



**Department of
Environmental
Conservation**

Nimham Arsenic Mine Summary Report

December 14, 2022

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Nimham Arsenic Mine – Site #340033
Gypsy Trail Road
Carmel NY, 10512

1.0 Introduction

The Division of Environmental Remediation (DER) prepared this IRM Summary Report for the Nimham Mountain Mines site located in the Nimham Mountain State Forest Multiple Use Area (MUA) in the Town of Kent, Putnam, New York. The site location is shown in Figure 1.

In March and April 2017, DER performed an Initial Site Investigation (ISI) at the site at the request of the Division of Lands and Forests; the ISI report was issued in June 2017. Analytical sampling for the Nimham Mountain Mines ISI was completed under Spill Number 1700110. Since, the site has been designated an “A” site on the list of New York State Inactive Hazardous Waste Sites. The ISI report recommended actions to be taken to limit public exposures to contaminants. These actions, hereafter referred to as an “IRM” (interim remedial action), occurred in three separate phases.

As stated above, the purpose of the IRM actions was to reduce exposures to contaminants for users of the MUA.

This summary will report only on arsenic in and around the MUA. “MUA” and “site” will be used interchangeably, although “site” specifically refers to the ~50 acre area of concern within the 1,054 acre MUA.



Figure 1: Site Location

2.0 Site Background and Physical Setting

The Nimham Mountain Mines site is located in the Nimham Mountain State Forest and is accessed from Gypsy Trail Road in the Town of Kent, Putnam County, New York. The site is located within the state owned 1,054-acre Nimham Mountain Multiple Use Area.

Due to the potential for exposure to mine wastes on publicly accessible state lands within the Nimham Mountain Multiple Use Area, the Division of Lands and Forests requested the Division of Environmental Remediation complete a Site Characterization and take actions if necessary. Based on observation of historic mining features, the area of concern (AOC) is primarily within the 50.7 acre tax parcel 32.1-15 (site parcel) owned by the State of New York and located within the MUA, as depicted in Figure 2.

A trail system exists in the AOC and within the MUA as a whole. Five main mine features were identified in the AOC: a main mine shaft, “Mine #1,” and Pit mines (likely exploratory pits) #2, #3, and #4, as depicted in Figures 3. The features on which IRM actions are focused are the trails and Pit Mines #2 & #3. Pit Mine #4 was not addressed in this effort because, regardless of the name, is not a pit but rather a feature dug into the side of a small hill. Therefore, it cannot be filled in.

2.1 SITE BACKGROUND

The mines were historically known as several names including the Nimham Mountain Mines, Pine Pond Mine, and Silver Mine, and was one of several arsenic mines in the Nimham Mountains. The mine operated between 1888 and 1908, however some records show that the area was prospected as early as 1839 and activity continued as late as World War 1. It is reported that Arsenopyrite (FeAsS) was mined for pesticides, pigments, and glass manufacturing.

Over the past several decades, residential homes have been constructed and state land has been dedicated for recreational use in the areas that were formerly used for mining activities. Public and private supply wells in this area have been investigated historically by the Putnam County Department of Health (PCDOH) and the United States Environmental Protection Agency (EPA). Historic analytical data from samples collected from three nearby private residential wells and one public well historically showed arsenic concentrations above the state and federal regulatory level of 50 micrograms per liter (ug/L). In December 1987, the residents of the home at 491 Gypsy Trail Road at that time were hospitalized with acute arsenic poisoning symptoms. The arsenic concentrations in water from the two other residences and the public well was determined to be treatable with Ferrosand® filters. However, arsenic concentrations within the water at 491 Gypsy Trail Road were extremely high (10,000 ug/L) and the Ferrosand® filters proved to be inadequate in removing the contaminant. In 1988 a cistern system was installed by EPA to provide the residence with potable water. This system was repaired by EPA in 2016.

It is the policy of NYSDEC to manage state lands for multiple uses to serve the People of New York State. The Unit Management Plan (UMP), which will be released by the Division of Lands and Forests (DLF), is the first step in carrying out that policy. In the course of developing the UMP for the Nimham Mountain State Forest, it was decided that the potential of arsenic impacts required the evaluation of the environmental significance of the historic arsenic mine on the property.

The MUA is managed by NYSDEC's Division of Lands & Forests, but several volunteer user groups aid in monitoring the MUA. These community groups help with cleanup, maintenance, and reporting of areas in need of repair to NYSDEC. Because the Nimham Mtn. MUA is owned by New York State, the site is prohibited from being listed on New York's inactive hazardous waste site registry (State Superfund). Therefore, limited general funds were approved to be used to perform emergency actions (Interim Remedial Measures, or IRM) to achieve the goal of limiting contaminant exposures to people using the MUA. Uses of the MUA is exclusively recreational. Uses include but is not limited to hiking/walking, horseback riding, and mountain biking.

In November 2019, adjacent areas outside of the MUA, across Mt. Nimham Court and north of the MUA along Gypsy Trail Road were listed as a federal superfund site by USEPA, also known as the National Priorities List (NPL). See Figure 4. An April 30, 2019 Health Advisory was issued by the Agency for Toxic Substances and Disease Registry (ATSDR) and a Health Consultation was issued on the same date by the New York State Department of Health

(NYSDOH) to establish the health risk necessary for listing as a superfund site. The USEPA-led site includes a second mine entrance located on private property, and several residential parcels. Two Operable Units have been designated at the NPL site which include a dissociation effort and possible relocation of residents (OU1), as well as a site-wide cleanup effort (OU2). These efforts are underway at the time of this document's issuance.

2.2 GEOLOGY & HYDROGEOLOGY

The site lies within the geologically complex New England Uplands physiographic province within the Hudson Highlands. The Hudson Highlands are a northern extension of the Reading Prong of the Appalachian Highlands, which rises to more than 1,400 feet above sea level. The geologic structure of the area is typified by northeast trending folds and faults. Glaciation has affected the region by scouring valleys and leaving low permeability till on hill tops, and lacustrine sand and gravel deposits in valleys. Bedrock in the area is high-grade metamorphosed Precambrian sedimentary and igneous rocks with dominant gneiss, schist, and granite, formed under high temperature and pressure conditions (Groff, et al.,).

The mine area, consisting of several pits and shafts, is located near the eastern base of Mount Nimham (elev. 1273') which consists of resistant amphibolite, diorite, gneisses, and gabbroic rocks. The bedrock outcrops observed at the site mine pits and shafts consist of hornblende-bearing gneiss. Historic mining activities at the site pursued a massive body as well as stringers of arsenopyrite (FeAsS) with some associated minor chalcopyrite (copper iron sulfide). The ore body was prospected as containing 18.5% arsenic. Mine 1 reportedly has a shaft 100 feet deep with a 75 foot drift at bottom atop a 12-20 foot wide quartz vein with sulfides. The vein of quartz runs parallel to the north-trending ridge of an altered peridotite dike containing serpentine. Two main ore zones intersect at 60 degrees. (Ralph, et al., mindat.org)

The site lies in the West Branch Reservoir watershed drainage basin which is part of New York City's water supply system's East Branch Croton River Watershed. The watershed is a part of the larger Lower Hudson River Basin. Water at the site drains into an unnamed tributary and wetland which has a source at Bird Pond 1.8 miles north of the site, runs through the larger Pine Pond, immediately north-northeast of the site, and south 1.9 miles to a discharge point on the West Branch Reservoir. Water here eventually flows to the Hudson River and ultimately the Atlantic Ocean.

Due to the nature of the steeply sloping and rocky topography of the area, soils at the site are the moderately permeable but excessively well drained soils of the Chatfield-Charlton Complex (CsD) (USDA, 1994). Site soils are anywhere from absent at rock outcroppings to approximately 24 inches deep and generally feature dark brown loam or yellowish-brown sandy loam, both often containing a gravel component. Groundwater occurs in both bedrock and unconsolidated formations in the region, but due to the steep slopes and shallow bedrock at this site, groundwater is likely to occur only in the bedrock. The average water table given for CsD soils is greater than 6 feet, however, private drinking water wells set into hornblende gneiss bedrock in the area are generally about 350 feet deep with an average yield of 11 gallons per minute (Chazen, 2004).

Water production in the gneissic bedrock is from secondary porosity of fractures, joints, and faults. While bedrock groundwater flow direction at the site has not yet been determined, it can be assumed that shallow bedrock groundwater and any bedrock seeps will follow topographic drainage patterns, while deep bedrock flow will follow preferred fracture pathways. Regional folding and faulting trends northeast-southwest but local folding and fractures could override those macrostructures as flow paths for groundwater.

2.3 SITE DESCRIPTION & ENVIRONMENTAL SETTING:

Location: The Nimham Mountain Mines site primarily consist of an approximately 50-acre parcel in a rural area. The site is located on Gypsy Trail Road approximately 2.5 miles northwest of Carmel, NY.

Site Features: The site is relatively square in shape and slopes down approximately 150 feet in elevation from west to east. A stream/wetland complex runs along the eastern portion of the site from Pine Pond north to south and two addition feeder streams run in to this stream from the west.

Current Zoning and Land Use: The site is owned by the state and the current use of the site is recreational. The site is part of the Nimham Mountain Multiple Use Area and is accessible via a trail head and parking area along Gypsy Trail Road and two trailheads and parking areas provide access from the west along Mt. Nimham Court.

Past Use of the Site: Historical records indicate that the area in and around the site was used for arsenic mining in the late 19th and early 20th centuries. The Site Characterization identified several surface features on the site that are indicative of historic mining activities.

3.0 Summary of Previous Investigations

Starting in March 2017, two rounds of field investigations were conducted by NYSDEC. The Initial Site investigation (ISI) included XRF soil analysis and laboratory analysis of soil, sediment, and surface water samples. Proper procedures were taken to record chain of custody and ensure that quality control and quality assurance measures were followed to the standards set by DER-10-2.1 for laboratory analytical samples. Results of the ISI are reported in the Initial Site Investigation Report, Nimham Mountain Mines Site, NYSDEC, June 2017.

X-ray fluorescence (XRF) analysis was used during this and subsequent investigations as a screening procedure, although confirmatory laboratory correlation is as high as 99% for arsenic as per the ISI Report. XRF spectroscopy is an analytical technique that exposes a solid sample to an x-ray source causing the sample to emit characteristic x-rays and allowing quantitative elemental analysis by counting the number of x-rays at a given wavelength. In the aforementioned investigations, DER used a Niton® XL3t GOLDD+ analyzer. Quality control samples were taken for lab analysis to determine accuracy. Geographic Information Systems (GIS) was used as an additional analysis tool by adding geospatial context to environmental data and assist in determination of the extent of contamination.

3.1 INITIAL SITE VISIT

DER and DLF conducted an initial site reconnaissance on March 9, 2017. The purpose of the site visit was to locate features visible from the ground surface that were indicative of mining and to confirm the presence of elevated levels of arsenic at the site. During the initial reconnaissance five surface features were identified. These surface features included the entrance to one mine shaft (Mine 1) and four exploratory pit areas (Pit 2, Pit 3, Pit 4, Pit 5). Observed mining features are shown on Figure 2. In-situ XRF screening was performed at approximately 20 locations. Almost all locations exceeded the residential soil cleanup objective (SCO) for arsenic of 16 part per million (ppm) with a maximum detection of 700 ppm near Mine 1. Snowfall limited the amount of reconnaissance and analysis that could be completed on this date. Based on this initial visit, it was determined a subsequent field effort was needed to adequately characterize the site.

3.2 PSA SITE VISIT

DER conducted a PSA during a site visit on April 11 and April 12, 2017. During this site characterization, a site reconnaissance was performed to relocate areas previously identified and to identify any additional areas of the site indicative of mining activities at the surface. XRF surface soils screening for metals was conducted generally in the areas where there was evidence of historical mining operations. Laboratory analytical surface soil samples were collected at several screening locations to confirm XRF results. Laboratory analytical sediment and surface water samples were collected to determine if impacts from mining activities in the surface soil had migrated into sediment and surface water running through the site.

3.2.1 ISI SITE RECONNAISSANCE AND SITE MAPPING

As part of the site reconnaissance surface features were identified within the site parcel that were indicative of historic mining. The locations of surface features were recorded with a GPS Trimble. The locations of these surface features are shown on Figure 2 and in Photographs in Appendix A.

The most prominent feature identified was a mine shaft near the parcel's access point off of Gypsy Trail Road denoted as "Mine 1". Based on historical records this mine shaft is reported to have a 100 ft sub-vertical shaft. The mine entrance is flooded, so it is not possible to access the mine and verify its length.

Three large pits approximately 25 feet in diameter and 10 feet in depth were identified approximately 1,000 feet southwest of "Mine 1". These pits are shown on Figure 2 as "Pit 2", "Pit 3", and "Pit 4". "Pit 3" consists of two pits that are about the same size. Two smaller pits approximately 10 feet in diameter were encountered closer to Mine 1. These pits are denoted as "Pit 6" and "Pit 8" on Figure 2. Two additional incursions were observed on the eastern side of the site parcel. These incursions are denoted as "Pit 5" and "Pit 7" on Figure 2. These hillside incursions are pits dug into a hillside approximately 30 feet in length and 30

feet in depth. Pits 2 through 8 likely originate from exploratory mining during the historical use of the site.

Several tailings piles were encountered during the site reconnaissance. Tailings piles consisted of waste rocks discarded near mining surface features during the mining process. Most of these tailings rocks were between 4 and 12 inches in diameter. Distinct tailings piles were observed near Mine 1, Pit 2, Pit 3, Pit 4, and Pit 5. The tailings pile adjacent to Mine 1 is comparatively small given the reported size of the shaft, and may indicate tailings were removed or placed elsewhere. The tailings piles adjacent to exploratory pits reflect the amount of material removed from these pits. XRF screening of tailing piles revealed that only the tailing around Pit 3 and Pit 4 contained arsenic levels indicative of the arsenic containing mineral being mined at the site. Due to this high concentration observance (over 10,000 ppm arsenic in some samples), the coordinates of these two tailing piles were logged with a GPS Trimble and are shown on Figure 2.

Other site features not directly related to historic mining operations were also noted during the site reconnaissance and shown on Figure 2. Three ditch features that appeared to be man-made were observed in various locations in the site parcel. The locations of the drainage ditches were recorded as linear features with a Trimble GPS. One of these ditches appeared to run away from hillside incursion Pit 5, while the other two drainage ditches had no observable connections to existent mining features. Three streams were observed during site reconnaissance within the site parcel. The location of these streams was incorporated into Figure 2 based on aerial photography. A hiking trail system was observed during site reconnaissance as the primary access to historic mining areas. The path of this trail system within the site parcel was documented as a linear figure with the GPS Trimble and is shown on Figure 2.

3.2.2 ISI XRF SURFACE SOIL SCREENING

As part of the site characterization, DER sampled 121 surface soils points (SS-2017-001 through SS-2017-121) in-situ with a Thermo XRF Analyzer. Sampling locations were generally selected in an around site features identified in the site reconnaissance as described in Section 3.2.1. Sampling was conducted by manually digging soil from a sampling point with a shovel to a depth of approximately 6 inches and then taking and in-situ XRF reading for approximately 20 seconds of mineral soil below the vegetative layer within the 2-6" depth interval. The location of all XRF surface soil screening points were recorded with a GPS Trimble and are shown on Figure 5.

In some cases, while attempting to sample surface soil in close proximity to the observed mine and pits, primarily mine tailings were encountered. In these cases the surface soil location as denoted to include (spoils) on Table 1 and Figure 5a.

3.2.3 ISI SURFACE SOIL SAMPLING

Eleven XRF sampling locations were selected for surface soil sampling to verify XRF concentrations. The selection of locations was generally random, however a range of arsenic concentrations from lower to higher was sought to evaluate the effectiveness of the XRF at

detecting arsenic at lower and higher concentrations. Figure 6 Tables 2 show the locations where lab analytical soil samples were collected. Laboratory analytical surface soil samples were analyzed for RCRA metals.

3.2.4 ISI SEDIMENT AND SURFACE WATER SAMPLING

As shown on Figure 7 two streams run from west to east across the site parcel and enter into a slightly larger stream that runs from north to south. Sediment and surface water samples were collected during the site characterization from seven locations (SED/SW-2017-02 through SED-2017-08) within these streams. Sediment and surface water samples were collected to determine if elevated historic mining activities and arsenic concentrations in surface soil were impacting sediment and surface water.

Just below the Mine 1 entrance lies a small surface water feature (tributary) that appears to emanate from the mine. A surface water and sediment sample was taken from this water body as well (SED/SW-2017-01).

Surface water and sediment samples were analyzed for RCRA metals and are shown on Tables 4 and 5.

3.2.5 ADDITIONAL SEDIMENT & SURFACE WATER SAMPLING

In November 2018 sediments and co-located surface water sampling was conducted by NYSDEC staff in order to delineate impacts in and around the site, particularly in the downstream direction. The purpose was to document the extent of impacts, focusing on whether impacts have reached the West Branch Reservoir, south of the MUA, which is a part of the New York City municipal water supply system. In addition, upstream samples were collected north of the MUA at Pine Pond with attention paid to the swimming beach area at the Gipsy Trail Club to determine if there is recreational risk of exposure to arsenic in sediment. Sediment samples were collected via trowel where accessible, and via ponar sampler in deeper water. Samples were analyzed for Metals and Mercury via EPA Method SW6010C and SW7470A, respectively. QA/QC samples were also collected, and only arsenic impacts are discussed in this summary. Sample locations are shown on Figures 8 & 9.

No surface water arsenic impacts were detected in any samples collected during this effort. Arsenic impacts in sediments were detected at the site, upgradient (north) from the site at Pine Pond, and downstream at the Pond within Veterans Memorial Park. Results were compared to Class A (lowest risk) sediment guidance values as given in *Screening and Assessment of Contaminated Sediment*, NYSDEC Division of Fish, Wildlife, and Marine Resources; June 2014. The Class A (lowest risk) sediment guidance value for arsenic which is <10 mg/kg.

Pine Pond Results (FIGURE 8): Three samples associated with Pine Pond were collected upgradient (north) from the MUA. Two samples were collected from the swimming/beach area owned by the Gipsy Trail Club. Again, arsenic was not detected in the surface water, while the swimming area sediments were 2.2 mg/kg and 2.4 mg/kg, below the Class A arsenic guidance value of 10 mg/kg. A third sample was collected from the channel outlet south of Pine Pond, immediately before the channel is directed underneath Gipsy Trail Road via a culvert. The channel flows into the MUA forming the wetland complex/unnamed tributary located on the eastern portion of the MUA. This sample contained 12.1 mg/kg of arsenic in the sediments, indicating that contaminated sediments are coming onto the site from the wetland complex associated with Pine Pond. It should be noted that this area receives drainage from the topographically higher NPL Arsenic Mine (and Second Mine entrance and spoils located on private property) site as it flows over residential properties on the east side of Gipsy Trail road and is received by the Pine Pond wetland and channel.

MUA Results (Figure 8): One sample was collected from the area just south of Mt. Nimham Court, directly across from a culvert which receives overland water from properties located in the EPA NPL site on the north side of Mt. Nimham Court. This sample, collected from a wet depression north of, and higher in elevation than Mine #1, had an arsenic concentration of 32.6 mg/kg, above the Class A guidance value of <10 mg/kg. It has been observed that soils in and around this area are impacted from overland water flow presumably carrying sediments contaminated with arsenic. This area was addressed by an IRM action and will be discussed further below.

Veterans Memorial Park Results (FIGURE 9): Veterans Memorial Park is located 1.25 miles south of the MUA along Gipsy Trail Road. Within the park is a pond, created by damming the

wetland/stream running from Pine Pond and through the MUA. There are two dams, the 'old dam' which is breached and is slightly north of the functioning 'new dam.' The pond is only 0.5 mile along the stream from the MUA as the crow flies. The pond in Veterans Memorial Park is used for recreational fishing (children only) and swimming. Swimming is allowed only in the beach area which is made up with imported sand. Nine co-located sediment and surface water samples were collected from the pond. Again, arsenic was not detected in any of the surface water samples. Eight of the nine sediment samples had detections of arsenic. Three of the sediment samples were collected adjacent to the beach area, one of which did not detect arsenic, and the other two were very low (1.3 mg/kg and 0.96 mg/kg). The highest arsenic detection, 8.8 mg is closest to the head of the pond, at a fishing dock. The end of the fishing dock was slightly lower in arsenic concentration at 5.4 mg/kg. The four sediment sample results at the 'old' and 'new' dams are comparable, from 3.8 mg/kg arsenic to 5.8 mg/kg arsenic. Because all the samples in Veteran's Pond were well below the Class A sediment guidance value, a second phase to collect sediments and surface water south of Veterans Memorial Park in the direction of the West Branch Reservoir was deemed unnecessary.

3.2.6 SITE-SPECIFIC ARSENIC BACKGROUND VALUE DETERMINATION

In 2017 and 2018 a surface soil background study was conducted by NYSDEC staff and results were shared with USEPA. At the time, USEPA was still working under emergency authorization on the adjacent site eventually listed on the NPL. USEPA analyzed the provided background data which was collected from Ten total areas (Figure 10) selected around the MUA for this purpose, and issued the *Development of statistically-defensible background values for arsenic in surface soils, arsenic mines background determination, SERAS-106 Work Order #94*, by Leidos-SERAS for USEPA, dated July 23, 2018. SERAS stands for Scientific, Engineering, Response, and Analytical Services. The report calculated four background threshold values (BTVs) using gamma and lognormal data population distributions. Two BTVs used all nine areas, and two BTVs used only eight areas, eliminating BKGD Area 2 because it appeared to be part of a different statistical and environmental population than the other areas. The most conservative (or lowest) BTV was calculated using a gamma distribution and eliminated BKGD Area 2. As of the issuance of this document, USEPA has verbally adopted this BTV, 123.9 mg/kg, as a site-specific background concentration of arsenic in soils, and it is anticipated that the Remedial Investigation and/or Feasibility Study for OU2 (the full remedial site) will officially adopt this background value for use in determining remedial objectives and actions.

3.2.7 ADDITIONAL TRAIL SAMPLING

In May 2019, immediately after first trail capping field effort was being performed, NYSDEC staff collected surface soils to be sampled *ex situ* using XRF. Twenty-six (26) Samples were collected starting from the end of the initially placed trail cap during field effort #1, to the end of the trail at Mt. Nimham Court and is depicted on FIGURE 11. The top two inches (approximate) of soils were bagged after removing all surface organic matter. Samples were then brought to NYSDEC's lab where larger gravel was removed to the extent possible, and analyzed using the XRF positioned in its stand. The purpose of this task was not only to map the trail using GPS, but also to gather surface soil data to determine if further trail capping is necessary. The average result along the trail was 24.8 mg/kg arsenic, which is above the 6 NYCRR Part 375 Soil Cleanup Objective of 16 mg/kg for all uses and protection of groundwater,

and 13 mg/kg for protection of ecological resources. Therefore, to reduce risk and exposures to arsenic by users of the trail at the site, it was determined that capping the entire trail was necessary. In addition, all other trails beside the main, capped trail in the ~50 acre site/area of concern, were closed.

4.0 Summary of IRM Actions

Since, and in response to the initial findings, three separate field efforts occurred at this site with the shared goal to limit exposures to contaminants by people using the MUA recreationally. Combined, these efforts are considered emergency actions or an Interim Remedial Measure (IRM), which is the subject of this summary report.

Field Effort #1: April – May 2019, NYSDEC contracted with standby I&R contractor, Precision Environmental Services, Inc., to cap the trail with imported, clean material. A temporary stream crossing/wetland buffer permit was issued, A 6 foot-wide geotextile was laid over centerline of trail and covered with Item #4/Crusher Run (compact, crushed stone) from Peckham Quarry. The material was already owned by DEC Division of Operations and staged at a nearby DEC facility (parking lot and former ranger station/house located just off Gypsy Trail Road). A skid steer was used to load material at the Gypsy Trail roadside staging area at the trailhead into a tracked concrete buggy to transport and place stone by hand and tamped with a plate compactor. With the limited funding (\$15,000) for this first effort, the trail was only capped to the second water crossing from the Gypsy Trail Rd trailhead, as depicted in FIGURE 12.

Field Effort #2: August 2019 – October 2019, NYSDEC contracted with standby I&R contractor Aztech Environmental Technologies (LaBella) to continue the IRM actions at Nimham Arsenic Mine site. Several actions occurred during this phase including completion of nearly one mile of trail capping from the end of Field Effort #1's trail cap to the trailhead on Mt. Nimham Court, closing superfluous trails and trails through high exposure areas, hanging signage, and installing appropriate drainage and/or water diversion structures where necessary. A stream crossing bridge which serviced a closed trail adjacent to the pit mines was also dismantled and removed. Prior to the start of field activities Fact Sheets (Appendix B) were issued in May 2018 and April 2019. Trail closures which were made in coordination with a NYSDEC Forester, and signage was hung to not only indicate trail closures, but also to warn of exposure risks. See images in Appendix A.

The trail was capped by laying 6-foot wide geotextile over centerline of trail and covered with a minimum of 6 inches of Item #4 (crusher run) which was then tamped using a vibratory plate compactor. Again, a skid steer loader at the trailhead staging areas (one along Gypsy Trail Road, and one at a parking area trailhead along Mt. Nimham Court) and a concrete tracked wheelbarrow were used to transport and place material to cap the trail. Rubber belt diverters were installed in high sloped areas as well as open top side culverts along trail (PVC pipe with large open slots to catch debris and water) to redirect overland water flow and to minimize erosion.

Field Effort #3: In January 2021 NYSDEC requested Aztech inspect the trail and provide recommendations on repairs and additional work in advance of deployment of Phase 3. Aztech

visited the site and discussed recommendations with NYSDEC in April 2021. With NYSDEC's authorization, Aztech proceeded to complete four separate IRM tasks at the site between June 7 and July 1, 2021, detailed below.

Pit Mine Filling: Pit Mines and their associated and adjacent spoils piles at the site were cited as a source of contamination and a physical hazard. A temporary access route was created on Nimham Court Road to allow for mobilization of an excavator and other small equipment into the pit mine area. The route was plotted with GPS and is presented on the attached Figure 12. NYSDEC's DLF requested the temporary road be returned to as natural a state as possible when efforts were completed in order to discourage users from mistaking it for a trail. Crane mats were used at an initial water crossing along the temporary road and again at a second water crossing near the pit mine locations. A Kobelco 140 excavator was advanced into the woods and removed trees as needed to allow for access. The pit mines were backfilled to the surface and blending with surrounding soils. Backfill material consisted of spoils piles, rock and vegetation that had grown into the spoil or around the edge of the mine. The backfill material was mechanically compacted with the excavator to the extent possible while backfilling. Once backfilling was completed, the former mine entrances were indistinguishable from the surrounding forest. Following demobilization of heavy equipment from the woods, the crane mats were removed and the access trail was covered with downed trees and blended to match the surrounding area in an effort to disguise the trail and discourage people from using the access. After backfilling, in Situ XRF analyses were performed in the pit mine area of soil disturbance to document what remained at the surface and shown on FIGURE 13

Fence Installation: Disturbed soils around the former pit mines were protected with temporary fencing. These soils are historically arsenic rich and present a potential risk to the public. The fencing will restrict access to this area until natural cover can accumulate. The fence utilized consisted of 6' tall Fastlock woven wire fence. The fence supports consisted of heavy gauge steel T-posts and were installed to approximate 3 to 4 feet below ground surface. One (1) gate approximately 3 feet wide was installed at each pit mine location. The gate was secured using steel cable and a combination lock. See photos of the fencing in Appendix A.

Swale Installation: To address impacts from sediments laid by water draining from the NPL site onto the MUA, a swale was installed to channelize the water and direct it to an intermittent stream which runs into the tributary near Mine #1. The drainage culvert extending from 16 Mt. Nimham Court Road was previously damaged and the downstream portion of the pipe was buried with soil, preventing proper drainage. 16 Mt. Nimham Court is adjacent to the second mine entrance and associated spoils located on private property, and is currently located on the USEPA NPL/Superfund site. Aztech used an excavator to expose the downstream portion of the culvert and cleaned debris from the exposed portion of pipe. A 10-foot extension of 12-inch diameter culvert pipe was added to the exposed pipe. The extension will prevent future damage to the pipe during plowing events. Additionally, a swale approximately 2-foot deep and 2-foot wide was excavated from the outlet of the culvert and extended approximately 60-feet, sloping downward, to a native creek bed. This channelized extension of the swale to the native creek bed reduces contaminated water from spreading out across a large surface area and instead diverts the contamination, reducing areal impacts. The swale was lined with non-woven geotextile fabric and covered with light stone fill (rip-rap) The fill consisted of 4 to 6-inch stone from Peckham industries, Putnam quarry. See photos of the swale in Appendix A.

Trail Repair and Maintenance: Following all other site work, the entire trail was inspected and repaired as needed. An additional layer of cover material was added to the majority of the trail. A total of 42.06 tons of item #4 material from DOT-approved Peckham Industries, Putnam Quarry, were placed. This was the same material used during the second phase of trail capping. In general, the trail was in very good condition. Extra material was placed at areas where the trail was most impacted from erosion, weather and traffic, typically at trail bends and slopes. All placed material was compacted using a plate tamper. The previously installed open top culverts were cleared of leaf litter and other debris.

5.0 Interim Site Management

Continued monitoring and maintenance of the implemented IRM actions at the site will be performed by NYSDEC's Division of Lands & Forests (DLF). At least one annual inspection will occur each spring (after snow melt) to determine if repairs are necessary. Maintenance at the site is projected to be unintrusive in nature and performed in-house. Such activities will likely be erosion repairs on the capped trail with clean material obtained by NYSDEC and stockpiled on state property, clearing out and maintenance of culverts and belt deflectors, clearing out of drainage swale, and fencing repairs. All imported material will originate from DOT-approved native sources, or will be sampled per DER-10. Should repairs require intrusive activities, DLF will request assistance from NYSDEC's Division of Environmental Remediation (DER). Work will be controlled by an Excavation Work Plan. A blank example of an Excavation work plan is provided to show the processes that need to be followed.

6.0 Conclusions

Contamination, derived from local, naturally occurring mineral deposits, as well as historic mining activities, is present in and around the Nimham Arsenic Mine site. Several investigations and an emergency action or IRM was performed in three phases at the site in order to reduce recreational users' contaminant exposures to arsenic-containing soils. Monitoring and maintenance of the actions at the site will be performed at least annually by NYSDEC.