
Final Engineering Report

**Closure of Underground Nike Missile Silos – Defense Battery BU-34/35
Town of Aurora, New York**

Contract No. W912WJ-16-C-0023

Prepared for:
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Table of Contents

CERTIFICATIONS.....	1
1.0 BACKGROUND AND SITE DESCRIPTION	2
2.0 REMEDIAL ACTION OBJECTIVES	3
3.0 DESCRIPTION OF REMEDIAL ACTIONS PERFORMED	4
3.1 Project Setup	4
3.1.1 Silo Dewatering	5
3.1.2 Silo Inspection Activities – Silos 1 through 5.....	5
3.1.3 Silo Inspection Activities – Silo 6.....	8
3.2 Silo Remediation	9
3.2.1 Asbestos Remediation.....	9
3.2.2 Silo Cleaning Activities (high pressure cleaning, oil/water/sediment removal)	9
3.2.3 Debris Removal.....	10
3.2.4 Hydraulic Oil Removal.....	10
3.2.5 Silo Equipment Removal.....	10
3.2.6 Exterior Waterproof Coating Removal	11
3.2.7 Silo 6 Excavation.....	12
3.3 Partial Silo Demolition and Backfilling	12
3.3.1 Dewatering Activities.....	12
3.3.2 Silo Demolition and Backfill	13
3.4 Site Restoration.....	14
3.5 Fuel Oil Underground Storage Tank Closure.....	15
3.6 Septic Tank Closure.....	15
4.0 REFERENCES	16

Tables

Table 1 – Analytical Log Sheet

Table 2 – Summary of Asbestos Containing Material Friable and Non-Friable, Silos 1-5

Table 3 – Summary of Oily Water and Oily Sludge Disposal, Silos 1-5

Table 4 – Summary of Hydraulic Oil Disposal

Table 5 – Summary of Coated Concrete Disposal

Table 6 – Summary of Non-Hazardous Soil Disposal

Table 7 – Summary of Asbestos Containing Material Friable Disposal, Silo 6 Soil

Table 8 – Summary of Asbestos Containing Material Non-Friable Disposal, Silo 6 Soil

Table 9 – Summary of Silo Backfill Testing

Figures

Figure 1 – Construction Site Plan

Figure 2 – 1958 Aerial Image of Launch Area

Figure 3 – Silo 6 Soil Borings, Wells, and Test Pits

Figure 4 – Final Typical Silo Cross-Section

Appendices

Appendix A – Photograph Log

Appendix B – Silo Closure Work Plan, November 2, 2018; NYSDEC Acceptance Letter, November 8, 2018; and Backfill Compaction Amendment, April 10, 2019

Appendix C – Delegation of Authority – Waste Manifests

Appendix D – Silo Water Treatment and Discharge Work Plan, October 11, 2017

Appendix E – Silo Water Discharge Report, August 3, 2018

Appendix F – 2018 Water Treatment System Media Waste Profiles, Waste Characterization, and Waste Manifests

Appendix G – Waterproof Coating Material – Laboratory Analysis

Appendix H – Asbestos Remediation Waste Profiles, Waste Characterization, and Waste Manifests

Appendix I – Asbestos Abatement Report, January 10, 2019

Appendix J – Silo Cleaning Oily Water and Oily Sludge Waste Profiles and Waste Manifests

Appendix K – Hydraulic Oil Waste Profile, Waste Characterization, and Waste Documentation

Appendix L – Coated Concrete Waste Profile, Waste Characterization, and Waste Documentation

Appendix M – Excess Soil/Unsuitable Backfill Waste Profiles, Waste Characterizations, and Waste Manifests

Appendix N – Silo 6 Investigation and Condemnation Letter, August 2, 2018

Appendix O – Silo 6 Soil Mixed with Asbestos Waste Profiles, Waste Characterization, and Waste Manifests

Appendix P – Demolition Permit, Town of Aurora and Resumption of Work Letter, April 3, 2019

Appendix Q – November 2018 and 2019 Water Discharge Report

Appendix R – Water Treatment and Discharge Requests to NYSDEC – September 5, 2018, March 15, 2019 and April 12, 2019

Appendix S – 2019 Water Treatment System Media Waste Profile and Waste Manifest

Appendix T – Backfill Density Testing

Appendix U – Final Survey

Appendix V – Fuel Oil UST Report

Appendix W – Septic Tank Closure Report

CERTIFICATIONS

I, Mark A. Lovejoy, am currently the holder of a professional engineer license in the State of New York. I certify, in my capacity as the person primarily responsible for the implementation of the remedial program activities and not for the purpose of providing professional services, that the November 2, 2018 *Silo Inspection Results and Closure Work Plan* (Work Plan), and amendment dated April 10, 2019 was implemented and that all construction activities were completed in substantial conformance with the Department-accepted Work Plan.

I certify that the data submitted to the Department with this Final Engineering Report demonstrates that the remediation requirements set forth in the Work Plan and in all applicable statutes and regulations have been or will be achieved in accordance with the time frames, if any, established for the remedy.

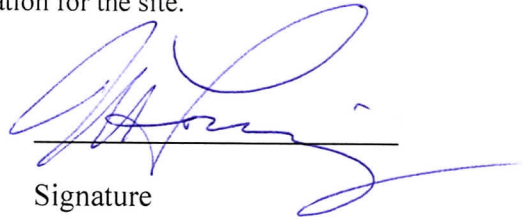
I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Mark Lovejoy, of TANTARA Corporation, am certifying as the Remedial Party's Contractor Project Manager, and I have been authorized and designated by the U.S. Army Corps of Engineers, as the Remedial Party, to sign this certification for the site.

91499 _____

NYS Professional Engineer No.

10/15/19

Date



Signature



1.0 BACKGROUND AND SITE DESCRIPTION

This Final Engineering Report (FER) has been prepared to document the closure of six Nike missile silos associated with the Former Niagara Falls – Buffalo Defense Nike Battery Unit BU-34/35 (the Site) to complete closure of the Site under the Defense Environmental Restoration Program – Formerly Used Defense Site (DERP-FUDS) program.

The Site is in Erie County, New York, and consists of two separate areas, the Launch Area and the Control Area. The property where the silos were located is on the roughly 20-acre Launch Area, located at 601 Willardshire Road, Town of Aurora, New York. The Former Niagara Falls – Buffalo Defense Nike Battery Unit BU 34/35 is listed in United States Army Corps of Engineers (USACE) records as FUDS site C02NY007701. The former Launch Area is now privately owned and contained six former missile silos (Figure 1).

Starting in 1955, the DoD began acquiring property for the construction of Former Nike Missile BU-34/35. After land acquisition and construction, the Former Nike BU-34/35 complex was used by the U.S. Army between January 1957 through 1963 for the assembly, launching, and control of guided Nike Ajax Missiles for defense against high-flying hostile aircraft. By 1958, almost 200 Nike Ajax batteries were deployed around strategic urban, military, and industrial complexes (including Buffalo). Shortly thereafter, the U.S. Army began to phase-out Nike Missile batteries due to the longer range and nuclear capabilities of the Hercules missiles. While certain Nike sites were converted to Hercules Missile Batteries, the Former Nike BU-34/35 site was deemed excess in July 1963 and then determined to be surplus by October 1963 (General Services Administration [GSA], 1963). The U.S. Army then disposed of both the Launch Area and the Control Area.

The Launch Area parcel was transferred from Marjorie Klopp to the U.S. Army via deed dated December 9, 1955. The U.S. Army constructed the surface to air missile Launch Area and ancillary buildings between December 1955 and January 1957 (Malcolm Pirnie, Inc. [MPI], 1996). The Launch Area formerly was occupied by barracks (subsequently converted to apartments) and a silo area consisting of six underground Nike missile magazines. Figure 2 is a 1958 aerial photograph depicting the configuration of the Launch Area at the time it was used by the U.S. Army. The missile magazines were configured in two rows of three magazines each and were situated southeast of the former barracks. The underground structures were made of reinforced concrete and were accessed at the surface by steel doors.

The Site was deactivated on April 8, 1965, and the Launch Area property reverted to the original property owner, Marjorie K. C. Klopp. Subsequently, the estate of Marjorie K. C. Klopp transferred title of the Launch Area Property to the H.G.M. Land Corporation. The Launch Area is currently owned by Waterhill Evergreen Holdings, LLC.

TANTARA Corporation (TANTARA) was selected as the USACE contractor to perform remedial/closure work related to the missile silos, a former underground storage tank, and a former septic tank at the Site.

2.0 REMEDIAL ACTION OBJECTIVES

The Site was addressed under the FUDS program in the framework of the federal regulations called the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Reauthorization Act (SARA). New York District follows USACE guidance, policy and regulations, and is required to comply with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) for all FUDS program sites. In addition, certain actions were completed at the Site under the FUDS program that were not regulated under CERCLA but are relevant to USACE's determination for no further action. These activities were performed under State and local requirements for underground storage tank (UST) removal, building demolition, and septic tank closure.

3.0 DESCRIPTION OF REMEDIAL ACTIONS PERFORMED

This section describes the work performed at the Site to close the six silos. Remedial activities completed at the Site were conducted in accordance with the NYSDEC-approved Work Plan. Any deviations from the Work Plan are noted below.

Closure of the six silos included the activities listed below.

- Project Setup
- Silo Inspections
- Silo Remediation
- Partial Demolition and Backfilling of Silo Structures
- Site Restoration

In addition, an underground fuel oil tank and underground septic tank were closed at the Site.

This report summarizes the work performed for each of these activities.

Photographs documenting the various phases of the work and referenced herein are presented in Appendix A. Daily quality control reports were prepared and submitted to the USACE. Table 1 shows a summary of analytical laboratory reports collected as part of this Work Plan and the appendix where they are located.

The following plans were developed by TANTARA specifically for performing the remedial action.

- *Silo Inspection Results and Closure Work Plan*, including the Community Air Monitoring Plan (CAMP), dated November 2, 2018 (see Appendix B), and amendment dated April 10, 2019.
- Accident Prevention Plan (APP), including a Site-Specific Health and Safety Plan (SSHP), dated November 21, 2016.
- Contractor Quality Control Plan (CQCP), dated September 12, 2017.

3.1 Project Setup

Prior to initiation of field activities, TANTARA performed the activities listed below.

- TANTARA provided temporary construction facilities for the duration of the field activities, including a site trailer and storage container.
- TANTARA added security cameras at four locations at the site.
- A temporary chain link fence was installed around the project site and each individual silo to control access to the work area.
- TANTARA received authorization to sign non-hazardous waste manifests on behalf of the USACE, as permitted in their June 21, 2018 letter (Appendix C).

3.1.1 Silo Dewatering

Prior to conducting inspections of the interior of the five intact silos (i.e., Silos 1 through 5) to evaluate potential environmental and physical hazards, TANTARA pumped and treated water contained within each silo through an onsite temporary treatment system. Treated silo water was discharged to Cazenovia Creek by overland flow and existing swales. Treatment and discharge of the silo water was performed in accordance with the October 20, 2017 approval letter (NYSDEC, 2017) from the New York State Department of Environmental Conservation (NYSDEC). NYSDEC's discharge approval was based on TANTARA's October 11, 2017 *Silo Water Treatment and Discharge Work Plan* located in Appendix D (TANTARA, 2017).

From April 23 through May 23, 2018, a total of 1,558,800 gallons of water was pumped from the five silos and treated using the temporary onsite water treatment system as specified below:

- 6" Hydraulic Submersible Pump: Moved from silo to silo.
- Two 21,000-Gallon Fractionation Tanks: Used as settling basins for removal of suspended solids and petroleum sheens. Sheens that collected on the water surface within the tanks were removed by absorbent booms and pads.
- Bag Filters inline (50 micron followed by 10 micron): To remove suspended solids.
- Two-Stage Media Filter: The first stage was Zeolite organoclay to remove free-phase oil and the second stage was granulated activated carbon (GAC) to remove dissolved organic compounds.
- Flowmeter.

Silo water treatment and discharge was performed in accordance with NYSDEC's October 20, 2017 approval letter. The results of the discharge sampling were presented in TANTARA's August 3, 2018 *Discharge Water Report* (TANTARA, 2018b) submitted to the NYSDEC (Appendix E).

A total of 38.8 tons of spent media (GAC and organoclay) was disposed of at Waste Management's Chaffee Landfill in Chaffee, NY. 0.59 tons of spent bag filters were disposed of at Modern Landfill, in Model City, NY. Approximately 11,700 gallons of water was generated from cleaning the fractionation tanks and was disposed of at Covanta Environmental Solutions in Niagara Falls, NY. See Appendix F for waste profiles and waste characterization laboratory analytical reports.

3.1.2 Silo Inspection Activities – Silos 1 through 5

From May 2, 2018 through July 26, 2018, following dewatering of Silos 1 through 5, silo inspections were completed by TANTARA to evaluate potential environmental and physical hazards within the silos. The results of the inspections were presented in TANTARA's November 2018 *Silo Inspection Results and Closure Work Plan* (TANTARA, 2018c) (Appendix B).

Entry into silos 1 through 5 was initially performed following permit-required confined space entry (PRCSE) protocols. The first entrants to each silo were a New York-licensed industrial hygienist from Sienna Environmental Technologies (Sienna) and a New York-licensed structural Professional Engineer (P.E.) from ENCORUS Group (ENCORUS). After entry into each of the five silos, it was determined that the silos did not meet the definition of a PRCSE and entry was thereafter downgraded to a non-permit required confined space entry (NPRCSE).

The interiors of the silos were inspected by a New York-licensed structural P.E., to determine if the walls and ceiling of the silos are sufficiently competent to allow for human entry into the silos. This evaluation included a visual inspection. Based on this inspection, it was determined that debris removal and a new handrail system should be installed on the concrete stairways into each silo. In addition, the anchor bolts on the floor should be cut flush to avoid tripping hazards. This investigation recommended avoiding personnel and equipment loads off the ceiling slab areas over each of the silos due to unknown condition of the slab supporting strength. The use of an excavator on the ceiling slab was not recommended without a more thorough investigation including core sampling, concrete compression break test and rebar detection equipment.

From May 2 through 17, 2018, Sienna sampled suspected asbestos containing material (ACM) throughout the interior of Silos 1 through 5. The following ACM were identified in each silo:

- Pipe insulation and mud elbows associated with approximately 185 LF per silo of water piping attached to the interior wall of each silo. Some of this insulation has detached from the piping and was laying on the floor of the silo.
- Transite pegboard lining the hallway to the side room (approximately 800 SF/silo).
- Short segment of wire insulation (approximately 4 ft/silo).
- Buried cementitious drainpipe (outside of silo) (approximately 130 LF/silo).

Details of the ACM inspection activities are included in Sienna's June 11, 2018 *Pre-Renovation Asbestos-Containing Materials and Lead-Based Paint Inspection Report* (Sienna, 2018) which is included as an appendix in TANTARA's November 2018 *Silo Inspection Results and Closure Work Plan* (Appendix B). It was determined by USACE that the asbestos present was incidental to the remediation work required to close the silo and would need to be abated.

During silo inspection activities, hydraulic system oil was observed both within the hydraulic system equipment (e.g., holding tank, piping) and, to varying degrees, spilled on the silo floor from deteriorated hydraulic system pipe fittings. Spilled oil was contained where possible using absorbent oil booms; however, it appears that oil was mixed with sediment and residual water across the floors of all five silos. This oil/water/sediment mixture was managed as a single waste stream and is discussed in the section on silo cleaning activities below. A water sample collected from Silo 2 in an area near the hydraulic pump system and where hydraulic oil had been released and mixed with residual water on the silo floor was analyzed for VOCs, semi-volatile organic

compounds (SVOCs), PCBs, total petroleum hydrocarbons (TPH), and metals. A summary of the results is provided in Table 1 of the Work Plan (Appendix B) and a copy of the analytical report is included in that report's appendix. As indicated by these results, this oil/water mixture was classified as a non-hazardous waste. It was assumed that this sample was representative of the oily water in all five silos.

During silo inspection activities, sediment was observed in a relatively thin layer in patches across the floor of each silo. The total volume of sediment per silo was estimated to be less than 1 CY. The sediment was orange in color, presumably from corroded metal equipment and piping contained in the previously flooded silos. A dark brown-colored sediment was also observed that appeared to consist of decomposed organic material. Samples of the sediment were collected from each of the five silos (1 through 5). Each silo sediment sample consisted of a 4-point composite sample, which included sediment from each of the four corners of the main silo compartment. Each sample contained a representative quantity of both the orange and dark brown sediments. The samples were analyzed for VOCs, SVOCs, PCBs, TPH, and metals. The maximum theoretical leachable concentration for some metals exceeded the applicable TCLP limit (i.e., total solid concentration is greater than 20 times the TCLP limit – “Rule of 20”) and the samples were re-analyzed for these metals under the TCLP protocol. The TCLP results of these samples were all below the detection limit (i.e., do not exceed the toxicity criteria). A summary of the results of these samples is provided in Table 2 of the Work Plan (Appendix B) and a copy of the analytical report is included in that report's appendix. As the summary table shows, the sediment was characterized as a non-hazardous waste.

Surfaces potentially containing lead-based paint were analyzed during the silo inspection activities using an XRF. The following items were determined to contain lead exceeding the action level of 1.0 mg/cm²:

- Elevator doors, structural steel, and grates;
- Metal doors and frames;
- Metal ladders; and
- Small (150 square inches) painted signs on concrete walls (4 signs per silo).

Details of the lead-based paint inspection activities are included in Sienna's June 11, 2018 *Pre-Renovation Asbestos-Containing Materials and Lead-Based Paint Inspection Report* (Sienna, 2018) which is included as an appendix in the Work Plan (Appendix B).

Inspection of the silos included identifying any debris that was left behind in the silos prior to abandonment. Silos 2 through 5 were substantially free of debris, except for a limited amount of debris associated with deteriorated or corroded equipment that had fallen to the floor over time. Silo 1 was observed to have a pile of debris that was dumped into the silo through the elevator doors. This debris consisted mostly of discarded comingled household items. The volume of this debris was estimated to be 60 CYs.

TANTARA observed various equipment associated with the former silo function, including hydraulic system components, elevator platform and lifting equipment, ventilation system, and miscellaneous piping. This equipment was in various states of deterioration consistent with being submerged for several years.

TANTARA did not find containers of chemicals during the silo inspection activities.

Sienna and TANTARA performed sampling of the exterior concrete silo walls and roofs that are coated with a tar-like waterproofing material. Samples of the waterproof coating were collected from the roof and sidewalls of each of the five silos and analyzed for asbestos. Asbestos was not detected in any of the samples. A copy of the laboratory report is included in Appendix G. Concrete core samples of the coated walls and roofs were also collected from Silos 1-5 to obtain a Beneficial Use Determination (BUD) from the NYSDEC to allow for the burial of removed wall and roof concrete to be backfilled within the remaining silo structure. After reviewing the results of this sampling effort, the NYSDEC decided that coated concrete removed during silo filling activities could not be used as backfill onsite unless a bulk of the coating was separated from the concrete. Therefore, the approach to address the coating is described further in Section 3.2.6.

3.1.3 Silo Inspection Activities – Silo 6

TANTARA performed test pits at various locations within the footprint of former Silo 6. Figure 3 shows the approximate locations of these test pits relative to estimated location of Silo 6. Observations made during these test pits are listed below.

- Test pits excavated at two corners of the former silo revealed the tops of the vertical silo walls and no roof to the silo. It was concluded that the entire roof (approximately 60 ft by 60 ft) has been demolished and likely dropped into the silo as fill material.
- Test pits extended approximately 5 feet deep with the water table at approximately 3 feet deep, which required dewatering to reveal the silo walls.
- Test pits were also excavated at either end of the former location of the missile elevator doors and the stairwell. No doors or door frame for the missile elevator were found. Fill material consisted of soil and large (4 ft to 8 ft) pieces of concrete slabs (approximately 6-inch thick). These pieces of concrete were assumed to have been from former surface concrete pavement/pads that existed at one time near Silo 6.
- Pieces of the concrete silo roof or of metal equipment were not discovered during the test pitting. It can be assumed that this material was used to fill in the silo and exists closer to the bottom of the silo.

3.2 Silo Remediation

3.2.1 Asbestos Remediation

From June 26, 2018 through August 15, 2018, Allied Environmental Services, Inc. (Allied) performed asbestos abatement activities at Silos 1 through 5 in accordance with an approved Asbestos Variance in accordance with New York State Department of Labor (NYS DOL) regulations (Appendix B). 1.59 tons of friable ACM and 7.62 tons of non-friable ACM were shipped to Waste Management's Chaffee Landfill in Chaffee, NY via Waste Management during July and August 2018. See Table 2 for waste summary and Appendix H for waste manifests, waste profiles and waste characterization laboratory analytical reports. Sienna Environmental Technologies provided the third-party air monitoring during the abatement activities. The results of this air monitoring are presented in Sienna's January 10, 2019 *Asbestos Abatement Report* in Appendix I (Sienna, 2019).

Allied removed the following from Silos 1 through 5:

- Pipe insulation and mud elbows associated with approximately 185 LF per silo of water piping attached to the interior wall of each silo. Some of this insulation had detached from the piping and was laying on the floor of the silo.
- Transite pegboard lining the hallway to the side room (approximately 800 SF/silo).
- Short segment of wire insulation (approx. 4 ft/silo).
- Buried cementitious drain pipe (outside of silo) (approx. 130 LF/silo).

On May 29, 2019, Allied Environmental Services, Inc., performed asbestos abatement activities not completed in 2018 at Silo 2 in accordance with an approved Asbestos Variance in accordance with NYS DOL regulations. A total of 0.26 tons of non-friable ACM caulking were shipped to Waste Management's Chaffee Landfill in Chaffee, NY via Allied Environmental Services, Inc. on July 16, 2019. See Table 2 for waste summary and Appendix H for waste manifests, waste profiles and waste characterization laboratory analytical reports. All identified ACM materials were removed from all six silos prior to demolition. Refer to Section 3.2.7 for details on ACM removal at Silo 6.

3.2.2 Silo Cleaning Activities (high pressure cleaning, oil/water/sediment removal)

Following asbestos abatement, the floor and interior walls of the Silos 1 through 5 were cleaned to remove any remaining oil and sediment following dewatering of the silos. This cleaning process included the use of high-pressure spray, shovel, squeegee and vac truck, and generated a mixture of oily water and sediment. The material was placed in the elevator sump prior to disposal.

During July and August 2018, 61,379 gallons of oily water and 60.52 tons of oily sludge were removed from the sumps in Silos 1 through 5. This material was transported by Sun Environmental Corporation and disposed at American Recyclers Company located in Tonawanda, NY as non-RCRA, non-DOT regulated liquids and non-RCRA, non-DOT regulated sludge. See Table 3 for a waste summary and Appendix J for waste manifests and waste profiles. The waste characterization

laboratory analytical reports were previously included in the Work Plan and are located in Appendix B. Characterization of this waste as non-hazardous was conducted during the silo investigation activities and is discussed above.

3.2.3 Debris Removal

TANTARA removed debris in Silo 1 using an excavator to bring the material up to grade where it was segregated. This debris consisted mostly of discarded comingled household items. Additional debris was segregated from Silos 2, 3, 4 and 5 along with general construction debris. CragCo, Inc. removed one 22-cubic yard roll off on August 28, 2018. Waste Management removed four 30-cubic yard roll offs on August 29 (2 roll offs), August 30 and December 12, 2018.

In addition, on September 27, 2018, 29 tires were removed from Silo 1 and disposed of by Geiter Done of WNY, Inc., Buffalo, NY, a tire recycler.

3.2.4 Hydraulic Oil Removal

Hydraulic oil remaining in the former hydraulic system equipment and piping was removed from the silos by pumping the oil out of piping and the elevator pistons and containing it within 55-gallon metal drums. The oil was accessed by removing the elevator piston and pumping the oil from the bottom of the casing.

Hydraulic oil was recovered from elevator pistons in Silos 1, 4 and 6 during fall 2018 and from Silos 2, 3, and 5 during spring 2019. Approximately 550 gallons of hydraulic oil and associated wash water was recovered from the six elevator pistons and sent for disposal. Six, 55-gallon drums were shipped on December 11, 2018 and five, 55-gallon drums were shipped on June 13, 2019 to Industrial Tank Service Corporation in Oriskany, NY by Sun Environmental Corporation. Refer to Table 4 for waste summary and Appendix K for waste documentation, waste profile and waste characterization laboratory analytical report.

3.2.5 Silo Equipment Removal

TANTARA removed former silo equipment from Silo 1 through 5. Equipment removed includes:

- Major hydraulic system components, including oil holding tank, pump equipment and associated metal framing, and exposed piping;
- Elevator doors, frame, and associated structural components;
- Elevator platform and lifting equipment;
- Major ventilation equipment;
- Elevator Piston;
- Doors; and
- Exposed piping and brackets.

Metal framing, rebar and components encased in the concrete remain as part of the silo that was left in place and backfilled as part of closure activities. TANTARA removed any metal/equipment from Silo 6 during excavation activities described above

A total of 394 tons of scrap metal were recycled by Niagara Metals during 2018 and 2019. This amount also included exposed reinforcing bars removed from the concrete silo walls during silo demolition activities (see Section 3.3.2)

3.2.6 Exterior Waterproof Coating Removal

After excavating soil to uncover the silo roof and walls, TANTARA removed an exterior waterproof coating from the concrete by using a straight edge gripped using the excavator bucket and thumb to separate the coating from the concrete surface. As discussed in Section 3.1.2, TANTARA requested a BUD from the NYSDEC to allow for the burial of removed wall and roof concrete with coating to be backfilled within the remaining silo structure. However, NYSDEC decided that coated concrete removed during silo filling activities could not be used as backfill onsite unless a bulk of the coating was separated from the concrete. The goal, as required by the NYSDEC, was to remove a bulk of the coating. TANTARA removed the exterior waterproof coating from the concrete walls in each silo to a minimum depth of 10 feet below the final ground surface elevation. The waterproof coating was removed from the silo wall with an excavator bucket. Removing coating from the exterior silo walls generated an amount of co-mingled soil that added to this waste stream.

The coating removed from the silo roof and walls at Silos 1 through 6 were sampled and analyzed prior to offsite disposal to ensure compatibility with the disposal facilities requirements, and confirmed the material was not a hazardous waste. Approximately 90 tons of coating mixed with concrete was removed from the site on October 8, 9 and 24, and November 7, 2018 and shipped to Waste Management's Chafee, NY landfill. This material was removed from the site in roll-off containers. See Table 5 for waste summary and Appendix L for waste documentation, waste profile and waste characterization laboratory analytical report.

Subsequently, it was determined that the coated concrete could be disposed of more effectively combined with the soil impacted with residual hydraulic oil from the silo demolition activities. This material was disposed of by using dump trucks under a separate waste profile. See section 3.3.2 for silo demolition information. Approximately 5,500 tons of soil not suitable for backfill was disposed of at Waste Management's Landfill in Chafee, NY by D&H Excavating. This material was contaminated with residual hydraulic oil. Most of this soil was generated from Silo 6 but also included isolated hot spots from the other silos and included some waterproofing material and concrete. This waste stream was sampled and characterized as non-hazardous for disposal. See Table 6 for waste summary and Appendix M for waste manifests, waste profiles and waste characterization laboratory analytical reports.

3.2.7 Silo 6 Excavation

From September 19, 2018 through October 10, 2018, TANTARA excavated concrete, soil, metal and debris contained within the walls at Silo 6. Excavation activities started at the center of the silo and worked toward the interior silo walls, because it was assumed that if ACM material (insulated piping and transite wall panels) was present, it would be associated with insulation of piping mounted to the silo walls consistent with the other five silos. TANTARA ceased excavation a minimum of five feet from the interior silo walls. TANTARA did not encounter suspected ACM material. Non-ACM excavated material was segregated and stockpiled onsite on poly sheeting and characterized to determine its suitability for backfill during silo filling activities. This material was disposed of as described in Section 3.2.6 because it was contaminated with hydraulic oil and mixed with the exterior waterproof coating. A copy of the laboratory analytical report is included in Appendix M. See section 3.2.6 for disposal information.

At this point, the asbestos abatement contractor, Allied, completed the excavation activities within Silo 6 following the standard requirements in NYSDOL ICR56-11.5 – *Controlled Demolition with Asbestos in Place*, which required a Condemnation Letter by a Structural Professional Engineer (see Appendix N). From October 15, 2018 through October 31, 2018, Allied excavated the remaining contents of Silo 6. Sienna provided third-party air monitoring during the abatement activities.

Excavated material containing ACM was handled separately. A total of 885 tons of friable ACM and 118 tons of non-friable ACM soil were shipped to Waste Management's Chaffee Landfill in Chaffee, NY via Zoladz of Alden, NY during October 2018. See Tables 7 and 8 for waste summary and Appendix O for waste manifests, waste profiles and waste characterization laboratory analytical reports.

3.3 Partial Silo Demolition and Backfilling

Silo demolition activities were performed as described in the Work Plan. Prior to demolition, a demolition permit was obtained from the Town of Aurora in 2018 (Appendix P). In addition, USACE sent the Town of Aurora a Resumption of Work letter upon the resumption of activities in April 2019 (Appendix P).

3.3.1 Dewatering Activities

Heavy rains and snow melt required additional dewatering from the silos prior to silo demolition. Treatment and discharge of the silo water was performed in accordance with September 12, 2018 (NYSDEC, 2018) and May 1, 2019 (NYSDEC, 2019) approval letters from NYSDEC (Appendix Q). NYSDEC's discharge approval was based on USACE submittals dated September 5, 2018, March 15, 2019, and April 12, 2019 which included laboratory analytical reports and water treatment information (Appendix R).

From November 5 through 8, 2018, a total of 154,001 gallons of water was pumped from Silo 3

and treated using the temporary onsite water treatment system. From April 17 through May 8, 2019, a total of 1,075,000 gallons of water was pumped from Silos 2, 3 and 5 and treated using the temporary onsite water treatment system. From May 9 through June 12, 2019, a total of 1,089,500 gallons of water was pumped from Silos 1, 4, and 6 and treated using bag filtration. The results of these dewatering and treatment events are presented in TANTARA's September 23, 2019 *Discharge Water Report* submitted to the NYSDEC (Appendix Q).

A total of 6.98 tons of spent media (GAC and organoclay) was disposed of at American Recyclers Company in Tonawanda, NY. See Appendix S for waste manifest and waste profile. The waste characterization laboratory analytical report was previously submitted in the Work Plan in Appendix B.

3.3.2 Silo Demolition and Backfill

After completing remediation activities, TANTARA demolished the concrete roof at Silos 1 through 5 using a concrete breaker on the end of an excavator and allowed the broken pieces of concrete to fall into the silo. As necessary, the broken pieces of concrete were reduced to 3-foot minus. TANTARA also demolished the side walls a minimum of 10 feet below final grade elevation. Silos 1, 4 and 6 were demolished during fall 2018. Silos 2, 3, and 5 were demolished during spring 2019.

TANTARA filled in the silos with a combination of crushed concrete, associated concrete launch pads, and other onsite fill material generated during silo remediation activities that was determined to be suitable for backfilling. As described above, the existing concrete roof and wall slabs, scraped of their waterproof coating, were demolished using a concrete breaker attached to an excavator, sized reduced to < 3 feet. A portion of this uncoated concrete generated from site demolition activities was crushed to < 3 inches using a temporary onsite crushing machine. Exposed reinforcing materials was cut or sheared off and transported for recycling or disposal. Void spaces at the ends and along the sides of the elevator pits were filled by breaking the silo floor down into these void spaces. Generation of dust was monitored throughout silo filling activities, as directed by the Site-Specific Health and Safety Plan. All work was conducted in accordance with the Community Air Monitoring Plan (CAMP) included in the *Silo Inspection Results and Closure Work Plan*, (TANTARA, 2018c).

Two dust monitors (MIE personalDataRAM-1000) were installed at two locations near the silos, pursuant to the CAMP, and were calibrated daily. During intrusive construction activities, the airborne particulate levels were automatically logged during typical construction hours of 7:00 AM to 3:00 PM by the dust monitors. The monitoring equipment also provided readings in real time. Alerts were pre-set such that if the downwind airborne particulate level exceeds 100 µg/m³ of the upwind particulate level for a fifteen-minute period, TANTARA's Site Supervisor were notified. No exceedances were recorded during the soil excavation and grading, silo demolition and backfilling activities or site restoration.

In 2018, no exceedances were detected in any of the monitors. In 2019, site conditions were

consistently moist as a result of more frequent than normal rainfall events that substantially reduced the potential for dust generation. Given these conditions, dust monitoring was determined not to be needed.

As specified in the Work Plan, backfill placed at depths greater than 10 feet below final grade consisted of broken pieces of uncoated concrete (sized reduced with concrete breaker on an excavator to 3-foot minus) combined with either onsite soils previously excavated from the site or imported select granular fill from D&H Excavating, Arcade, NY. Backfill was placed in approximate 12-inch lifts and compacted with the back of an excavator bucket. Backfill placed in the upper 10 feet below final grade consisted of onsite soils previously stripped from the site, crushed uncoated concrete with an onsite concrete crusher (< 3 inches), and imported fill from D&H Excavating. Backfill was placed in approximate 12-inch lifts and compacted using a sheepsfoot roller. The amount of backfill imported to the site totaled 3,685 tons.

Imported backfill was pre-characterized and was found to meet the NYSDEC Unrestricted Use criteria. A copy of the analytical reports with the results of chemical analyses performed on a sample of this material is included in Appendix B of the Work Plan (TANTARA, 2018c). A summary of these results compared to the NYSDEC Unrestricted Use criteria is presented in Table 3 of the Work Plan (Appendix B). See Figure 4 for a cross section of the approximate typical final conditions of Silos 1 through 6.

From June 4, 2019 through July 2, 2019, each lift of backfill in the upper 10 feet of the excavation was tested for density by 3rd Rock, LLC, East Aurora, New York. Backfill successive lifts would only occur if the in-place density of the backfill achieved 90% Modified Proctor or greater. A total of 112 density tests were performed on 56 lifts. A copy of the results of the density testing, along with the Modified Proctor analysis of the excavated material, is provided in Appendix T and shown on Table 9.

3.4 Site Restoration

Disturbed areas of the Site, including the area where a fuel oil UST was removed in 2017, see below, and the former silo area, were evenly graded to achieve proposed final grades as indicated by the site grading plan presented in the Work Plan (TANTARA, 2018c). A minimum of 4 inches of topsoil was spread over the disturbed areas. The topsoil consisted of a combination of previously stripped and stockpiled topsoil and clean imported fill material screened to remove material larger than 0.5 inch from D&H Excavating, Arcade, NY. The amount of topsoil material imported to the site totaled approximately 300 tons. These areas were then hydroseeded with a native grass mix by Bison Bluegrass, East Aurora, NY.

On July 16, 2019, GPI Engineering, Landscape Architecture & Surveying, LLP surveyed the final grades across the site. A copy of the final survey is provided in Appendix U.

3.5 Fuel Oil Underground Storage Tank Closure

In addition to silo closure activities, on February 16, 2018, TANTARA prepared a *UST Closure Report* (TANTARA, 2018a) which described work activities performed to complete the removal of a 8,000-gallon fuel oil UST and associated soil containing diesel fuel from a prior spill event. UST closure activities were conducted from October 16, 2017 through November 14, 2017. Additional details are included in the *UST Closure Report* located in Appendix V.

3.6 Septic Tank Closure

From July 16 through July 23, 2019, TANTARA closed a septic tank that was constructed and used as part of the missile silo launch area compound. Closure activities are documented in TANTARA's September 9, 2019 *Septic Tank Closure Final Report* (Appendix W), which describes the work activities conducted to complete the decontamination and permanent closure of the septic tank.

4.0 REFERENCES

- New York State Department of Environmental Conservation. 2017. *Silo Water Treatment & Discharge Work Plan. Closure of Underground Nike Missile Silos – Defense Battery BU 34/35*. October.
- New York State Department of Environmental Conservation. 2018. *Silo Water Treatment & Discharge Scope of Work Plan. Closure of Underground Nike Missile Silo 6 – Defense Battery BU 34/35*. September.
- New York State Department of Environmental Conservation. 2019. *Silo Water Management Plan 2019. Closure of Underground Nike Missile Silos – Defense Battery BU 34/35*. May.
- Sienna Environmental Technologies. 2018. *Pre-Renovation Asbestos-Containing Materials and Lead-Based Paint Inspection Report. Closure of Underground Nike Missile Silos – Defense Battery BU-34/35*. June.
- Sienna Environmental Technologies. 2019. *Asbestos Abatement. Underground Nike Missile Silos – Defense Battery BU-34/35*. January.
- TANTARA Corporation. 2017. *Silo Water Treatment and Discharge Work Plan. Closure of Underground Nike Missile Silos – Defense Battery BU-34/35*. October.
- TANTARA Corporation. 2018a. *UST Closure Report. Former Launch Area Formerly Used Defense Site Nike Battery BU-34/35*. February.
- TANTARA Corporation. 2018b. *Discharge Water Report. Silo Water Treatment and Discharge. Closure of Underground Nike Missile Silos – Defense Battery BU-34/35*. August.
- TANTARA Corporation. 2018c. *Silo Inspection Results and Closure Work Plan. Underground Nike Missile Silos – Defense Battery BU-34/35*. November.
- TANTARA Corporation. 2019. *Septic Tank Closure Final Report. Former Niagara Falls – Buffalo Defense Nike Battery BU-43/35*. September.