

Long-Term Stewardship: Institutional Controls on Department of Energy Sites

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ABSTRACT

Development and Management of Institutional Controls at U.S. Department of Energy Office of Legacy Management Sites

The U.S. Department of Energy (DOE) has managed the Long Term Stewardship and Maintenance activities at DOE sites since 1988. DOE's Office of Legacy Management (LM) was established in December 2003, and its specific mission is to manage the DOE's post-closure responsibilities and ensure the future protection of human health and the environment. LM has control and custody for legacy land, structures, and facilities and is responsible for maintaining them at levels suitable for their long-term use.

LM uses DOE Policy 454.1, *Use of Institutional Controls and Associated Guidance* that states it is "DOE policy to use institutional controls as essential components of defense-in-depth strategy that use multiple, relatively independent layers of safety to protect human health and the environment..." Also as defined by the DOE guidance document, *Long-Term Stewardship Planning Guidance for Closure Sites*, long-term stewardship refers to all activities necessary to ensure protection of human health and the environment. These activities include, but are not limited to, "all engineered and institutional controls (ICs) designed to contain or to prevent exposure to residual contamination and waste, such as surveillance activities, record-keeping activities, inspections, groundwater monitoring, maintenance of other barriers and contained structures, access control, and posting signs." The term "stewardship" has been superseded by the term "surveillance and maintenance" by DOE policy. The development and management of

ICs has been, and continues to be, a critical component to the success of LM surveillance and maintenance activities.

Many major Federal laws, Executive Orders, regulations, and various other drivers influence the establishment and use of ICs at LM sites. LM uses a wide range of ICs as part of efforts to appropriately limit access to, or uses of, land, facilities and other real and personal property assets; protect the environment; maintain the physical safety and security of DOE facilities; and prevent or limit inadvertent human and environmental exposure to residual contaminants and other hazards.

ICs generally fall into one of four categories identified by EPA guidance, and DOE is successfully using a “defense in depth” strategy which uses multiple mechanisms to provide “layering” for additional durability and protectiveness:

- Proprietary controls – such as easements and covenants.
- Governmental controls – implemented and enforced by state or local governments.
- Enforcement and permit tools with IC components – such as CERCLA agreements or RCRA permits.
- Informational devices – such as state registries or public advisories.

An additional practice that supports ICs at LM sites entails the use of engineered controls, such as fences, gates, access controls, etc. to ensure public access to applicable areas is limited. An engineered control that is not an IC is the disposal cell itself with its design criteria that protects the contaminated interior, controls the penetration of precipitation, and the provides a physical barrier to environmental and biological intrusion. Other site engineered controls manage surface runoff, restrict access, and provide a monitoring network to track residual contamination and ensure the integrity of the remedy. These engineered controls are part of the remedy and are not considered to be Institutional Controls.

As of fiscal year 2006, LM has long-term surveillance and maintenance (LTS&M) responsibilities at 70 sites in 27 states and Puerto Rico with 23 sites planned for transfer to the office during Fiscal Year 2007. ICs are in place at approximately 44 of the current LM sites and they are being tracked to ensure their integrity.

A formal inspection process is used at many LM sites to confirm that remedial action components, including associated ICs, remain in place and are effective. Inspections are also critical for determining if additional maintenance or monitoring is necessary. Inspections may be conducted on an as-needed basis and frequencies can vary widely depending on site-specific policies and conditions, but typically occur on an annual basis. At CERCLA sites, the annual inspections are also incorporated into the Five-Year Review process. Inspection procedures are developed for each site and may contain the following components:

- Development an inspection checklist based on previous findings or progressive changes in site conditions.

- Physical inspection of engineered structures designed to contain or control waste materials.
- Review of completed maintenance work and determination of maintenance needs.
- Formal inspection of the physical location of IC areas to ensure continued protection of human health and the environment.
- Contact of property owners to ensure continued awareness of ICs on their property.
- Inspection of the IC areas to ensure that any restrictions imposed by the IC are not being violated, such as drilling of wells in an area that has groundwater restrictions.
- Check of county records to verify that deed notices, easements, and other recorded instruments remain in place.
- Preparation of report documenting inspection proceedings and schedule for completion of corrective actions, if any.

The inspection process is a successful mechanism for ensuring effectiveness of ICs that allow protection of human health and the environment. As the LM site inventory grows to 131 sites by the year 2015, development and management of ICs will continue as an increasingly critical component of LTS&M programs.

INTRODUCTION

Since 1988, the mission of the Department of Energy's (DOE) Office of Legacy Management (LM) is to manage the Department's post-closure responsibilities and ensure the future protection of human health and the environment. LM has control and custody of legacy land, structures, and facilities and is responsible for maintaining them at levels suitable for their long-term use. Management of legacy land after cleanup includes maintaining the remedy, monitoring to ensure integrity of the remedy, complying with regulatory requirements, and disposition of property for other beneficial uses.

Institutional controls (ICs) have been established at LM sites to contain or prevent exposure to residual contamination and waste, such as surveillance activities, record-keeping activities, inspections, groundwater monitoring, maintenance of other barriers and contained structures, access control, and posting signs. The development and management of ICs has been, and continues to be, a critical component to the success of LM surveillance and maintenance activities.

IC IMPLEMENTATION CHALLENGES

LM currently manages 70 sites within 27 states and Puerto Rico (Fig. 1). As cleanup is completed, sites will continue to be added every year with 113 sites expected to be transitioned into LM by the year 2011. Although DOE has a substantial amount of experience in conducting LTS&M activities at sites, this schedule represents a rapid increase in the scope of the overall LTS&M program. Sites may be regulated by numerous Federal cleanup regulations such as the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), Uranium Mill Tailings Radiation Control

Act (UMTRCA), Formerly Utilized Sites Remedial Action Program (FUSRAP), and Nuclear Waste Policy Act (NWSA), and are also subject to associated state regulations.

Some sites have been monitored for as long as twenty years (Canonsburg, PA) and experiences have been documented regarding weather patterns, erosion, flooding, soils, and vegetation management. Newer sites may have different design criteria or were designed and constructed by the private sector (UMTRCA Sites). These sites may require more frequent monitoring to ensure the controls are appropriate and protective.



Fig. 1. LM Sites and Offices

LM must ensure that ICs are appropriate, visible, enforceable, and must implement ICs on a variety of land types, including Federal property, adjacent non-federal property, and land that is being transferred. As sites are accepted by the LM's governmental regulators, from the private sector, new designs, engineered controls, and ICs are carefully reviewed and monitored to ensure success over the long time frames of the LM mission.

LM APPROACH TO ICs

DOE has a long history of acknowledging the need to restrict access to permanent disposal features and to restrict access to any protected resources such as cultural resources and protected habitat and any natural resources such soil or groundwater where contamination was allowed by the regulators to remain in place after cleanup activities were completed.

In 1988, DOE stood up the Long-Term Surveillance and Maintenance (LTS&M) Program to accommodate stewardship of sites that had either a permanent contamination disposal feature or sites where the government oversight regulator had given permission for contamination to be left in place for any number of justifiable reasons. These sites most often had a uranium mill tailings disposal cell associated with the UMTRCA Program. In addition, DOE maintained responsibility for the soil and groundwater contamination at former uranium mill tailings processing sites which DOE did not own, but where the residual contamination could become problematic if it was not restricted. DOE was legislatively directed to manage these sites once the Nuclear Regulatory Commission (NRC) terminated the license with the private entity.

Concurrent with the LTS&M Program, DOE established the Uranium Mill Tailings Remedial Action (UMTRA) Program to complete cleanup of the sites under UMTRCA. Through the risk analyses being conducted for the sites in the program, DOE saw the need to establish needed restrictions to protect the public and the environment from access to the disposal cells and the soil and groundwater contamination. In some instances, it was necessary to leave contamination on private land using supplemental standards provided for by regulation. Where this was done, DOE often provided deed notices and restrictions to ensure institutional memory of the contamination continues to protect future landowners.

DOE POLICY

In 2003, DOE issued Policy 454.1, *Use of Institutional Controls*, and associated guidance documents after receiving input from DOE sites on what ICs mechanisms are being used and how the ICs are being planned, negotiated, implemented, and monitored. DOE uses this policy to ensure proper management of resources, facilities, and properties and to implement its programmatic responsibilities. Specifically for LM, the ICs policy is an integral part of the long-term stewardship of the sites in its care.

The main objectives of DOE's Policy are to affirm DOE's commitment to protect human health and the environment; to establish a consistent approach to all phases of ICs as a component of DOE's mission and operations; to integrate the use of well-designed, effective, and reliable ICs with other tools to manage, monitor, and transfer real and personal property under DOE control; and, to maintain the ICs as long as necessary to perform their intended protective purposes. All of these objectives are critical to the implementation and success of ICs being established and tracked by LM.

The foremost concept in the Policy is what DOE calls "defense-in-depth". This is a strategy that uses multiple, relatively independent layers of restrictions and notices to protect human health and the environment (including cultural and natural resources). DOE uses this strategy in conjunction with risk assessments to attain a level of protection appropriate to the risks involved. An example for a defense-in-depth strategy for a disposal cell would be (1) Federal ownership of the land, thereby giving control of the land use in perpetuity; (2) engineered control of fences and gates to control access to the property; and (3) signs and boundary monuments providing notice of the existing contamination.

As a result of the numerous types of facilities within the DOE complex, the ICs Policy was written to be flexible and encompass the broadest application of the term "institutional controls".

It includes all internal and external regulatory requirements or policies established under individual statutes. The ability to tailor each site's ICs is particularly useful to LM because of the geographic distribution of sites and the number of regulatory agencies that provide oversight. The Environmental Protection Agency may classify ICs as Proprietary (ownership, deeded rights, leases), Government (Public Land Orders, deed restrictions), Enforcement (CERCLA, Federal Facility Agreements, Consent Decrees), and Information (signs, registries). As the regulator for many LM sites, these categories may appear in Records of Decision and other cleanup and closeout documents. For other sites, DOE refers to categories of ICs including Administrative (anything not physical that can be enforced), Engineered (disposal cells, fences), and Notices (signs, boundary monuments). Many of the LM sites that are inherited from FUSRAP have been cleaned up and transferred through the U.S. Army Corps of Engineers and have ICs categorized under the Department of Defense framework of "land use controls." While LM is working on developing consistent terminology, the focus is developing appropriate controls, ensuring they are visible to public, monitoring them for effectiveness, and providing for enforcement mechanisms in the event of a violation.

INSTITUTIONAL CONTROLS PROCESS

All ICs created or evaluated under LM follow the same process to ensure they are appropriate for the risk, visible to the public, and enduring into the future. Each site is assessed for risk including types of contaminants, potential pathways for exposure, current and likely future land uses, and public awareness of the restrictions. Project staff develops the restriction language and engages realty staff to prepare the appropriate instruments to obtain the restrictive easements for land use from the landowner, if DOE does not own the land. The instrument includes not only the restrictions, but also accommodates access or other considerations for DOE to monitor protected resources and the restrictions in outyears. If DOE is the landowner, project staff develops plans detailing how the land use and resources will be restricted, including a schedule to monitor and report site integrity. Most ICs are a part of the cleanup remedy and must be approved by the regulators. Once the regulator approves the plans and any instruments are signed by the affected parties and recorded in the county with other land records, DOE begins the cycle of routine monitoring to ensure there are no violations in the ICs. Table I shows examples of the types of ICs in effect at LM sites under different regulatory regimes.

LM has three groups of sites in its inventory where all aspects of ICs must be, are being, or have been, evaluated for appropriateness and completeness. Firstly, there are the sites that have been part of the inventory since LM's inception in 2002. These are the remnant sites from UMTRCA and other regulatory programs. Secondly, there are sites that are being transferred into LM from various regulatory programs within DOE (e.g. Environmental Management transfer of Weldon Spring, Rocky Flats, and Fernald sites) and sites being transferred in from FUSRAP and the UMTRCA Title II Programs. Many of these sites are currently or have been privately owned, creating some unique ICs challenges. The third group of sites are those that LM has identified for potential transfer to governmental agencies or private entities. These are sites that can clearly serve a beneficial use if, and only if, the appropriate restrictions can be applied and maintained as long as required.

Many of the sites that were in the LTS&M Program had restrictions applied at the end of their cleanup phases. That could have occurred in the 1980s or early 1990s. At that time, the concepts and strategies were not as mature as they are today. In addition, there are many new statutes and mechanisms to establish and implement restrictions. In the absence of defined policy and guidance, DOE recognized its obligation for protectiveness and provided for monitoring of the restrictions in the LTS&M Plans, or equivalent document, for each of the sites. The LTS&M Plan is the document that defines the operational and maintenance requirements and schedule for each site. The appropriate regulators approve this plan and it becomes the roadmap for site surveillance and maintenance. The plans contain the annual (or more frequent) inspection checklist that includes an inspection of the engineered ICs onsite and the obligation to check the administrative ICs for effectiveness. As time permits, project staff review older LTS&M Plans to ensure completeness and appropriateness. New and/or revised ICs are included in revisions to the plans.

Table I. Institutional Controls for Legacy Management Transition Sites

Other LM Sites	Proprietary/ Administrative	Government/ Administrative	Enforcement/ Administrative	Information/ Notices	Engineered
CERCLA/RCRA Sites 5 sites in LM through 2006	3 DOE-owned disposal facilities, 1 State-owned facility, Formal Annual and more frequent inspections, ICs reviews	Property deed annotations, Covenant deferrals, Easements with restrictive language	CERCLA Records of Decision (RODs), Consent Orders, Federal Facility Agreements	Signage, LM Web site	Fences, Gates
FUSRAP Sites 27 Sites ^(a) in LM through 2006. 4 Sites have potential for ICs	1 DOE-owned site, Formal Annual Inspection, ICs reviews	Deed Notice		LM Web site	Fences, Gates
Other (Regulatory) Sites 11 Sites in LM through 2006 NWPA, D&D, Transfer from EM, etc.	2 DOE-owned, Formal Annual and more frequent Inspections, ICs reviews	Atomic Energy Act Contract		Signage, LM Web site, LTS&M Plan	Fences, Gates

<p>UMTRCA Title I Sites</p> <p>21 Sites in LM through 2006 (31 separate properties)</p>	<p>15 DOE-owned, 13 Privately owned, 3 DOE custody on Tribal lands, Quitclaim/other deeds with restrictive language, Formal Annual and more frequent inspections, ICs reviews</p>	<p>Environmental Covenants in respective states, Groundwater protection through zoning restrictions</p>	<p>LTS&M Plans</p>	<p>Signage, LM Web site, Annual compliance reports</p>	<p>Fences, Gates</p>
<p>UMTRCA Title II Sites</p> <p>5 Sites in LM through 2006</p>	<p>4 DOE-owned, 1 DOE custody on Tribal lands, Formal Annual and more frequent inspections</p>			<p>Signage, LM Web site</p>	<p>Fences, Gates</p>

^(a) Remaining 26 sites in LM inventory have only records and stakeholder support obligations

Also in LM's inventory from the beginning are sites from the UMTRCA Title I Program. These sites have undergone surface cleanup and some are currently under evaluation for groundwater cleanup. Where there is a disposal cell, the site is regulated by an LTS&M Plan that addresses ICs. When the site has been a former processing site with groundwater issues, these sites must produce a Groundwater Compliance Action Plan for regulator approval. This document serves the same purpose as the LTS&M Plan, but defines only what DOE must do to maintain protectiveness from contamination left in the groundwater. Any ICs required for groundwater access must be fully implemented (e.g., the zoning ordinance must be approved and in place) prior to regulator approval.

After sites are cleaned up to regulatory standards and there is some Federal responsibility remaining, they can become part of the LM inventory either as DOE-owned property or with the understanding of DOE's responsibility for residual contamination. LM maintains the Site Management Guide, aka "Blue Book" that outlines the schedule of when sites are most likely to transfer into LM. Well ahead of the transfer, as in the case of the Rocky Flats, Mound, Nevada Offsite, and Fernald sites, the transferring entity and LM set up a team of subject matter experts to evaluate all aspects of the transfer to ensure nothing critical is forgotten. In the case of ICs, LM works with the transferring agency to ensure all ICs are identified prior to the transfer. Table II shows the ICs currently being implemented at these transition sites. To ensure that those with institutional knowledge of the site requirements have the opportunity for input, LM staff prepares a LTS&M Plan for review by all parties well in advance of the transfer.

Table II. Institutional Controls for LM Transition Sites

Transition Sites	Proprietary/ Administrative	Government/ Administrative	Enforcement/ Administrative	Information/ Notices
Fernald, Ohio	DOE-owned, Formal Annual and more frequent Inspections, ICs reviews		CERCLA RODs, Legacy Management and ICs Plan (LMICP), CERCLA 5-year Review	CERCLIS # OH6 890 008 976 National Priorities List, Annual Site Environmental Reports (ASER), Signage, LM Web site, Multi-Use Educational Facility, Ohio Utility Protection Service, Public Reading Room
Mound, Ohio	Partially DOE-owned, Quitclaim deeds to MMCIC w/restrictions, Formal Annual and more frequent Inspections, ICs reviews		CERCLA RODs, O&M Plan for ICs, Various O&M and Work Plans, CERCLA 5-year Review	CERCLIS # OH6 890 008 984, Annual Notices on ICs in local newspapers, Environmental Summary recorded with deed, National Priorities List, Signage, LM Web site, Public Reading Room
Rocky Flats, Colorado	DOE-owned, Routine inspections	MOU with USFWS, Environmental Covenant with State of CO (not yet signed)	Rocky Flats Cleanup Agreement (RFCA), CERCLA CAD/ROD, CERCLA 5-year Review; Post-Closure Agreement (Rocky Flats Legacy Management Agreement (not yet signed)	CERCLIS # CO7890010526 National Priorities List, Signage, LM Web site, Public Reading Room, Quarterly and Annual Reports

One of the primary LM goals is to manage legacy lands and assets, with emphasis on protective real property reuse and disposition. LM has staff dedicated to working with local governmental agencies and private entities to identify beneficial reuse. When property that is subject to ICs is dispositioned, LM will ceases control over land uses and must ensure that ICs remain protective and in place and have a plan to monitor them. Recently, LM completed the successful transfer of the Wayne, New Jersey FUSRAP site to the Wayne Township. The General Services Administration and the National Park Service assisted LM in the transaction using the Lands to Parks Program. LM reviewed the environmental and closeout documents from site cleanup, conducted a risk evaluation, and proposed both the appropriate mechanism (deed restriction) and the appropriate restriction language to be protective. LM may likely add other layers to the ICs strategy, but these steps were sufficient to conduct the transfer.

Regardless of when a LM site is scheduled for transfer, there can be the added challenge of needing ICs on non-DOE-owned property. This is common for former uranium ore- processing sites, for properties where soil or other contamination was left, or for property that is underlain by a contaminated groundwater plume. In these instances, LM works closely with local entities and state agencies to establish ICs for each affected property. These properties are included as

part of the "site" where the contamination originated and violations of the ICs are monitored along with the site property.

LM SITE INSPECTION PROCESS

A formal procedure directs the inspection process used at many LM sites to confirm that remedial action components, including associated ICs, remain in place and are effective. Inspections are also critical for determining if additional maintenance or monitoring is necessary. Inspections may be conducted on an as-needed basis and frequencies can vary widely depending on site-specific policies and conditions, but typically occur on an annual basis. Inspection procedures are prepared for each site and may contain the following:

- Development of an inspection checklist based on previous findings or progressive changes in site conditions.
- Physical inspection of engineered structures designed to contain or control waste materials.
- Review of completed maintenance work and determination of maintenance needs.
- Formal inspection of the physical location of IC areas to ensure continued protection of human health and the environment.
- Inspection of the IC areas to ensure that any restrictions imposed by the IC are not being violated, such as drilling of wells in an area that has groundwater restrictions.
- Contact of property owners to ensure continued awareness of ICs on their property.
- Check of county records to verify that deed notices, easements, and other recorded instruments remain in place.
- Preparation of report documenting inspection proceedings and schedule for completion of corrective actions, if any.

Site inspections are often guided by checklists that address the performance of each inspection item. The checklists include different areas of the inspection and performance criteria to determine whether the item was found to be satisfactory or unsatisfactory. For the institutional control areas, the IC area would be listed and any restrictions or requirements for that area.

A formal annual inspection is conducted at each LM site, which includes inspections of the physical locations addressed by ICs. A check of all engineered ICs, such as, fences, gates, signs, and boundary and erosion control monuments, is made at this time. If maintenance on any IC areas had been planned this is also inspected to verify its completeness and effectiveness. Maintenance needs on engineered ICs and other IC areas are also determined during the annual inspection.

During the annual physical inspection the ICs are also evaluated to determine whether they remain effective in protecting human health and the environment and to determine whether any restrictions imposed by the IC are being violated. As stated above, this can include a walkover of the area to ensure that no new wells have been installed in an area that has groundwater restrictions or that no digging is occurring in an area that has soil restrictions. Calls are also made

to the relevant state office to check if any new well permits have been issued for the area. Also, land use changes in the area or any observations of significant land disturbance are evaluated.

Property owners are contacted annually to ensure they remain aware of ICs on their property. The contact consists of a documented phone conversation to confirm agency contact information, inquire about any future activities or plans that could affect the ICs on the property, and to confirm knowledge of the IC and its requirements. Similarly, DOE also checks county records to verify that deed notices, easements, and other recorded instruments remain in place. County records can be verified by a physical visit to the county office or in some cases county records can now be checked on-line on the county's Web site. Planning and zoning offices for some sites with significant growth are also contacted annually to determine if any zoning changes will affect the institutional controls for the site.

At the LM sites, during routine sampling of wells, the sampling crews are also instructed to inspect for any evidence of land use changes or evidence of significant land disturbance. For offsite wells, this also serves as an independent inspection and allows for the opportunity to communicate with the landowner to validate land uses, restrictions, and ensure the ICs are appropriate and effective.

A detailed inspection report is prepared for each inspection. The report will include the observations noted for the ICs and any documented phone calls with property owners. Photos and maps of the IC areas are also included. If any findings or recommendations are made during the inspection, the corrective actions for these items are identified and scheduled.

The inspection process is a successful mechanism for ensuring effectiveness of ICs that allow protection of human health and the environment. As the LM site inventory grows to 131 by the year 2015, development and management of ICs will become an increasingly critical component of LTS&M programs.

PROPERTY REUSE

DOE is the fourth largest Federal land manager, conducting its mission on approximately 3 million acres throughout the country. Numerous sites and tens of thousands of acres of land will continue to be transferred to LM after active environmental remediation has been completed.

In 2003, LM developed a comprehensive set of strategic goals. LM's goal 4 calls for establishing environmentally sound and protective land reuses on LM sites. To accomplish this, LM will implement Departmental land use planning processes, taking into account economic, ecological, social, and cultural factors surrounding each site or parcel of land. LM believes that there can be beneficial uses of land even though some types of ICs may be needed. As part of goal 4, LM will also make excess lands and facilities available for government, public, and private use consistent with the tenets of sustainability and best practices for land heritage resource management. In order to ensure success at development of property reuse opportunities, LM will be developing land assessment strategies and identifying priority heritage sites for historical and cultural resources.

Property reuse opportunities fall into several distinct categories that may be adapted to LM sites while maintaining protectiveness and taking required land use restrictions into consideration:

- Energy – utilization of appropriately screened sites for wind and solar energy development partnerships.
- Conservation – development of wildlife habitat and natural resource protection.
- Agriculture – coordination with public and private entities to utilize DOE lands for grazing, crop production, or other appropriate uses.
- Community – development of recreational and educational resources through partnerships with local community-based organizations.
- Commercial/Industrial – utilization of existing or refurbished facilities on LM sites for business development, incubator possibilities, or industrial ventures.
- Mining – Uranium leases on applicable LM properties.
- Historical/Cultural – recognition of historical and cultural resources available on LM sites.
- Property Disposition – transfer of land ownership to public or private entities.

While DOE continues to hold ownership of the property, but where interests are given to others for beneficial uses, LM will continue to review and monitor ICs. LM will include required restrictions in the realty documents that permit the reuse activities, such as grazing licenses. The challenge for LM is to ensure that ICs remain in effect as long as is necessary on property where ownership is transferred to others. Because DOE is responsible for any residual contamination, LM is developing strategies using all available mechanisms to maintain visibility and efficacy of ICs on transferred property.

LM WEB SITE FOR PUBLIC ACCESS TO ICs INFORMATION

The LM Web site located at <http://www.lm.doe.gov/> is intended to provide the general public with an efficient and effective mechanism to access information on ICs. Information is clearly segregated by sites currently within the LM system and includes multiple layers of data. A collection of site-related documents is maintained in electronic format for reference. A link to the Geospatial Environmental Mapping System (GEMS) provides access to site maps, individual well-by-well data, and areas that have been delineated to show IC applicability. Fig. 2 shows the link to the LM Web site and how to reach the GEMS system for site-specific information.



Fig. 2. The GEMS portion of the LM web site

CONCLUSION

Due to the fact that LM will manage or retain custody and control over sites for an indefinite period of time, ICs are an important component of on-going protectiveness of human health and the environment. LM must ensure that ICs are visible, appropriate, will endure as long as necessary, and that appropriate ICs are included in land transfers. In order to adequately address this, LM has increased its participation in site closure and transition activities to ensure sites transition seamlessly and that all appropriate controls, ICs, and realty interests are in place. DOE has a substantial amount of experience in the implementation and management of ICs, and this experience will be drawn upon as additional sites transition into the LM system and as DOE looks for opportunities for beneficial reuse.

REFERENCES

1. DOE (U.S. Department of Energy), DOE Policy 454.1, "Use of Institutional Controls", Office of Environment, Safety and Health (2003).
2. DOE (U.S. Department of Energy), "Institutional Controls Implementation Guide for Use with DOE P 454.1, Use of Institutional Controls", Office of Environment, Safety and Health (2005).
3. EPA (U. S. Environmental Protection Agency), "Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups", Office of Solid Waste and Emergency Response (2000).