the original ERC. A copy of the recorded modification or termination must be provided to IDEM.

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<sup>71</sup> Per IC 13-25-4-24(c)

## 12.9 Environmental Restrictive Ordinances (EROs)

An ERO is an ordinance adopted by a municipal corporation<sup>72</sup> that seeks to control the use of ground water in a manner and to a degree that protects human health and the environment against unacceptable exposure to a release of hazardous substances or petroleum, or both. IDEM neither encourages nor discourages local governments from adopting EROs. It is up to the community to decide if adopting the ordinance is appropriate, taking into account current and future planned use of water resources. Per IC 13-25-5-8.5(e), IDEM must consider and give effect to EROs in evaluating risk based remediation proposals.

Because IDEM has the responsibility to ensure that remedies protect human health, it will review EROs for effectiveness. Effective EROs *prohibit* use of contaminated ground water for potable use and, depending on the contaminant(s), remaining concentrations, and plume dynamics, *may* prohibit use of ground water for other purposes (e.g., irrigation, cooling water, etc.). EROs may not be acceptable where plumes encroach or fall within a wellhead protection area (WHPA).<sup>73</sup>

ERO effectiveness depends in part on understanding the present and future extent of ground water contamination, and ensuring that the ERO area fully encompasses that extent and a recommended additional buffer zone area. The CSM will inform design of the ERO area, and the design may also employ LOEs from a plume behavior evaluation (Section 4).

EROs that allow for special use exceptions or variances may unintentionally permit future exposure to contaminated ground water. Therefore, before granting a variance or exception, local government units should ensure that the proposed changes will not result in unacceptable exposure.

Depending on site-specific factors (unusually toxic or persistent contaminants, large and/or unstable plumes, etc.) IDEM may condition its approval of a remedy that relies on an ERO on the responsible person's compliance with continuing obligations. For example, IDEM may condition closure approval on the responsible person's continued ground water monitoring to ensure that the plume does not extend beyond the established boundaries of the ERO. In addition, the responsible person may need to take other remedial measures to control exposure via pathways (such as VI) not addressed by the ERO.

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<sup>72</sup> As defined in IC 36-1-2-10. For purposes of this guidance, a municipal corporation may include counties, municipalities, townships, local hospital corporations, or any entity that may enact an ordinance.

<sup>73</sup> Either the five-year time of travel of a delineated WHPA or a 3,000-foot fixed radius WHPA for a community water system. In accordance with IC 5-14-3-4(b)(19)(H), locations of approved WHPAs are not available on line. For general information regarding WHPAs consult the [IDEM Wellhead Protection Program web page](#); to determine whether a specific site is within a WHPA, contact IDEM's Ground Water Section via phone at 317-232-8603.

### 12.9.1 ERO Evaluation Criteria

IDEM will thoroughly evaluate EROs proposed as a component of a remedy. Approval of an ERO for one site does not ensure that other contaminated sites within the boundaries of the ERO will automatically be granted closure based on that same ERO. Use of an ERO as a proposed remedy will be evaluated on a case-by-case basis and evaluated according to the facts at each site. ERO evaluations will include at a minimum:

1. An assessment of plume extent and stability of the ground water plume. There should be sufficient understanding of the contaminant mass flux within a ground water plume to demonstrate that the contaminant plume will not migrate beyond the boundaries established in the ERO at levels that would not be considered protective of human health. This may be accomplished by:
  - a. Identifying characteristics of the site and the contaminant plume that provide a level of confidence that the plume is near its maximum extent and concentration;
  - b. Demonstrating that the contaminant plume is stable or shrinking, prior to acceptance of an ERO as an IC at a particular site; or
  - c. Long term monitoring that demonstrates that the contaminant plume does not extend beyond the boundaries established in the ERO.
2. Location of the site with respect to the ERO coverage area. The ERO coverage area should include the contaminant plume, predicted plume expansion area, and usually should include a buffer zone.
3. Evaluation of the site receptor survey. Section 2 provides guidance on identification of water well users. The receptor survey should thoroughly document all water use within and near the ERO boundaries including:
  - a. Potable well users within ERO extent (noting that some commercial/industrial wells are also used for potable water);
  - b. Commercial/industrial, dewatering, and irrigation wells;
  - c. Nearby water withdrawals (such as high-capacity wells near the ERO coverage area that may impact the contaminant plume);
  - d. Food or drug manufacturing facilities that utilize ground water wells.
4. Input from the local government unit that has enacted or that has proposed adoption of the ERO. Responsible parties and their consultants are encouraged to work directly with the local government unit. Because IDEM must rely on local governments to enforce EROs, municipal involvement throughout the review process will help IDEM evaluate the effectiveness of proposed EROs. Local governments should be contacted for information including:
  - a. Current and future local water resource planning;
  - b. Procedures for granting exceptions and variances to the ERO;
  - c. Local point of contact for ERO monitoring and compliance;
  - d. Notification provisions for EROs.

IDEM will notify local government units, including public water supply systems, in writing of any formal proposal to utilize an ERO at a particular site; and will request input on the items listed above if the information has not already been provided in the work plan.

5. Future effectiveness of the ERO (notice to interested parties). IDEM has the responsibility to ensure that remedial decisions are protective of human health. One of the documented limitations with the use of local ground water ordinances as an IC is that their continued

effectiveness hinges on public acceptance and awareness of the ordinance. In Indiana, this is particularly important given the lack of comprehensive state-wide well permitting requirements. Continued compliance with an ERO is necessary for the ERO to remain effective at managing risk and controlling completed or potential exposure pathways. Therefore, a plan or mechanism that ensures continuing public awareness of, and compliance with, the ERO can help to ensure that the ERO remains effective at managing exposure pathways. Some examples of such plans may include but are not limited to:

- a. If there is an existing local well permitting authority, notification to that entity of the existence of the ERO so that no potable wells, or wells that may exacerbate the contamination, are permitted.
  - b. Active monitoring and outreach by the local government unit so there is an ongoing public awareness of the ERO.
6. Evaluation of the ERO language. IDEM will evaluate each ERO on its own merits, and there is no requirement to follow a particular template. However, clear, unambiguous ERO language is recommended, such as:
- a. A statement indicating that the purpose of the ERO is to protect public health, and that the ordinance has been enacted as a response to ground water contamination.
  - b. Language that specifically excludes all use of ground water as a potable drinking water source for human and domestic purposes and prohibits the installation of new wells. An ordinance that just requires hookup to an existing water supply if supply lines are available, or one that allows existing wells to remain in use, may not be sufficiently protective of human health.
  - c. A clause that states that the ERO shall not in any way restrict or limit the ability of parties to perform remediation or to monitor contamination.
  - d. Language that limits the variances or exceptions allowed by the ERO<sup>74</sup>, and requires the proper handling and disposal of water that is withdrawn.
  - e. If the ERO does not apply everywhere within the boundaries of the local government unit, the extent of the ERO should be easily identifiable and clearly defined within the ERO (e.g., map or illustration showing ERO boundaries, legal description of ordinance boundaries, or common reference points such as street names). A buffer zone outside of the modeled/measured contaminant plume area is recommended to compensate for the potential influence on the plume by nearby water withdrawals. ERO boundaries should be fixed and should not be subject to change without amending the ERO (e.g., no boundaries defined by zoning districts or the availability of public water).
  - f. Language that specifies that the ERO applies at all depths and is not limited to specific aquifers.

Final acceptance by IDEM will depend on ERO content, effectiveness, and adoption by the local unit of government. IDEM will not issue closure documentation prior to receiving certification from an authorized official that the approved ERO meets the requirements of the governing statute and has been lawfully adopted by the local unit of government.<sup>75</sup> IDEM will draft site closure documents so that closure decisions may be revisited if IDEM receives or becomes aware of new information. Examples of circumstances where this is likely to happen include: 1) the

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<sup>74</sup> Examples include irrigation wells, heat pump wells, cooling water wells, fire protection wells, construction dewatering wells.

<sup>75</sup> The ERO copy should be certified [signed by the local authority and attested by the town clerk-treasurer (IC 36-5-2-10.2 ) or city clerk (IC 36-4-6-17)].

ERO is subsequently amended in a manner that allows contaminant plume migration beyond the established ERO control area or would allow exposure to contaminated ground water, 2) the ERO is repealed, 3) variances/exceptions are granted that could allow for exposure to contaminated ground water, or 4) there is evidence that exposure to contaminated ground water is occurring within an ERO approved as an IC. IDEM will enter all EROs utilized as a component of a site remedy in IDEM's Institutional Controls Registry (Section 12.11).

### 12.9.2 ERO Notification Provisions

In accordance with IC 36-1-6-11(c) and IC 36-2-4-8(4), EROs should include the following notice requirements:

- Giving written notice to IDEM not later than 60 days before amendment or repeal of the ERO;
- Giving written notice to IDEM not later than 30 days after passage, amendment, or repeal of an ERO.

Local government units should send these notices to IDEM at the following address:

IDEM, Office of Land Quality  
Remediation Services Branch  
Attn: Branch Chief  
IGCN-Suite 1101  
100 N Senate Ave  
Indianapolis, IN 46204-2251

### 12.10 Engineering Controls (ECs)

ECs are physical measures, such as caps, vegetative covers, liners, slurry walls, vapor mitigation systems, extraction wells, or treatment methods that are capable of managing risk by:

- Controlling downward migration or infiltration of surface run-off or precipitation;
- Controlling migration of contaminants through the subsurface;
- Reducing contaminant levels; or
- Limiting or eliminating the completion of exposure pathways.

ECs should usually be supported by ICs, which ensure that the ECs stay in place and are maintained. For instance, ERCs should contain an obligation to operate and maintain any ECs used at the property. Written operation and maintenance plans should be developed and approved to ensure long term reliability of ECs.

### 12.11 Institutional Controls Registry

All sites where an IC has been utilized as a remedy component will be entered in IDEM's Institutional Controls Registry. The registry allows IDEM to track sites with ICs and provides external stakeholders (local government units, water utilities, real estate developers, concerned citizens, etc.) notice of sites subject to restricted use or obligations.

IDEM posts an [IC Registry summary report](#)<sup>76</sup> every month. The report contains site-specific information on each IC site such as the site address, city, county, remediation program, and a listing of land use restrictions and engineered controls. Additional information for each site can be found by clicking on the active links on the left hand side of the summary report; a window to

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<sup>76</sup> [http://www.in.gov/idem/files/institutional\\_controls\\_registry\\_report.pdf](http://www.in.gov/idem/files/institutional_controls_registry_report.pdf)

IDEM's electronic Virtual File Cabinet is opened via one of the links, allowing the viewer to examine the base ERC, ordinance, or other relevant site document. The summary report also contains a link to the Indiana Map viewer, an interactive state-wide portfolio of GIS data that illustrates the location of each IC site.

### **12.12 Financial Assurance (FA)**

Certain conditional closures may entail substantial future expense. Examples include remedies with large ongoing operational, maintenance, and/or sampling costs, or remedies that require periodic replacement of expensive, limited-life components. FA is a guarantee that funds will be available for such expenses in the event that the responsible party becomes insolvent. In this context, the term responsible party refers to the property owner, operator, or program participant who is providing the FA.

Therefore, where there is a substantial potential exposure risk from failure or need for eventual replacement of a costly remedy, IDEM may request that responsible parties establish and maintain FA to operate and maintain the remedy as a condition of closure. Forms of FA include a trust fund, an irrevocable standby letter-of-credit (LOC), a surety bond, insurance, and financial test or corporate guarantee. IDEM does not intend to routinely request FA, and will determine the need for FA based on the nature of the remedy, and the cost and consequences of its failure. When FA is considered necessary, it will be established under an agreement such as an Agreed Order or Voluntary Remediation Agreement.

#### **12.12.1 FA: Determining Amount**

The FA amount requested of the responsible party will be no less than the cost estimate to operate, maintain and inspect ECs for which FA is required for the duration of the risk. If the duration of the risk is expected to last for an extended time period, FA will need to be structured for an appropriate rolling time period.

Cost estimates to operate and maintain the remedy are based on the costs to the responsible party of hiring a third party to conduct the necessary activities. Generally the cost estimate is calculated by multiplying the annual cost estimate by the number of years necessary to operate and maintain the remedy. In cases where a remedy will require the eventual replacement of an engineered system or control, the cost estimate includes the cost of such replacement.

When a remedy involves FA, the closure mechanism will obligate the responsible party to review and update cost estimates at least once every five years, or more often if necessary to reflect changing circumstances, either by completing a new cost estimate in current dollars, or by multiplying the previous year's cost estimate by a specified inflation factor. The financial instruments will then need to be updated to cover the new cost estimates, and both the cost estimate and adjusted instruments submitted to IDEM.

Some costs, such as erosion control and ground water sampling, might be reduced over time as the cover vegetation matures and a meaningful amount of monitoring data is accumulated. Due to site-specific conditions, a shorter or longer remedy operation and maintenance period might be determined to be appropriate; however, FA will need to be maintained until the threat of harmful exposure no longer exists.

When evaluating the amount of FA needed to ensure the effectiveness of the remedy, IDEM will apply the following guidelines:

- Activities are described in an operation and maintenance plan in sufficient detail to facilitate review of the cost estimates.
- Cost estimates are itemized in detail.
- Cost estimates reflect the costs to hire a third party to conduct the remedy operation and maintenance activities.

### **12.12.2 FA: Timeframe for Establishing**

After the nature and extent of contamination has been adequately determined, any interim remedial/clean-up activities have been completed, and a long-term remediation and/or exposure control method has been approved by IDEM, the responsible party should then proceed to obtain FA via one of the mechanisms listed below. IDEM will not issue a closure certification, covenant not to sue, or other closure documentation until after review and acceptance of the financial mechanism by IDEM staff. When closure is based on the provision and maintenance of FA and a responsible party fails to maintain adequate FA, the conditions for closure will no longer be met and IDEM may require the responsible party to take further action.

### **12.12.3 FA Instruments**

The following five types of financial instruments are allowed under current RCRA rules. The responsible party may propose to use any of these instruments, and IDEM will evaluate the appropriateness of the requests. Each instrument is briefly described below.

1. *Trust Fund.* A trust fund is an agreement between three parties wherein the responsible party sets aside a specific amount of cash or funds, which is held in trust by a third party (the Trustee) for the purpose of paying for operation and maintenance of the remedy. IDEM is named as the beneficiary of the trust. In the event of bankruptcy, IDEM uses the funds in the trust to hire a third party contractor to operate and maintain the remedy.
2. *Letter of Credit.* An irrevocable standby LOC is a document issued by a bank or other financial institution that guarantees the payment of a responsible party's obligation for up to a stated dollar amount for a specified time. The responsible party arranges with a financial institution to issue an LOC payable to IDEM, assuring that the responsible party will pay for operation and maintenance costs when necessary. Essentially, an LOC substitutes the bank's credit for that of the responsible party, eliminating the financial risk to the state. An LOC is always accompanied by a stand-by trust agreement, which creates a trust into which IDEM will deposit the funds from the LOC in the event that it must cash in the LOC in order to continue operation and maintenance of the remedy should the responsible party be unable to do so.
3. *Surety Bond.* Like an LOC, a surety bond is an agreement between two parties. One party (the Surety) guarantees that the financial obligations of the second party (the Principal) will be met. For purposes of FA, the responsible party is the Principal. By means of the bond, the Surety guarantees to IDEM that it will meet the responsible party's obligations if the responsible party is unable to do so. A surety bond is always accompanied by a stand-by trust agreement, which creates a trust into which IDEM will deposit the face value of the surety bond in the event that the responsible party has failed to meet its obligations under the terms of the bond.

4. *Insurance.* A responsible party may obtain an insurance policy for a face value amount at least equal to the cost estimate for the operation and maintenance of the remedy. Through a policy, the insurer agrees to reimburse the responsible party upon direction from IDEM, for costs incurred to operate and maintain the remedy. The insurer must be licensed by a state (use of offshore insurers is not allowed) and may not cancel, terminate, or fail to renew the policy unless the responsible party fails to pay the premiums.
5. *Financial Test.* A responsible party may demonstrate the ability to cover the costs of operation and maintenance of the remedy without a third-party guarantee by passing a financial test. With this form of FA, the company is responsible for paying costs associated with operation and maintenance of the remedy. These tests document that the responsible party has sufficient assets located within the United States to cover operation and maintenance costs. Only companies with large net assets (i.e., net worth) relative to the total estimated costs of remedy operation and maintenance are likely to pass a financial test. The responsible party demonstrates that they continue to pass the financial test by submitting updated information to IDEM after the close of each fiscal year.

A responsible party may obtain a written guarantee from a separate but related company to cover remedy operation and maintenance costs in the event the responsible party is unable to do so. The related company demonstrates the ability to serve as a guarantor for the responsible party by passing the financial test.

