Project Construction Report for the
Building G-1 Deconstruction and Groundwater Investigation
Former Harshaw Chemical Company Site
Cleveland, Ohio
Formerly Utilized Sites Remedial Action Program

FINAL

Contract No. W912P4-07-D-0005-0005

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LIST OF ACRONYMS

ACM	Asbestos Containing Material
AEC	Atomic Energy Commission
APP/SSHP	Accident Prevention Plan/Site Safety and Health Plan
C&D	Construction and Demolition
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COPC	Contaminants of Potential Concern
COR	Contracting Officer's Representative
CQCM	Contractor Quality Control Manager
CQCP	Contractor Quality Control Plan
CTG	CTG Environmental
DP	Deconstruction Plan
dpm/100cm2	Disintegrations Per Minute Per 100 Square Centimeters
DPT	Direct Push Technology
DQCR	Daily Quality Control Report
EM	Electromagnetic
FS	Feasibility Study
FUSRAP	Formerly Utilized Sites Remedial Action Program
GIS	Geographic Information System
GPR	Ground Penetrating Radar
GWS	Gamma Walkover Survey
HP	Health Physics
IDW	Investigation Derived Waste
IMC	Intermodal Container
HTRW	Hazardous, Toxic, and Radioactive Waste
LARW	Low-activity Radioactive Waste
MARC	Multiple Award Remediation Contract
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
OH	Ohio
OH EPA	Ohio Environmental Protection Agency
OSHA	Occupational Safety and Health Administration
OU	Operational Units
PCB	Polychlorinated Biphenyl
pCi/g	Pico Curies Per Gram
PEL	Permissible Exposure Limit
PM	Project Manager
POTW	Publicly Owned Treatment Works

PPE	Personal Protective Equipment
QCP	Quality Control Plan
QCS	Quality Control System
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RMS	Resident Management System
RSO	Radiation Safety Officer
SAP	Sampling and Analysis Plan
SSHO	Site Safety and Health Officer
SOP	Site Operations Plan
SOW	Scope of Work
T&D	Transportation and Disposal
TLR	Transmission Line Report
TSCA	Toxic Substances Control Act
TTL	TTL Associates, Inc.
UF_4	Uranium Tetrafluoride
UF_6	Uranium Hexafluoride
UO_2	Uranium Dioxide
UO_3	Uranium Trioxide
USACE	United States Army Corps of Engineers
USEI	US Ecology of Idaho
WAC	Waste Acceptance Criteria
WC	Waste Characterization
WMTDP	Waste Management, Transportation and Disposal Plan

1.0 INTRODUCTION

The purpose of this report is to provide a final narrative, summarizing all activities associated with the Building G-1 Deconstruction and Groundwater Investigation project (Project). Project Work is performed by ECC under the US Army Corps of Engineers' (USACE) Multiple Award Remediation Contract (MARC), contract number W912P4-07-D-0005-0005. This report is intended to satisfy the requirements of the Project Construction Report, under the MARC contract's requirements and section 4.10 of the Scope of Work (SOW) (USACE, 2014).

In addition to the narrative of the field work performed, the report includes all required project records and records in accordance with applicable codes, standards, and regulations. This report also includes records of all survey, characterization, and sampling results.

1.1 PROJECT SUMMARY

Project initiation required the completion of the SOW's specified work plans. Once the relevant plans were approved by the USACE, the Project site work proceeded.

The Project was primarily focused on the deconstruction of Building G-1, which was a former processing site for uranium. This Project's field work is performed under the USACE's Formerly Utilized Sites Remedial Action Program (FUSRAP). FUSRAP sites are subject to the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] 300).

The deconstruction features of work include the characterization of the wastes, their sorting, transportation and disposal (T&D) to appropriately licensed facilities. Air monitoring, decontamination and radiological surveys ensured that contaminants concern remained within the Project Site.

Contaminants of concern posed by dissolved uranium products in the Project Site's groundwater were also investigated. The presence of known and undocumented sewer and water transmission lines leading to and from Building G-1 were investigated as potential pathways for groundwater contamination. The investigation included:

- a records search to discover existing sewer and water transmission lines;
- a geophysical survey to potentially discover additional, undocumented (or unavailable in the records search) water lines, or previously unknown underground infrastructure relevant to Building G-1's contaminant concerns;
- an investigation of the water lines, including test-pitting and temporary groundwater well points to collect groundwater quality data and ascertain sources of groundwater contamination; and
- the installation of permanent monitoring wells to augment the Project site's existing groundwater monitoring network.

The detailed Project Groundwater Report and related project work is provided as **Attachment A.** The record search and related Project information regarding the water transmission lines can be located in **Attachment B**.

In addition to the project work completed above, which satisfies the requirements of the SOW, modifications to the contract were made to encompass additional work outside of the original SOW. These modifications are:

- Mod 1A: Included the removal of existing debris from the Project site, which was not covered under the SOW. It also included the rental and temporary installation of steel plating to protect existing and active underground utilities.
- Mod 1B: The groundwater and water line investigations discovered a vault-like structure during the excavation of text pit #4 at the NW corner of the Chevron property. This modification further investigated this structure, verified that known waterlines feeding the site were not pressurized and further investigated the west side of the Harshaw property for any unidentified or unknown utility lines filling in a data gap from the initial GPR survey.
- Mod 1C: Included additional soil borings to further delineate the site's soil contamination. It also included additional stone cover and ground stabilization materials to be installed around the Project site.

The USACE was updated regarding the Project's progress weekly during weekly meetings. The meeting minutes are included as **Attachment N**.

2.0 PROJECT BACKGROUND

The site is located at 1000 Harvard Avenue in Cleveland, Ohio, surrounded by industrial operations and residential areas. The site is adjacent to the Cuyahoga River and Big Creek within an industrialized area in Cuyahoga County. Neighboring industries include Mittal Steel, Aluminum Company of America, Chemical Solvents, Inc., and CSP Fabricating. The site consists of approximately 55 acres and includes several developed and undeveloped land parcels located near the intersection of Harvard Avenue and Jennings Road. Developed site parcels include former production areas and remaining facility buildings, former production area foundations, parking areas associated with previously dismantled buildings, and re-developed, privately-owned commercial properties. For the purposes of environmental investigation and remediation, the site has been sectioned into operational units (OUs). These are illustrated in **Figure 2-1**. OU-1 encompasses the vicinity of former uranium operations. **Figure 2-2** illustrates a general site layout for the project work around Building G-1.

The Former Harshaw Chemical Company Site produced a number of major and minor uranium products in various forms under contract. Historic accounts describe five thousand metric tons of uranium were processed between 1942 and 1954. Major products included uranium tetrafluoride (UF) (Green Salt), uranium hexafluoride (UF), and uranium trioxide (UO). The major processing plants located within Building G-1 were the Refinery and Brown Oxide Plant, which produced UO and uranium dioxide (UO), respectively. Also located in Building G-1 were the UF plant and the UF plant. Plant activities were confined to the currently fenced area around Building G-1 and included the use of the former rail yard adjacent to Building G-1. Site investigations also discovered surface contamination in the former Foundry (previously designated as Building F-1), Garage, and Warehouse buildings, shown in **Figure 2-1**. However, these buildings are not covered in this scope of work.

These operations were carried out within the Building G-1 complex, which was built and expanded several times over the period from 1945-1949. The Building G-1 complex is situated within a 1.6-acre fenced area located in the northern portion of the Former Harshaw Chemical Company Site, within OU-1, as shown in **Figure 2-1**. The BASF Corporation (BASF) owns and operates existing facilities on OU-1. Note that the local groundwater in the northwest area of OU-1is presently captured with an active pump-and-treat system using bedrock-depth wells to capture nickel contamination that may migrate off-site.

2.1 PREVIOUS SITE INVESTIGATIONS AND SITE CONDITIONS

Respective Remedial Investigations (RI) and Feasibility Study (FS), provides additional background information, and technical details of the known site conditions and contaminant concerns of OU-1, prior to the start of the Project work (USACE 2009 & 2012). Building G-1 has been unoccupied for 30 years and significant decay to the building structures may have occurred. This also includes infestation from rodents and pigeons.

Generally, the air and surface soils of the site do not contain significant radioactivity. There is no evidence of enriched uranium however, soil and groundwater do demonstrate residuals of slightly depleted uranium based on the presence of detected isotope ratios. Most samples were below detection or detected at very low levels. Only 18% of samples demonstrated levels of uranium above naturally occurring background with gamma-spectroscopy. Alpha spectroscopy did indicate higher levels, however the results conflict with the evidence that no enriched uranium exists, as the ratio uranium-235: uranium-238 was more than double the naturally

occurring ratio, as compared to the gamma-spectroscopy results. The high bias was attributed to an alpha peak-interference typically observed from the uranium-236 isotope, normally encountered in recycled uranium. Other contaminants of potential concern (COPCs) were at or below background levels in soils.

Groundwater in the vicinity of Building G-1 is currently monitored for radioactive contamination associated with FUSRAP constituents with periodic sampling of the site's monitoring well network. The highest levels of uranium risk center around monitoring wells near the 3-story structure built in 1948 (see **Figure 2-3**). Details of the site's groundwater contamination can be found in the USACE's Conceptual Site Model for the Project Site (USACE, 2010). The groundwater in the vicinity of Building G-1 flows from west-by-southwest to east-by-northeast. It was anticipated that if contamination migrates, it would be successfully captured by the existing groundwater pump-and-treat system in place (USACE, 2010).

Surveys and samples within Building G-1 did demonstrate radioactivity above Nuclear Regulatory Commission's (NRC) Guide 1.86 values for natural uranium and levels suitable for former facility closure (removable alpha/beta activity) of 1,000 disintegrations per minute per 100 square centimeters (dpm/100cm^2) screening level for the "removable alpha/beta activity," which is the sampling of the dust-wipe used to collect the sample over a given surface area. The highest levels were found on the third floor of the building at levels of 3,700,000 dpm/100cm^2 in an isolated area where "yellow-cake" uranium was visually identified. Interior wall maximum readings ranged from 247,683 dpm/100cm^2 to 1,518,459 dpm/100cm^2. The mean exterior readings were around 33,486 to 47,798dpm/100cm^2. Fixed point data surveys found a maximum reading of 395,830 dpm/100cm^2 on the roof.

The building materials were sampled for naturally occurring radioactivity (i.e. uranium, radium, and thorium), measured in picoCuries per gram (pCi/g). A maximum reading of 13,381 pCi/g for total uranium was encountered in a concrete floor sample from the third level floor. This reading is likely from the layer of yellow-cake contamination found 0.5-ft below the floor surface, suggesting that a slab was poured over the contamination on the original floor. Next highest was Thorium-230 detected at a maximum reading of 833 pCi/g in trench sediment. Other isotopes were not detected above 3.28 pCi/g.

Building G-1's pipe-drain and trench-drain sediments were also sampled. Generally, the results exceeded screening levels, but did not indicate that enriched uranium wastes were present in the building's drains and trenches.

Based on the RI data, Building G-1 contained widespread radiologically contaminated areas. Likely, most of Building G-1 could be classified as exempt Low-Activity Radioactive Waste (LARW), where the waste characterization sample would demonstrate levels below 2,000 pCi/g.

2.2 PROJECT SITE LAYOUT DETAILS

The Project site centers on Building G-1 and the infrastructure in its vicinity. **Figure 2-2** illustrates the approximate boundaries of the Project site. These were the limits considered in the project's geophysical survey. Building G-1 is surrounded by a fence, as illustrated in **Figure 2-3**. In addition, the figure illustrates the dates for each section of Building G-1. **Figure 2-3** also illustrates relevant infrastructure, such as water transmission lines and sewer lines to and from Building G-1. It also provides the number of stories for each section, which is how the deconstruction process was determined.

Generally, all deconstruction work remained within the confines of the building's fence-line, which encompasses approximately 1.5 acres. Building G-1 occupies 47,400 square feet (SF) on the first floor, 15,200 SF on the second level, and 3,200 SF on the third level (65,800 SF total).

Figure 2-2 illustrates the locations of the staging area and specific truck routes used for truck traffic based on site logistics and existing underground piping. This was to minimize any potential contact of the trucks which would receive the prepared deconstruction debris. A staging area along the empty concrete paving (or former Building G-2 pad) northwest of Building G-1 was utilized to store waste containers. A 15-foot buffer zone around Building G-1 was maintained and radiologically surveyed during the project, to ensure that no contamination escaped the buffer zone during deconstruction activities.

Dust particulates were monitored in the vicinity of Building G-1 for silica, lead and radiological dusts (Gross Alpha/Beta). The locations were moved depending on the stage and positioning of the deconstruction activities. Typically, there was at least one dust track unit on each side of the building (north, south, east, and west). The dust-particulate tracking logs illustrate the location of the dust track at the time the readings were collected (see **Attachment C**).

3.0 PROJECT ORGANIZATION

3.1 PROJECT TEAM

The following key personnel were involved in this project:

- **Program Manager** – [redacted] was the Program Manager. His role was to facilitate the project via upper-level programmatic support.
- **Project Manager (PM)** – [redacted] was the Project Manager (PM). The PM oversaw the day-to-day activities on the project and was responsible for the development and implementation of the project and to ensure that it was safely and satisfactorily completed in accordance with all applicable requirements. The PM was also responsible for the daily updates and project submittals to the USACE Contractor Quality Control System (QCS).
- **Site Superintendent** – [redacted] was the site superintendent. He was responsible for the day-to-day operations on site, ensuring that all labor adheres to all work plans and procedures. He advised the PM on all matters pertaining to the project's progress and completion in the field.
- **Site Safety and Health Officer (SSHO)** – [redacted] was the SSHO. The SSHO was responsible for health, environmental, and safety procedures to be followed on the project in compliance with the project APP/SSHP and other applicable standards.
- **Radiation Safety Officer (RSO)** – [redacted] was the health physicist for the project. He was responsible for oversight and review of all radiological-related activities and data.
- **Contractor Quality Control Manager (CQCM)** – [redacted] was the project CQCM. The CQCM was responsible for maintaining the project QA/QC in accordance with the requirements of SAP, CQCP, and appropriate quality management guidance provided in the project's other work plans. [redacted] was responsible for participating in the project field activity readiness review, approving variances during field activities before work continues, overseeing and approving any required project training and designing audit/surveillance plans followed by supervision of these activities. The CQCM reported to the Site Superintendent and was accountable to the PM. The CQCM also provided quality assurance in regards to submittals to the USACE via their QCS. He was also responsible for the daily Construction Quality Control Reports (DQCR) (see **Attachment H**).

The project organization chart and resumes of the key project personnel are included in CQCP (ECC, 2014b) which details the lines of communication and authority for the project.

3.2 SUBCONTRACTOR SUPPORT

The subcontracted services used for this project included:

- Supplemental structural engineer survey (DEMCO)
- Supplemental asbestos survey (TTL)
- Supplemental Hazardous, Toxic, and Radioactive Wastes (HTRW) survey (TTL)

- Asbestos abatement (JT Diamond, subcontractor to DEMCO)
- Building deconstruction (ECC)
- Subsurface utility location/mark-out (Ohio Dig Safe)
- Geophysical survey (Grumman Exploration)
- Groundwater/soil boring investigation (HGL / TTL)
- Analytical laboratory services (ALS)
- Hazardous waste transportation/disposal (US Ecology)
- Health Physics Services (Perma-Fix)

4.0 PRE-DEMOLITION ACTIVITIES

Pre-demolition activities began once the notice to proceed was provided by the USACE on 5 August 2014. Pre-construction submittals were prepared in Draft form and submitted to the USACE for review / approval. Concurrently, specific site activities were conducted in September 2014 including a Hazardous Materials Survey (**Attachment E**), Pre-Deconstruction Structural Engineering Survey (**Attachment F**), Building Hazardous Waste Survey (**Attachment E**), and the required local utility notifications. The work plans were finalized on 12 December 2014, after which the deconstruction of Building G-1 could proceed. During this period various non-intrusive site preparation and planning activities were completed in preparation for the major feature of work. These included underground utility location, water transmission line records search, and radiological surveys (**Attachment G**).

Pre-deconstruction field work of the site began mid-November 2014. Activities included the geophysical survey and ACM abatement. The Hazardous Materials Survey also identified lead paint on surfaces of the building along with fluorescent bulbs in various locations of Building G-1. The lead was addressed in accordance with the Occupational Safety and Health Administration's (OSHA) Lead in Construction Standard 29 CFR 1926.62. Prior to deconstruction any bulbs that could be safely removed were properly containerized and disposed of with the building debris.

In early December 2014, the water and sewer utilities and drains were located and terminated at the Building G-1 slab. The interior drains (sumps and trenches) were cleaned of sediments and sludge, then grouting followed. This would prevent any liquid wastes associated with the deconstruction activities from entering the building's drain system. The final pre-deconstruction surveys (including radiological sweeps) occurred on 12 December 2014 in anticipation of the deconstruction, which began on 16 December 2014. The finalized results from the surveys and pre-deconstruction field work were presented to the USACE during a deconstruction meeting held on 11 December 2014, where permission was granted for ECC to proceed with deconstruction of Building G-1.

Photo-documentation of pre-deconstruction activities was submitted to USACE throughout the execution of the project work. These photos are provided as a photo log in **Attachment D**.

Safe execution of the Project was of paramount importance. During all field work activities, daily "tailgate safety meetings" were conducted such that all project staff were kept mindful of safety procedures required in the APP (ECC, 2014a). These tailgate meeting sign-in logs and summaries are provided as **Attachment M**.

4.1 PREPARATION OF WORK PLANS

The Project's SOW specified requirements for multiple work plans to cover the various aspects of executing the project work, maintain communication, quality control, and data objectives. These project work plans are summarized below.

- (ECC, 2014a) *Accident Prevention Plan/Site Safety and Health Plan* (APP/SSHP) – This plan examines work scenarios and prescribes procedures, protective equipment, protective monitoring, and project controls related to the human health and safety of workers on site and the surrounding community. Particularly, it addressed the hazards posed by the dilapidated structure, the site activities, and the potential risks posed by areas that are possibly contaminated with Hazardous, Toxic, and Radiological Wastes (HTRW).
- (ECC, 2014b) *Contractor Quality Control Plan* (QCP) – This work plan contained the technical management plan for executing the project on time and within budget, while detailing the procedures taken to meet the quality objectives pertaining to each feature of the work. The plan included the project's official resource organization, the responsibilities and authorities of the personnel, lines of communication between the client and contractor, and how the required submittals were delivered to the USACE via their Contractor Quality Control System (QCS).
- (ECC, 2014c) *Deconstruction Plan* (DP) – This work plan contained the details of the execution of the building's deconstruction. This includes the procedures for the field work pertaining to decontamination and abatement of construction materials, the required deconstruction of building components and systems.
- (ECC, 2014d) *Sampling and Analysis Plan* (SAP) – This work plan detailed the sampling and analysis procedures for the environmental investigation, HTRW survey, characterization of the building materials and project associated environmental media. The SAP detailed the required quality control procedures for both the field work and the analytical laboratory that met the data quality objectives set forth in the QCP and other applicable guidance documents.
- (ECC, 2014e) *Waste Management, Transportation and Disposal Plan* (WMTDP) – This work plan contained the technical details for the characterization, segregation, packaging, transportation and disposal of the wastes generated during the performance of deconstruction activities.
- (ECC, 2014f) *Site Operations Plan* (SOP) – This work plan describes the day-to-day operations and general outline of the features of work required by the project.

4.2 PRE-DECONSTRUCTION ACTIVITIES RELATED REPORTS

The following reports provided supporting details for their respective features of work:

Attachment B: Transmission Line Report (TLR) and Addendum No. 1, REV. 01

- Contains the results of the records search, including illustrations of the historically known networks of water transmission lines and sewer drains. This includes the narrative of the later utility line field investigations that began on 22 January 2015.
- Contains the results of the geophysics surveys, including both the ground penetrating radar (GPR) and electromagnetic Induction Profiling (EM) scans within the areas illustrated on **Figure 2-2**.

- Includes narratives and documentation of related field work activities associated with the pre-deconstruction phase of the Project's water line investigation feature of work.

Attachment E: Hazardous Materials Survey Report

- Contains the details of the ACM survey, including the sample locations and the results extrapolation quantifying the amount and locations of ACM in Building G-1 that required abatement prior to deconstruction.
- Contains the results of the lead-based paint (LBP) survey, which identified surface-areas and building materials that would likely contain elevated levels of lead within their coatings. These would need to be considered prior to any hot-work (vaporization) or potential dust-creating activities (mechanical cutting and vibration from deconstruction).
- Note that the roof was found to be structurally unsafe in the Engineering Survey (see below), therefore the roof was not sampled.

Attachment F: Pre Deconstruction Structural Engineering Survey

- Noted the existence of debris materials remaining within Building G-1 that must be removed prior to deconstruction.
- No temporary bracing and support required for deconstruction methods (refer to the DP; [ECC, 2014c]).
- Building levels were safe for workers on foot to accomplish pre-deconstruction activities. No structural damage from fire, wind, or water was found. However, the roof was found to not be structurally sound without additional bracing and measures.
- No windows or decorative trims would require removal prior to the start of deconstruction.

Attachment G: Radiological Surveys

- Contains radiological surveys including the pre-deconstruction building surveys, weekly haul road surveys and post deconstruction surveys.
- Contains the incoming / outgoing surveys for the site equipment and weekly surveys of the site office trailers.
- Includes the Building G-1 Concrete Pad Maps.
- Includes the Building G-1 Concrete Pad Surveys.
- Contains Air Sampling Results.
- ECC worked in close coordination with all trades and subcontractors, providing their HP expertise. Their surveys would clear areas prior to pre-deconstruction activities such as walk-through surveys, abatement and debris removal.

Attachment H: Daily Quality Control Reports (DQCRs)

The DQCRs provide daily documentation of the trades on site and a summary of the work accomplished. DQCRs began on the first day where project staff was on site to begin work. DQCRs are organized by month per the requirements in the SOW (USACE, 2014). Generally, most of the execution of the site work from the pre-deconstruction surveys and reports are documented via DQCRs and photo-documentation (**Attachment D**).

4.3 RADIOLOGICAL SURVEYS

The areas around Building G-1 were cleared via gamma walkover surveys (GWS), prior to the entry of site preparation personnel to prevent the migration of radiological contamination that may reside in the dust, debris and soils along the exterior of Building G-1. All equipment coming on site was surveyed by the HP team, verifying that it was uncontaminated entering the Project work site. Additionally, all areas of the building were cleared by the HP team prior to the entry of survey and later, abatement crews. Building surfaces were confirmed with wipe samples where appropriate, prior to deconstruction.

Surveys occurred daily to verify site conditions and that radiation did not migrate away from the site. It also was used to verify the effectiveness of decontamination techniques. The survey logs from the project work are collected and presented in **Attachment G**, as described above. These surveys were critical to all phases and aspects of on-site project work.

4.4 SITE PREPARATION

DEMCO (deconstruction subcontractor) provided site preparation services under the supervision of ECC. Site preparation began on 13 November 2014, after radiological surveys cleared the areas. Site preparation included minimal clearing and grubbing of the work area surrounding Building G-1 within the fenced area, as well as areas outside of the fenced area to allow access for geophysical survey equipment. Silt fence was installed along the building's fence-line as the primary sediment and erosion control measure. A vehicle access entrance into Building G-1's perimeter fence-line was constructed by removing a section of the fence and reinforcing the ground with cribbing and matting (see **Figure 4-1**).

In addition, **Figure 4-1** illustrates the general location of the Project site worker's office trailers. Parties with trailers on site included: the USACE, ECC and DEMCO. The area is located just southwest of Building G-1. The area was also used as a laydown and storage area for clean equipment and materials arriving on-site.

4.5 PRE-DECONSTRUCTION WASTE CHARACTERIZATION AND HANDLING

Based on the surveys to identify HTRW in the project work site, some building materials have LBP coatings, and some paint coatings did have detectable levels of polychlorinated biphenyls (PCBs). Areas of animal wastes were also encountered throughout the building. Radiological surveys confirmed extensive areas above screening criteria, akin to previous investigation results however, all of these materials were left in place, as the deconstruction and disposal methods permitted the mixture of these wastes, classifiable as exempt Low-activity radioactive waste (LARW) and disposed in a Subtitle C landfill. The chosen landfill was U.S. Ecology's facility in Grand View, Idaho (USEI). All of the waste-characterization results and pre-deconstruction surveys demonstrated waste profiles classifiable as LARW and therefore all radiological waste generated during this project was sent to USEI as LARW.

Therefore, based on the deconstruction approach and T&D methods, no pre-clearing of debris, animal wastes, or LBP coatings occurred. Any personnel entering Building G-1 was required to wear appropriate personal protective equipment per the APP (ECC, 2014a) and dispose of their PPE, prior to leaving the work site's exclusion zones.

Building G-1 did contain ACM, which required abatement. Deconstruction would likely create conditions where ACM would become friable, and asbestos fibers and particles would be released into the air. Therefore, all ACM was abated prior to any deconstruction of Building G-1.

4.6 UNDERGROUND UTILITY LOCATION AND ABANDONMENT

Prior to site preparation activities, Ohio Digsafe was contacted to mark out the locations of any known underground utilities on site, starting on 20 October 2014. Additionally, coordination between BASF and the local water departments occurred as part of the Project's records search feature of work. BASF and the local water authority provided drawings and geographic information system (GIS) files of the known water distribution and sewer system. BASF also provided in-the-field personnel to identify relevant utility vaults.

4.6.1 Building G-1 Water and Sewer Termination

Utility disconnecting and abandonment activities began on 2 December 2014. These were located with the aforementioned coordination with local authorities and utility companies. The geophysical survey results, provided at the end of November 2014, were used to confirm the location of underground utilities going into and out of Building G-1, prior to excavation / termination of the subsurface drains. Generally, nearly all utilities for Building G-1 flow to and from the eastern side of the building (refer to the TLR and Addendum No. 1, REV. 01 located in **Attachment B**).

In coordination with the HP team, the hazardous waste survey results, and the ACM abatement team, exterior utilities were identified and primarily consisted of exterior water transmission lines, fire suppression water lines, and roof drains connecting to the storm sewer system. All visible exterior utilities were terminated at their junctions, away from Building G-1. The above-ground steam-line was also confirmed disconnected from the boiler plant. The electrical power utility line had been previously abandoned when operations at Building G-1 ceased. Utilities were terminated at their nearby utility vaults where possible, as they tied into the main water transmission and sewer network serving the former Harshaw site.

Subsequently, the remaining subsurface utilities were addressed. These primarily consisted of drains that were excavated and terminated as close to the Building G-1 slab as possible. North of Building G-1, a 2-inch (“) steel pipe, that was not present on any known as-built drawings, was located and terminated. Although it was believed to be a water service-line into the building, it was not pressurized when uncovered and terminated.

Within Building G-1, all trench drains and piped floor drains had their sludge and sediments removed and containerized (in “super sacks”) for waste handling and profiling. Subsequently, the trenches and pipe drains were grouted to the building slab grade. This would prevent any debris or liquid entering the Building's drain system during deconstruction.

4.7 ACM ABATEMENT

ACM abatement occurred on 19 November 2014 and concluded on 24 November 2014. Work was performed by JT Diamond (DEMCO subcontractor). The DQCRs for November 2014 document the work proceedings.

Prior to entry into the building and abatement of ACM, the HP team provided radiological surveys to clear work areas and surfaces. Exterior materials, such as roof tiles and pipe-insulation were abated using man lifts, to avoid endangering workers on an unstable roof.

Interior ACM was removed where found on piping, drywall, floor tile and other building materials identified as ACM in TTL's pre-deconstruction survey. Overall, seven (7) cubic yards of ACM was removed from Building G-1. Materials were sealed in "super sacks" and staged on site within a sealed intermodal container (IMC), for eventual disposal at USEI. CTG Environmental provided 3rd party oversight and personal air-monitoring of the ACM abatement work. The Asbestos Project Monitoring Report is provided in **Attachment E**.

5.0 DECONSTRUCTION ACTIVITIES

Deconstruction of Building G-1 began on 16 December 2014, after the confirmation that all of the utilities were disconnected. Additionally, a portable onsite truck scale was installed, and a revised haul route was implemented to better access the site and load the transport vehicles without contacting potentially contaminated areas. The deconstruction portion of work, which was dismantling of the building with an excavator equipped with a demolition grapple, lasted until 2 January 2015. Photo documentation of the Project work is contained in **Attachment D**.

Processing and piling of the debris began on 22 December, 2014. Each USEI truck was equipped with an intermodal container (IMC) capable of transporting LARW and hazardous waste with a capacity of approximately 25 cubic yards of debris and waste. The IMCs were transported by trucks to a nearby rail-yard facility where they were loaded onto the rail-cars for transportation to the USEI. Based on the anticipated rate of incoming /outgoing IMCs, the completion date for the loadout was projected to be on 13 February 2015. However, there were delays in obtaining sufficient rates of incoming IMCs to meet the previously anticipated loadout schedule. As a result, the loading of the deconstruction debris was not completed until 4 May 2015.

The truck haul route was surveyed by the HP team weekly, to ensure that radiological contamination was not migrating off site from the trucks. Additionally, each truck entering and leaving the site was surveyed by the HP team. **Figure 5-1** illustrates the truck-haul route and the truck scale location.

The delay prevented the start of the decontamination of the Building G-1 slab until 23 March 2015. The decontamination and clearing of the building slab was critical to completing the deconstruction feature of work in the Project's contract, prior to site-restoration and project close-out. Supplies, personnel, and equipment were demobilized in phases, once they were no longer needed to complete subsequent features of work.

5.1 SEQUENCE OF DECONSTRUCTION

Once all of the pre-deconstruction work was completed and accepted by the USACE, ECC was given permission to proceed with the deconstruction work. **Figure 5-2** illustrates the sequence over which the deconstruction took place, as a path. Before the building was deconstructed, the overhead steam-pipe at the southern portion of the building was removed. The debris was staged on site, and cleared by the HP team.

Deconstruction proceeded in a top-down fashion, first by cutting steel connections from the roof, and allowing it to collapse inward. Then each story was demolished by cutting with a demolition grapple and removing steel beams at strategic points, and pushing the walls of the structure inwards. This approach kept the debris within the confines of the building slab. Deconstruction began on 16 December 2015 on the most southwestern corner of the structure.

Deconstruction then proceeded along a path towards the northeast sections of the building, demolishing sections of the building as work proceeded. Debris was processed and staged so as to clear the slab behind the excavator, as it proceeded along the route illustrated in **Figure 5-2**. This allowed the slab to be used to stage the demolition debris as much as possible, minimizing the need to move potentially radiologically contaminated wastes away from the footprint of the building. This was in anticipation of the decontamination of the building slab, once

deconstruction was completed. Building G-1 was deconstructed down to the slab elevation by 2 January 2015. However, the building debris required processing and disposal.

Radiological surveys by the HP team (see **Attachment G**) continuously monitored the work site, to ensure that radiological contamination did not migrate beyond the "exclusion zones" for the project during the execution of the work. Dust control measures were implemented to prevent the migration of dust generated from the deconstruction process and primarily consisted of the use of a water spray fed from a water buffalo that was filled at a nearby fire hydrant. Generally, the use of water on site was minimal, and did not require containerization, as it was used in quantities such that it was allowed to evaporate, and did not pool to have significant amounts of surface sheet-flow to threaten breaking containment from the exclusions zones. Additionally, continuous air-monitoring at stations around the site (see **Attachment C**) verified that no unacceptable levels of dusts escaped the work site. The dust-particulate cartridges were also sampled by the HP team and sent to an analytical laboratory for radiological contamination as well. No unacceptable levels were found in the samples, nor did the HP team's routine GWS discover any elevated levels of radioactivity migrating from the site.

5.2 DECONSTRUCTION DEBRIS PROCESSING, TRANSPORTATION, AND DISPOSAL

Although USEI was able to accept various mixtures of hazardous waste and LARW, waste profiles were required to meet the facilities waste acceptance criteria (WACs). **Attachment J** contains the facility consent packages for USEI, which include the results of the waste characterization (WC) sampling. **Attachment K** provides the laboratory reports used to generate the waste profiles to meet the WACs, Figures 1, 2 & 3, which identify where each WC was collected along with a brief narrative of each WC sample. Waste characterization proceeded as required, if a novel waste-stream was generated and a new profile was needed, or if the volumes generated increased and waste segregation was changed from previously submitted waste profiles. Procedures and quality control measures for the collection, handling, and field and laboratory analysis of samples were located in the SAP (ECC, 2014d).

There were two waste streams generated from the construction debris. One was LARW that did not contain levels of hazardous substances to meet the criteria for hazardous waste. The other waste stream generated was contaminated building structural steel that could not be decontaminated. The steel was appropriately sized and loaded into approved dump trailers for transportation and disposal at USEI.

Every truck that entered and left the work site was surveyed by the HP team. **Attachment G** contains the records of the surveys. Additionally, each load had a weight ticket bill of lading, and waste manifests recorded for each load. These records are provided in **Attachment L**. The accompanying tracking spreadsheet totals the tonnage of wastes disposed of from the site, as transported and disposed of by USEI.

5.2.1 Shipped Totals of Project Waste

The execution of the deconstruction of Building G-1 generated large quantities of wastes, characterized and handled as exempt-LARW. No hazardous waste was encountered during the execution of the Project work. USEI provided all T&D services and shipped a total of 5,508.53 tons of Project related wastes. Attachment L contains a Tracking Spreadsheet documenting the material disposed of offsite at USEI. A breakdown of the type of waste and method of transportation, along with their total tonnage, is presented below:

- 250 IMCs with deconstruction debris were shipped off-site via rail car totaling 4,573.71 tons.
- 33 loads of steel were shipped off-site via truck dump-trailers totaling 406.81 tons.
- 23 loads of deconstruction debris were shipped off-site via truck dump-trailers totaling 528.01 tons

The deconstruction debris included the pre-deconstruction activity's wastes (e.g. the abated ACM), and wastes generated from the termination of utilities and investigations of the transmission-lines (e.g. soils and piping). These activity's wastes were separate from the investigation derived wastes (IDW) generated during the Project's groundwater investigation.

5.3 ADDITIONAL DEBRIS REMOVAL, CONTRACT MODIFICATION 1A

Piled up debris existed along the northeast fence-line within the Building G-1 area prior to the start of any work. This debris was from Building G-1 stabilization efforts completed by the building owner and building materials that fell from the Building G-1 parapet wall. The removal of this debris was not a part of the original contract for this Project. However, the USACE elected to remove the debris and provided the means to clean-up the area with Contract Modification 1A. Execution of this field work began on 26 January 2015.

Modification 1A also included the placement of several steel plates to cover and protect utilities associated with the BASF nickel treatment system located within the Project work area and haul routes. This was done to mitigate concerns expressed by BASF that trucks entering and leaving the site could potentially damage the system.

5.4 DECONTAMINATION AND CLEARING OF BUILDING G-1'S SLAB

On 23 March 2015, sufficient debris had been processed and removed from the Building G-1 slab. Decontamination proceeded with a wet sweep and disposal of any remaining material on the slab. This was followed by a power-wash. The accumulated material was allowed to dry and was placed into super-sacks for disposal. Results of the slab surveys and clearances are available in **Attachment G**. The slab was cleared via a systematic grid sampling with wipe samples. Each grid square, approximately 4-feet by 4-feet in size, was wiped and sampled by the HP team. The final set of wipe samples from the G-1 slab were collected on May 15, 2015, all results were below RG 1.86. The Gamma Walkover Survey of the Building G-1 slab was completed on May 19, 2015.

5.5 DISPOSAL OF INVESTIGATION DERIVED WASTES

During the Project's groundwater investigation, a total of 7 drums (standard 55-gallon) of IDW were generated and containerized in these sealed drums. These wastes were characterized as non-hazardous and allowed to remain on-site until coordination with a licensed and permitted disposal contractor occurred for its T&D. In March 2016, Energy Solutions provided T&D services for the IDW.

6.0 GROUNDWATER INVESTIGATION

Details regarding the Project's groundwater investigation feature of work are located in the attached report as **Attachment A**. The groundwater investigation field work occurred during the deconstruction process of Building G-1. It consisted of a series of temporary well points to assess the current groundwater conditions in the vicinity of Building G-1. The results confirmed that the plume of radiological groundwater contamination continues to be contained in the same region as that depicted in the RI.

The field work began on 22 January 2015 and consisted of installing eighteen (18) new monitoring wells and converting five (5) existing temporary well points / piezometers to permanent wells. One of the existing locations (IA03-TP0001) was not re-installed and was only converted to a permanent surface completion, thus totaling twenty-two (22) new wells installed. It also consisted of five (5) test pits and thirteen (13) temporary well points, in support of the water transmission line investigation, the details of which are located in the Transmission Line Report in **Attachment B**. The groundwater investigation also included three sampling events that began in June 2015 and were completed in September 2015. Specifically, the first round was completed June 12th, the second round completed on August 3rd and the third and final round was completed September 24th. Further details on these events can be found in Attachment A along with sample results that are provided in Attachment K.

As the field work proceeded, it became apparent that additional investigations in the area would be needed to thoroughly and sufficiently characterize the site's hydrogeology, as well as to investigate possible issues associated with the underground water-infrastructure of Building G-1. This additional work is contained in their respective reports and the funding was provided by the following contract modifications:

Mod 1B – Provided additional funding for the further investigation of the Site Water Lines and Test Pit # 4. Information on the work performed can be found in Attachment B – TLR, Addendum No. 1, REV. 01.

Mod 1C – Provided increased funding for additional soil borings. It also provided funds for stone cover over areas that exhibited surface radiological contamination and to stabilize the former G-2 pad that degraded during debris load-out operations. The additional soil borings are discussed in Attachment A – Project Groundwater Investigation Report.

6.1 MODIFICATIONS 1B & 1C

These contract modifications provided for additional soil borings in the northern area of the site. These were collected via direct-push-technology (DPT) and intended for characterization purposes only and not for monitoring well placement. Fifty-seven (57) soil borings were collected. The USACE collected and submitted samples during this effort for analytical analysis. The details and conclusions are contained in Attachment A –Project Groundwater Investigation Report. Field work for the contract modifications began 6 May 2015 and were completed on 02 June 2015.

Additionally, the water line investigation revealed that all incoming water transmission lines had been successfully terminated prior to deconstruction. There was an observed area of persistent pooling and ponding just north of the Building G-1 slab (see **Attachment B**, Test Pit #4 location / TLR Addendum No. 1, REV. 01). It was presumed, that the condition may be from a broken transmission line. The area was excavated and a concrete vault was located. No transmission

lines were observed within the vault structure. This effort also included the termination of a fire suppression service line along Harvard Avenue, and the confirmation of terminated water mains along the Dennison Avenue overpass along the northern border of OU-1, and along Harvard Avenue in the south.

Prior to the deconstruction, there were areas of persistently high radioactivity, above the NRC 1.86 criteria surrounding Building G-1. These areas, though likely related to activities from Building G-1 operations, were not part of the original SOW to be addressed in the deconstruction. There were also areas that contained depressions from subsidence, prior to the start of field work. Since ECC was mobilized and had the equipment, a contract modification provided the means to address these areas. Several locations were covered with geotextile and a layer of clean crushed gravel, isolating the previously contaminated area.

Figure 6-1, illustrates the GWS that occurred on 18 December 2014, which surveyed the perimeter of Building G-1 and potential truck routes (access routes) indicating the areas of elevated radioactivity. The figure also provides approximate dimensions and the locations of the areas that received the stone cover in May 2015.

7.0 SITE RESTORATION AND DEMOBILIZATION

Site restoration activities began 05 May 2015, following the first post-deconstruction survey by the HP team on 04 May 2015, once the debris had been completely loaded out and removed from the site. Radiological surveys continued throughout the site restoration process until 29 May 2015, when the survey cleared the building slab and all Project field work areas and equipment. No other debris was generated. All materials, brought onto the site, were completely used for the site restoration. The Building G-1 slab remained in place.

All erosion-sediment control measures were removed and disposed of as appropriate. Each control was surveyed by the HP team. Materials that were found to be LARW were disposed of as such, prior to the completion of the waste loadout. Cleared hay bales were re-used to stabilize restored areas and allow for the existing vegetative cover to take hold.

No equipment was permitted to be demobilized until decontamination and HP survey had concluded that it would be clear to leave the site (see **Attachment G**). Equipment and personnel were demobilized in phases, to allow for their gradual removal as they were cleared. All field personnel and equipment, including office trailers, were removed from the site on 5 June 2015. The groundwater sampling team, on-site to sample in August 2015 and September 2015 was separate from this effort and did not impact the clean-up or site restoration approvals from the USACE. During the first groundwater sampling event, which occurred from 01 June through 12 June 2015, a Post Deconstruction GWS was performed on 10 June 2015, this survey is provided as Figure 7-1. This figure also provides the GWS of the rerouted truck haul route that was utilized from mid-April 2015 through project completion.

Note that all project permits, such as the hotwork, confined space and radiation work permits that were acquired to safely execute the project work described above and comply with all applicable regulations are located in **Attachment I**.

7.1 SUBMITTAL REGISTER

The submittal register is provided in **Attachment O** for reference. It contains a record of the electronic and hard copy submittals to the USACE as required by the CQCP (ECC, 2014b). **Attachment O** also includes the transmittal log.

7.2 PROJECT SAFETY INCIDENT REPORT

Only one incident occurred during the execution of the project work. This occurred on 25 November 2014. A material vendor (J&M Trucking) was delivering stone and backed into an on-site non-operational street-light. No personnel were injured. The Final Incident Report was provided to the USACE on 01 December 2014.

8.0 REFERENCES

ECC, 2014a. *Accident Prevention Plan/Site Safety and Health Plan* for Former Harshaw Chemical Building G-1 Deconstruction and Groundwater Investigation, Cleveland, OH. Contract Number W912P4-07-D-0005. ECC, September 2014.

ECC, 2014b. *Contractor Quality Control Plan* for Former Harshaw Chemical Building G-1 Deconstruction and Groundwater Investigation, Cleveland, OH. Contract Number W912P4-07-D-0005. ECC, September 2014.

ECC, 2014c. *Deconstruction Plan* for Former Harshaw Chemical Building G-1 Deconstruction and Groundwater Investigation, Cleveland, OH. Contract Number W912P4-07-D-0005. ECC, September 2014.

ECC, 2014d. *Sampling and Analysis Plan* for Former Harshaw Chemical Building G-1 Deconstruction and Groundwater Investigation, Cleveland, OH. Contract Number W912P4-07-D-0005. ECC, September 2014.

ECC, 2014e. *Waste Management, Transportation, and Disposal Plan* for Former Harshaw Chemical Building G-1 Deconstruction and Groundwater Investigation, Cleveland, OH. Contract Number W912P4-07-D-0005. ECC, September 2014.

ECC, 2014f. *Site Operations Plan* (SOP) – This work plan describes the day-to-day operations and general outline of the features of work required by the project.

NRC, 1974. *Regulatory Guide 1.86 – Termination of Operating Licenses for Nuclear Reactors.* Published June 1974, Latest Evaluation September 2007.

OH EPA, 2014. *Guide to Environmental Permitting in Ohio*, Office of Compliance Assistance and Pollution Prevention. April, 2014.

SAIC 2003. Former Harshaw Chemical Site Remedial Investigation, Sampling and Analysis Plan – Volume I Field Sampling Plan, Revision 3. May 9.

USACE, 2009. *Remedial Investigation Report: Former Harshaw Chemical Site Remedial Investigation*, Cleveland, OH. Contract Number W912P4-04-D-0001 DO-0004. U.S. Army Corps of Engineers, Buffalo District. December, 2009.

USACE, 2010. *Groundwater Conceptual Site Model, Harshaw FUSRAP Site*. Buffalo District FUSRAP Team. www.lrb.usace.army.mil/fusrap/harshaw.htm

USACE, 2012. *Feasibility Study Report: Former Harshaw Chemical Company Site*, Cleveland, OH. September, 2012. Contract Number W912QR-08-D-0008 DO-0003. U.S. Army Corps of Engineers, Buffalo District. September, 2012.

USACE, 2014. *Scope of Work for Building G-1 Deconstruction and Groundwater Investigation*, Cleveland, OH, April 2014. U.S. Army Corps of Engineers, Buffalo District.

FIGURES

ATTACHMENT A
Project Groundwater Investigation Report

ATTACHMENT B
Transmission Line Report and Addendum No. 1, REV. 01

ATTACHMENT C
Dust Particulate Tracking Logs

ATTACHMENT D
Project Photo Log

ATTACHMENT E
Hazardous Materials Survey Report (TTL) and Asbestos Project Monitoring Report (CTG)

ATTACHMENT F
Pre-Deconstruction Structural Engineering Survey

ATTACHMENT G
Radiological Surveys

ATTACHMENT H
Daily Quality Control Reports

ATTACHMENT I
Permits

ATTACHMENT J
Waste Profiles and Facilities Consent Packages

ATTACHMENT K
Waste Sampling and Characterization Results

ATTACHMENT L
Tracking Spreadsheet, Waste Shipping Logs &Waste Manifests

ATTACHMENT M
Daily Tailgate Meetings and Site Worker Sign-In Logs

ATTACHMENT N
Weekly Meeting Minutes

ATTACHMENT O
Transmittal Log / Final Project Submittal Register (Form 4025 Transmittals)