

**RELOCATION OF ON-SITE SPOILS PILE
FUSRAP LINDE SOILS REMEDIATION, TONAWANDA, NY**



**U.S. Army Corps of Engineers, Buffalo District
Shaw Environmental, Inc.
DACW41-01-D-0031, DN01 (Kansas City PRAC)**

**US Army Corps
of Engineers®
Buffalo District**

The U. S. Army Corps of Engineers (USACE) Buffalo District has been designated to remediate the Manhattan Engineer District (MED)-related, radiologically contaminated sites located in Tonawanda, New York. This effort is part of the USACE's Formerly Utilized Sites Remedial Action Program (FUSRAP), which was established to investigate, and cleanup or control sites previously used by the Atomic Energy Commission (AEC) and its predecessor, the MED.

The primary objective of the Linde site remediation effort is the effective cleanup of the site in accordance with Alternative 2 of the USACE's "Proposed Plan for the Linde Site, Tonawanda, New York" and the approved Record of Decision (ROD). The Linde property, currently owned and operated by Praxair, Inc., (the Owner) consists of various office buildings, fabrication facilities, warehouse storage areas and parking lots.

Spoils Pile History

The spoils pile was located in the southeastern portion of the Linde site. In 1990, the Owner initiated facility expansion and improvement work that involved construction of a new building and site parking lots on the west side of the property. Excess materials that were removed during construction of these facilities were relocated within the area that became known as the spoils pile. From 1990 through the spring of 2005, all excess material generated from landscaping, construction, demolition and excavation activities by the Owner or its subcontractors was placed in the pile. These materials included soil and soil-like material, concrete, steel, wood and asphalt. The in-situ volume of the spoils pile was estimated at 14,000 cubic yards as surveyed in 2003. Development of the property by the owner between 2003 and 2005 resulted in additional material being added to the spoils pile.



Configuration of Linde Site Spoils Pile - May 2005

Relocation Objective

Relocation of the spoils pile was necessary to allow core sampling to be completed safely as part of Class 2 final status survey activities. The Final Status Survey Plan (FSSP) for the Linde project specifies the means and methods by which data are collected following remedial actions and how those data are evaluated against the site cleanup criteria. As identified by the FSSP, approximately 70 core samples were required to be collected from within the footprint of the spoils pile.

Relocation Alternatives

Prior to initiating spoils pile relocation operations, USACE investigated alternatives for handling of the material. The alternative approaches for determining the disposition of the spoils pile included:

- In-situ characterization and disposal of material exceeding cleanup levels,
- Segregate non-soil material from soil, perform characterization, and dispose of all materials exceeding cleanup levels,
- Windrow all material, perform surface scans of cut faces, characterize, and dispose of all materials exceeding cleanup levels,
- Off-site disposal of all material in the spoils pile, and,
- Relocate the material in the stockpile to another area of the site.

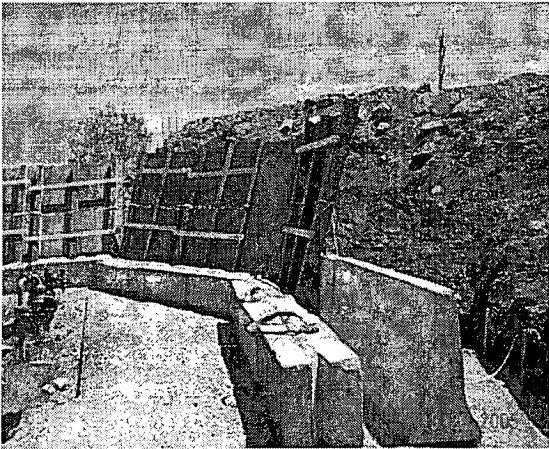
Evaluation of the five alternatives included detailed analysis of cost, safety and the ability to perform the alternative under the given constraints and assumptions. The selection process considered the following:

- Health and safety consideration related to employees of the property owner, local residents and the close proximity of an elementary school,
- Safety concerns related to material management, heavy equipment and personnel,
- Requirements for engineering controls for sediments, dust control and water recovery,
- Environmental monitoring requirements related to air monitoring and soils sampling,
- The level of effort required to manage relocated material,
- The cost and availability for appropriate heavy equipment,
- The cost and availability of personnel including HP Technicians, operators, laborers, and technical staff.
- The cost associated with transporting and disposing of material off-site, and,
- The level of effort and cost associated with decontamination and demobilization.

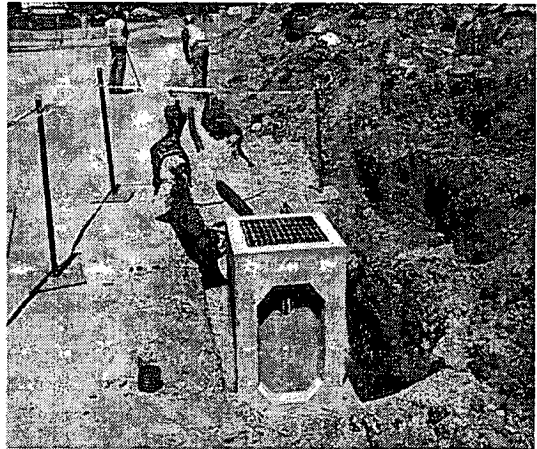
Pre-Relocation Activities

Prior to commencing relocation activities, several support tasks were completed including:

- Preparation, submittal, review and approval of an Operational Approach plan to govern relocation work,
- Location and marking of underground utilities within the spoils pile area,
- Sampling and radiological analysis of the material designated for initial relocation,
- Installation of silt fence along the perimeter of the pile,
- Preparation of a task-specific Hazardous/Radiological Work Permit,
- Construction of water diversion trenches for management of dust control water,
- Installation of protective barriers to shield Owner facilities from potential falling debris as material was relocated,
- Isolation of existing manholes and catch basins to prevent runoff water from entering the sewer system,
- Protection of underground utility tunnels by installing ground level bridging along haul road routes,
- Inspection of underground utility tunnels to establish pre-relocation conditions and monitoring to identify for potential damage due to earth moving operations, and,
- Preparation of areas designated to receive the relocated material.



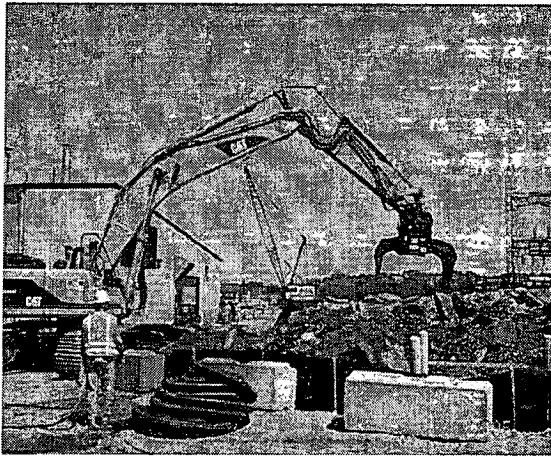
Debris shields were constructed to protect the Owner's facilities from potential falling objects.



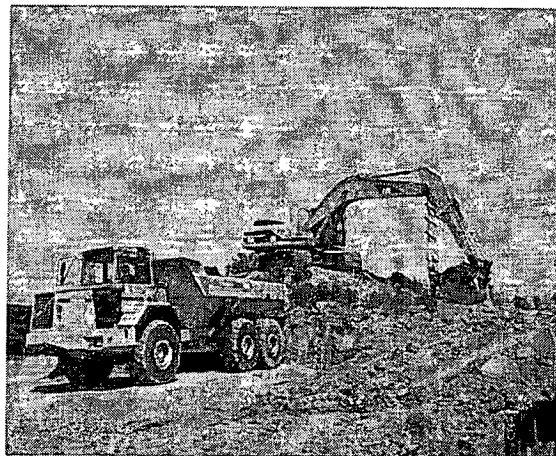
Interceptor trenches were installed to divert and collect runoff and dust control water from the spoils pile.

Spoils Pile Relocation

Relocation of spoils pile material commenced in May 2005. Field operations relied on conventional excavation techniques using hydraulic excavators and articulated haulers to excavate, segregate, load and transport soil, soil-like material, concrete and debris from the spoils pile to designated staging areas. Staging areas for each type of material were established near the northeast corner of the Linde site where removal of radiologically-impacted soils and subsequent backfilling had previously been completed. Materials were transported along a prescribed route with each load being escorted to its destination to ensure safe passage.



A hydraulic excavator with grapple attachment was used to separate and load concrete slabs and debris.



The primary method of soil relocation involved use of articulated haulers and hydraulic excavators.

Evaluation of Material for Potential Radiological Contamination

As specified by the USACE-approved relocation plan, all materials that were removed from the spoils pile were examined for the presence of radiological constituents which exceeded prescribed threshold levels. The spoils pile was divided into 500 cubic yard portions to facilitate the evaluation process. As daily excavation progressed, individual 500 cubic yard "lots" were identified by performing field measurements to establish the area and associated lift thickness that would result in removal of a 500 cubic yard volume of material. For each 500 cubic yard lot, the following activities were performed:

- Prior to initiating relocation operations for an individual lot, a composite sample was collected and analyzed on-site by gamma spectroscopy to quantify levels of contaminants of concern including Thorium-230, Radium-226 and Total Uranium (for this effort, 57 samples were analyzed),
- During active excavation, each bucket of soil or soil-like material was scanned by a Health Physics (HP) Technician,

- Daily gamma walkover scans were performed on newly exposed soil surfaces, and,
- Concrete slabs and large debris were all scanned in the field by the HP Technician.



A Health Physics Technician performed a daily GPS-linked gamma walkover of exposed soil surfaces.



Concrete slabs were rinsed with water, laid flat to dry, and scanned for potential radiological contamination.

Scanning of soils was performed with a Ludlum Model 2221 rate meter (or equivalent) and a Ludlum Model 44-10 NaI scintillation detector (or equivalent) on the surface of the material at a rate that does not exceed 1½ inches/sec. Scanning of all other materials was performed with a Ludlum Model 2360 with a Ludlum Model 43-89 100 cm² alpha/beta scintillator (or equivalent) at the same scan rate. The probe was held within approximately 2-inches of the surface. The HP Technician utilized the audible output function of the instrument while scanning and paused to determine if an increased count rate was greater than background and sample collection was required.

For soils or soil-like material, scan rates exceeding 18,000 counts per minutes (cpm) required the HP Technician to stop the soil removal activity and establish of a radiologically controlled area (RCA). A hazardous work permit (HWP) was established for areas where the 18,000 cpm scan rate was exceeded.

For non-soil media (e.g., steel, asphalt, concrete), a ten percent scan of each exposed section of material was performed. If a count rate of 2,200 β/min/100 cm² was observed, the material was disposed off-site.

Instruments were calibrated properly prior to use per established procedures identified in the project plans. Source checks on all instruments were performed on a daily basis. Appropriate background reference locations were established to develop representative daily background values for the surveys. Specific values were derived to correspond with each type of material encountered in each survey (i.e., soils, steel, concrete, asphalt,

miscellaneous non-soil). The values were used for background subtraction of any potential direct readings for surface contamination and for general scanning surveys. At least 30 random one minute background measurements were obtained daily for each survey instrument as appropriate for each type of material surveyed.

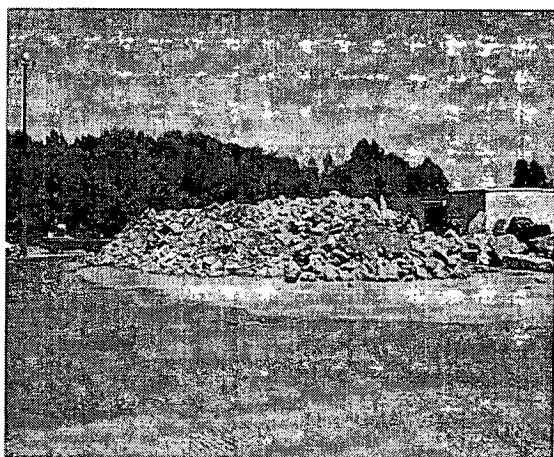
Any materials exceeding the established screening thresholds were immediately segregated and removed for off-site disposal at an appropriately permitted disposal facility. Screening efforts performed during relocation operations resulted in segregation and off-site disposal of 15 cubic yards of soil and approximately 5 cubic yards of concrete debris.

Volume Tracking and Placement of Relocated Material

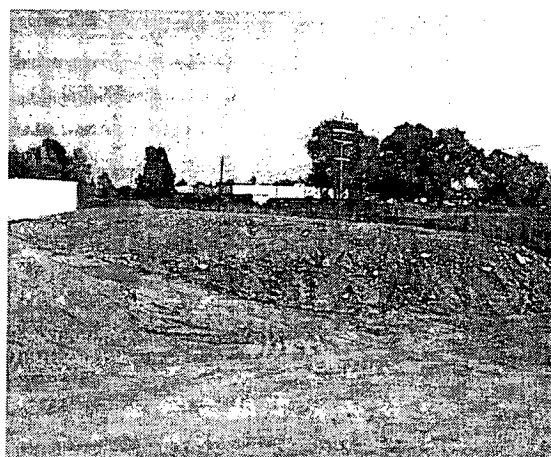
Relocated materials from the spoils pile were placed in designated staging areas located at the northeast corner of the site. Staging areas were established for each type of material (soil or soil-like, concrete or debris) and were sized to accommodate the estimated quantity. The position of staged material did not impede ongoing site work and was delineated to support the eventual off-site removal of the material.

The volume of relocated material was tracked on a daily basis and relied on three processes including; 1) a daily count of the number of loads transported by the articulated haulers, 2) the number of 500 cubic yard lots, and 3) measurements taken on stockpiled material in the staging area. The ex-situ (i.e. post-excavation) volume of material relocated from the spoils pile was estimated at a total of 29,175 cubic yards including:

- 27,100 cubic yards of soil and soil-like material,
- 2000 cubic yards of concrete, and,
- 75 cubic yards of debris.



Staging Area for Concrete



Relocated Soil in Staging Area

Final relocation efforts were completed in October 2005. Most areas within the footprint of the spoils pile were configured to the approximate original grade with the exception of an underground utility corridor. Three feet of overburden remained in this area pending physical location of all utilities that may be impacted by excavation.



*South end of former spoils pile area –
looking northeast*



*North end of former spoils pile area –
looking south*

Engineering Controls and Effective Safety Management

Relocation of spoils pile materials was performed in conformance with the USACE-approved or endorsed project plans for the Linde FUSRAP site. Primary consideration focused on the safe execution of field operations and implementation of engineering controls to minimize or eliminate potential worker exposure and to ensure that ALARA goals were being met. Job-specific tasks included:

- Preparation of a Radiological Work Permit (RWP) to govern soil relocation activities,
- Establishing a Controlled Area Access location to serve as the single point of entry/exit for authorized personnel,
- Preparation and review of a task-specific Activity Hazard Analysis (AHA),
- Performing daily Area Air Monitoring and Dust Monitoring,
- Completing hand-dig efforts to definitively locate subsurface utilities within the footprint of the spoils pile,
- Providing dust suppression by means of water misting on haul roads, at the point of excavation and at the relocation areas, and,
- Performing periodic inspection of the subsurface utility tunnels located beneath haul roads.

Throughout the 159 calendar days during which spoils pile material was relocated, effective safety management and engineering controls contributed to over 7000 man hours recorded without a lost time accident.



Engineering controls included water misting for dust suppression



Hand digging was performed to verify the location of subsurface utilities

Cost Savings and Partnering

The cost estimates associated with the 5 alternatives ranged from \$482,000 for Alternative 5 to \$3.42 M for Alternative 4. All costing assumed that the pile contained 14,000 cubic yards of material.

Through a collaborative effort involving USACE, the remedial contractor, the Owner and the New York State Department of Environmental Conservation (NYSDEC), final management of the spoils pile material combined elements of Alternatives 1 and 5 allowing for the material to be evaluated and subsequently removed to another location on-site.

The actual amount of material that was relocated was approximately 29,175 ex-situ cubic yards. The task was completed at an estimated cost of \$700,000 and involved the safe execution of over 7000 man-hours. By endorsing the process of analysis and relocating spoils pile materials, a savings of at least \$5.0 M (based on the actual volume) was realized by avoiding off-site transportation and disposal of all material in the pile.

Efforts by the Property Owner

Further partnering between the Owner and NYSDEC has allowed for the cost-effective removal of nearly 11,000 cubic yards of material from the site, including 8700 cubic

yards of material relocated from the spoils pile. All concrete debris was transported to a recycling facility to be crushed and reused as conventional aggregate. In addition, the Owner conducted further analysis of relocated soil material and worked with NYSDEC to qualify the material for use off-site.

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