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REMEDIAL INVESTIGATION SUMMARY REPORT AND INTERIM REMEDIAL MEASURE (IRM) WORK PLAN FOR THE ELLISON BRONZE COMPANY SITE

6-26-92

Prepared For:

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June 26, 1992

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REMEDIAL INVESTIGATION SUMMARY REPORT AND INTERIM REMEDIAL MEASURE (IRM) WORK PLAN FOR THE ELLISON BRONZE COMPANY SITE

1.0 INTRODUCTION

1.1 Background

The Ellison Bronze Company Site is located at 125 West Main Street, in Falconer, Chautauqua County, New York. A Site Location Plan is presented as Drawing No. 1 in Appendix A. The site has been developed and used for industrial purposes since the 1880's. The Ellison Bronze Company has been in business at the site since 1912.

Initially, the Ellison Bronze Company operated as a foundry, however, in 1932 the company changed their focus to commercial door manufacturing, which continues today. As part of the door manufacturing operations at the Ellison Bronze Company facility, a small foundry has been used continually since 1932.

The Ellison Bronze Site has been characterized by the New York State Department of Environmental Conservation (NYSDEC) as posing a potential threat to public health and the environment. The NYSDEC has made this determination based on contaminated material from previous foundry operations that have been found on the site. As a result, the NYSDEC has required that a focused Remedial Investigation (RI) be completed to determine the nature and extent of suspect contamination.

Empire Soils Investigations, Inc. (ESI) completed the remedial investigation field work during February and March 1992. The results of the Remedial Investigation will be used to identify potential remedial alternatives associated with environmental contamination found on-site. Selection of the most appropriate remedial alternative will be based on information gathered during the Remedial Investigation phase of the study. Subsequent remediation and post remediation monitoring will be completed as specified in the Interim Remedial Measure (IRM) scope of work (Section 6) and the Final Engineering Report (Section 9), respectively.

1.2 Purpose and Scope

Based on the results of the Remedial Investigation and ongoing discussions with the NYSDEC, contaminated soil associated with the foundry operations will require an Interim Remedial Measure to remove the contaminant source material from the site. The Interim Remedial Measure (IRM) will require a Work Plan which will summarize the remedial investigations completed at the Ellison Bronze Site and the details of the Interim Remedial Measure selected.

In addition, the Work Plan discusses potential conditions that may impact the health and safety of on-site workers and quality control procedures which will ensure the collection of representative and meaningful data.

The specific objectives of the IRM Work Plan are to:

- Summarize the site characteristics including the nature and extent of contamination as determined from the Remedial Investigation;
- Briefly identify potential Interim Remedial Measures which would address the on-site contamination;
- Prepare a preliminary cost estimate for each IRM option identified;
- Recommend the most suitable IRM alternative based on the current knowledge of the site;
- Discuss in detail the work to be completed for the proposed IRM, and;
- Describe the proposed sample verification plan, site restoration and post IRM monitoring.

Limitations to the Work Plan are presented in Appendix B of this report.

2.0 SITE CONDITIONS

2.1 Physical Setting

The subject property is located at 125 West Main Street in Falconer, New York. Based on the Chatauqua County tax maps, the site covers approximately 2.6 acres. The Ellison Bronze Company property is bound on the northwest by West Main Street and on the southeast by the Chadakoin River. Moon Brook is directly northeast of the site and Davidson's Restaurant is located immediately to the southwest. The specific features of the subject site are shown on Drawing No. 2 in Appendix A.

Approximately two thirds of the property has been developed into a commercial door manufacturing plant and parking areas. The Ellison Bronze plant and offices cover approximately 45,000 square feet on the north central part of the site. An asphalt covered parking area is located on the north end of the site measuring approximate 60 by 120 feet. On the southeast side of the Ellison Bronze plant, an asphalt covered employee parking area was constructed in the early 1980's. The employee parking area is irregular in shape and covers approximately 24,000 square feet. An asphalt covered driveway and loading dock area (approximately 16,500 square feet) is located on the west side of the Ellison Bronze plant.

The topography along the southeast and northeast property lines slopes downward towards the Chadakoin River and Moon Brook. Based on the information gathered during the Remedial Investigation completed at the site, the ground water gradient beneath the site is generally in an east/northeast direction towards Moon Brook/Chadakoin River.

A grass covered area is located on the south end of the subject site. The grassy area is bound by the employee parking area (northeast), West Everett Street (northwest), Phetteplace Street (southwest) and the Chadakoin River (southeast). The approximate areal extent of the grass covered portion of the site is 15,000 square feet. A strip of land oriented between the employee parking area and the Chadakoin River and Moon Brook occupies approximately 13,000 square feet.

Foundry wastes have historically been dumped outside the plant in the vicinity of the foundry which is on the north/northeast side of the plant. During the construction of the employee parking area, the banks of Moon Brook were covered with fill material used as part of the pavement structure. The depth of this cover material is generally between 0 and 2-feet.

Currently, foundry wastes are separated into two separate wastes consisting of grinding dust and foundry sand. The foundry sands are placed into a roll-off bin located on the employee parking area for off-site disposal. The grinding dust is collected and recycled.

A wooden chemical storage shed (approximately 10-feet by 10-feet) was located on the northeast end of the grass covered area. Various chemicals were stored in this shed which were used as part of the manufacturing and maintenance operations at the plant. The chemicals known to have been stored within the shed include naptha, lacquer thinner and acetone.

Two utility related features were identified on the northeast end of the employee parking area. A dry transformer is located approximately 50-feet southeast of the Ellison Bronze plant. An underground electric line extends from the dry transformer to the plant. A natural gas meter and regulator is housed in a concrete block building adjacent to the dry transformer. A sanitary sewer is buried approximately 20-feet from the southeast side of the Ellison Bronze plant and is oriented parallel to the plant. An above ground petroleum (fuel oil) storage tank was formerly located on the exterior of the east end of the plant. The tank was abandoned some time ago (undetermined date) and removed from the site.

A maintenance garage is located on the southwest end of the site along the driveway access to the rear of the plant. Two particle separator systems were also observed on-site. One particle separator was noted on the west end of the site adjacent to the loading dock. A second particle separator system was observed on the exterior of the south end of the plant.

2.2 Site History

Information on site history was obtained from the Chautauqua County Department of Planning and Development, Chautauqua County Clerks Office, Town of Ellicott Historian, aerial photographs and inspection of available historical maps. The discussion below is based solely on information obtained from these sources.

The Town of Ellicott Historian, City of Jamestown Assessor and the Chautauqua County Department of Planning and Development informed ESI that the subject property has been developed since the 1880's. According to Chris Lyon, the Town of Ellicott Historian, the property was vacant prior to 1881 when residential construction was first reported there. During the 1880's, a blacksmith shop was in business directly adjacent to Moon Brook. Between 1890 and 1912, a towel factory was in operation before the Ellison Bronze Company took over the factory in 1912. The Ellison Bronze Company was a foundry initially, however, in 1932 the company changed their focus to commercial door manufacturing which continues today.

A summary of property ownership since 1921 is shown in Table 2.1. The Ellison Bronze Company became a subsidiary of the Dowcraft Corporation in 1969. In 1986, Ellison Bronze secured a loan from the Chautauqua County Industrial Development Agency (CCIDA). As a result of the property lien the Chautauqua County Industrial Development Agency retains, the assessors office lists the CCIDA as the current owner of the property.

The main environmental concerns identified from the historical research include the potential impact of foundry wastes on the property and the presence of a former chemical storage shed outside the plant.

TABLE 2.1		
PROPERTY TRANSFER OF THE ELLISON BRONZE COMPANY SINCE 1921		
Listed Seller	Listed Owner	Date
Unknown	Ellison Bronze Company	1/10/1921
Ellison Bronze Company	Dowcraft Corporation	12/31/1969
Dowcraft Corporation	Robert and Jane Kope	5/2/1973
Robert and Jane Kope	Ellison Bronze Company	3/5/1985
Ellison Bronze Company	Chautauqua County Industrial Development Agency	6/30/86

2.3 Site Geology

Information on site geology, surface water hydrology, hydrogeology and meteorology (Sections 2.3, 2.4, 2.5 and 2.6, respectively) was obtained from the United States Geological Survey Bulletin Number 58 entitled "Ground Water Resources of the Jamestown Area, New York; with Emphasis on the Hydrology of the Major Stream Valleys", by Leslie J. Crain (1966).

The geology at the Ellison Bronze Site was evaluated to identify geologic features which may affect the migration of contaminants. Understanding the site geology consisted of determining the geology of both the bedrock and of the unconsolidated overburden including soil deposits. According to the publication entitled "Ground Water Resources of the Jamestown Area, New York with Emphasis on the Hydrogeology of the Major Stream Valleys, "the site is over a portion of the Jamestown Aquifer which supplies drinking water to most residents in the vicinity. Although the site is not located on a recharge area, deltas of the Chadakoin River may recharge the Jamestown Aquifer. The specific rationale for investigating the unconsolidated and bedrock geology includes:

- o Evaluate the effect of the area geology on water bearing units and aquifers;
- o Evaluate the effect of the area geology on the release and movement of contaminants; and,
- o Obtain information on the engineering and geologic aspects of the site for selection of remediation alternatives.

2.3.1 Overburden Soils

The subject site is located near the southwestern edge of the Cassadaga Valley, approximately one (1)-mile west of the intersection of the Cassadaga and Conewango Valleys. Overburden soils in this area are mainly of glacial origin. Overburden thickness in the Jamestown-Falconer Valley areas varies from approximately 200 to 600-feet below ground surface. Overburden thickness on the adjacent hills is typically less than 25-feet. In the area of the subject site, overburden thickness, or depth to bedrock, is estimated to be about 300-feet.

Soil stratigraphy in the valley areas typically consists of layers of sand and/or gravel confined in or under silt and clay units. In the vicinity of the subject site, surficial native soils generally consist of sand or sand and gravel. Dense glacial till material is the predominant soil type in the nearby hills.

2.3.2 Bedrock

The uppermost bedrock formations that lie beneath the overburden soils in the Jamestown - Falconer area consist predominantly of gray shales with some interbedded siltstones and a few beds of sandstone and conglomerate. This sequence of late Devonian-age rocks (approximately 350 million years old) is about 2,000-feet thick. The uppermost bedrock units dip gently southward at a rate of about 50-feet per mile.

2.4 Surface Water Hydrology

Surface water hydrology in the Jamestown-Falconer area is controlled by the marked surficial topography of the area, with valleys flanked by steep hillsides. Precipitation on the hills does not readily infiltrate into the overburden till soils due to their relatively low permeability, and therefore mostly flows overland toward the valleys. Since the valley areas typically contain higher permeability, granular soils, it is in the valleys where most infiltration to the ground water table occurs. Surface runoff not locally infiltrating the ground water table enters the creek and river systems at the valley bottoms.

In the area of the subject site, the Chadakoin River flows generally eastward and joins Cassadaga Creek. Cassadaga Creek flows generally southeastward into Conewango Creek, which flows generally southward and into the Allegheny River.

2.5 Hydrogeology

The main hydrogeologic feature in the Jamestown/Falconer area is the prolific Jamestown Aquifer, which reportedly can produce up to 1,000 gallons per minute (gpm) in certain areas. The Jamestown Aquifer is contained within the deep valley fill in the Cassadaga and Conewango Valleys.

Due to confinement by overlying silts and clays, the Jamestown Aquifer often exhibits artesian characteristics. Multiple water-bearing units can often be encountered at a given valley location due to the interbedding of coarse-grained soils (sands and gravels) within fine-grained soils (silts and clays). Note that areas underlain by artesian aquifers often exhibit negative vertical hydraulic gradients (i.e. upward gradients).

According to the available information, the subject site appears to overlie an area of potentially prolific artesian ground water production from relatively shallow depths. For example two nearby wells reportedly produce 450-500 gpm from a gravel unit less than 50-feet below the ground surface.

Ground water production from bedrock aquifers is of relatively low significance compared to the Jamestown Aquifer or similar valley aquifers. Domestic wells in the surrounding hills which penetrate bedrock typically produce less than a few gallons per minute.

2.6 Meteorology

The climate of the region is of the humid-continental type, characterized by long cold winters and short warm summers. The U.S. Weather Bureau station in the Falconer area is the only long-term weather station in the project area. Records have been collected there continuously, with the exception of a few months, since 1896. Mean monthly temperature, total precipitation, and snowfall in the Jamestown area are shown in Figure 2.1.

The average annual precipitation in the Falconer area is 42.65 inches and the mean annual air temperature is 49.1°F (Fahrenheit) (U.S. Weather Bureau, 1960). Precipitation is distributed quite evenly throughout the year with the exception of slightly lower amounts in February and August.

Snowfall comprises a large percentage of the annual precipitation. Mean annual snowfall is 92.6 inches in the Falconer area. Snowfall often occurs irregularly over the region. The northern part of the area lies within the Lake Erie snow belt and storms moving out of the Lake Erie basin often drop larger amounts of snow on and near the escarpment than they do farther south.

The average length of the growing season in the Falconer area is 144 days. This is somewhat longer than the season in the adjacent uplands.

Precipitation may fall as snow or rain and an entire monthly total may fall during only a few days of the month. If large amounts of rainfall occur over short periods of time, much of the water is lost through overland runoff to the streams because the soil cannot absorb the water as fast as it falls. However, all or nearly all of a drizzle will soak into the ground. If precipitation occurs as snow, it is stored on the surface of the ground and has an opportunity to be absorbed by the soil slowly, if melting is not too rapid.

Due to higher air temperatures, a large part of the precipitation during the summer is lost by evaporation before it can enter the ground. Conversely, during the fall, winter, and spring, evaporation may return little of the precipitation to the atmosphere, thereby allowing more water to infiltrate. Because the growth of vegetation reaches its peak during the summer, most of the water absorbed by the ground during this period is intercepted by the soil zone and is used by plants. Large amounts of water are required for plant growth, and during periods when rainfall is scarce, water stored in the soil zone is depleted. Thus, the precipitation that infiltrates into the ground during the summer is used to replenish this soil moisture and little, if any, percolates through the zone of aeration to the water table. The first killing frost in the fall stops the use of this water by plants.

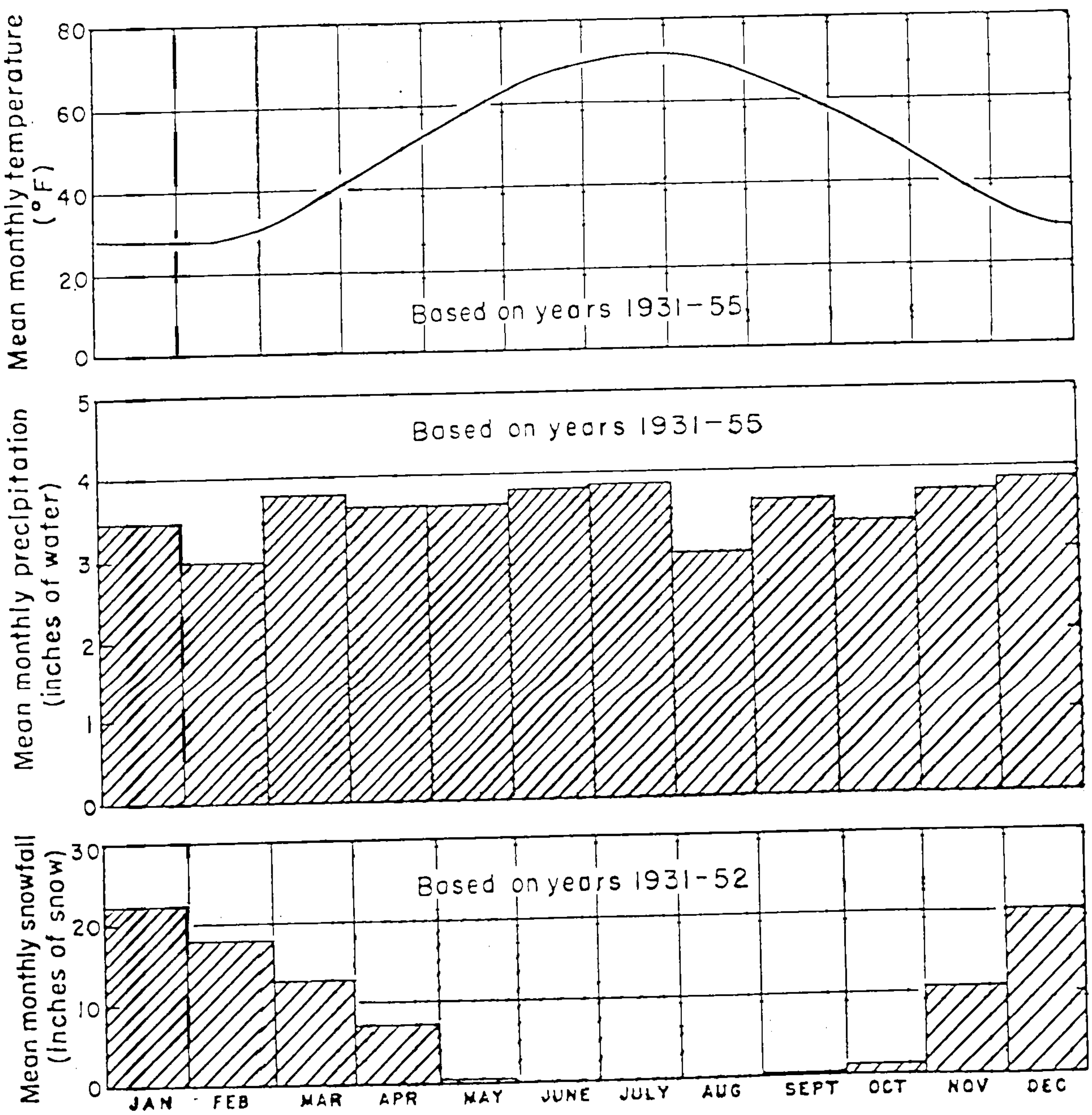

Figure 2.1

Mean Monthly Temperature, Precipitation and Snowfall Data for the Falconer Area

3.0 PREVIOUS ENVIRONMENTAL INVESTIGATIONS COMPLETED AT THE ELLISON BRONZE SITE

3.1 Background

Empire Soils Investigations, Inc. (ESI) was contracted by the Dowcraft Corporation to complete an Environmental Investigation including Phase I and Phase II Environmental Site Assessments for the Ellison Bronze Site. The Phase I and Phase II Environmental Site Assessments were completed in October and December of 1990.

Foundry sands were observed along the banks of Moon Brook during the Phase I Environmental Site Assessment. In addition, staining of the wooden floor of the chemical storage shed was also noticed during the Phase I Environmental Site Assessment.

The discovery of foundry sands prompted the excavation of seven exploratory test pits as part of the subsequent Phase II Investigations. Significant quantities of foundry wastes were observed beneath the ground surface in five of the seven test pits. Refer to Drawing No. 2 in Appendix A for test pit locations.

It should be noted that the chemical storage shed has been demolished since the Phase I Environmental Site Assessment was completed on the site. Soil samples were taken (Phase II Sampling) in both the foundry waste disposal area and beneath the former chemical storage shed to better define the environmental condition of the site. The soil sample locations are shown on Drawing No. 2 in Appendix A.

3.2 Surface Soil Sampling

ESI collected one surface soil sample (0 to 6-inches below the surface) from soils directly below the chemical storage shed on November 14, 1990. The surface soil sample was analyzed for United States Environmental Protection Agency (USEPA) Target Compound List (TCL) volatiles. The selection of the volatile compounds for analysis was based on the types of chemicals noted to be present within the former chemical storage shed during the site reconnaissance on September 12, 1990.

Toluene was the only TCL volatile compound detected in the surface soil sample. Toluene was present at a concentration of 1,000 mg/Kg (parts per million). A maximum concentration standard of 28 mg/Kg has been established by the USEPA for land disposal of toluene contaminated soils (Federal Register, June 1, 1990). It should be noted that the chemical storage shed area will be identified as Area B throughout this report.

3.3 Test Pit Excavation and Subsurface Soil Sampling

ESI monitored the excavation of seven test pits (TP-1 through TP-7) along Moon Brook on October 25, 1990. The test pit program was completed to observe subsurface conditions and to collect subsurface soil samples. The test pits were located in the vicinity of where foundry sands were observed on the surface during the Phase I Environmental Site Assessment site reconnaissance.

Foundry wastes were noted to be present in test pits TP-1 through TP-5, however, there was no visibly contaminated material in test pits TP-6 and TP-7. Five representative subsurface soil samples were collected from test pits TP-1 through TP-5. The approximate test pit locations and ground surface elevations of the foundry sand disposal area are presented on Drawing No. 3 in Appendix A. Note that the foundry sand disposal area will be identified as Area A throughout this report.

The initial parameters selected for chemical testing were lead and total phenolics based on the historical use of these compounds for foundry operations. The lead and phenolics results for the subsurface soil samples are presented in Table 3.1.

[redacted]

TABLE 3.1		
ANALYTICAL TEST RESULTS FOR SUBSURFACE SOIL SAMPLES		
Sample Location	Concentration (mg/kg)	
	Lead[1]	Phenolics[2]
TP-1	3,740	17.3
TP-2	2,850	3.58
TP-3	156	1.94
TP-4	919	3.99
TP-5	343	3.85

1 -- The average NYS range for lead in soils was reported to be 1-12.5 mg/Kg (NYSDEC). The average crustal concentration of lead is 16 mg/Kg.

2 -- Soils contaminated with phenol above 6.2 mg/Kg (USEPA) require pretreatment prior to landfilling.

Based on the elevated lead concentrations encountered, a Toxicity Characteristic Leachate Procedure (TCLP) extraction test for metals was also completed on samples TP-1 through TP-5. The TCLP extraction test provides a basis for determining whether the material is considered a hazardous waste based on the leachability of contaminants.

The analytical test results for the TCLP extraction test for metals are presented in Table 3.2. The detectable metals concentrations have been compared to the USEPA hazardous waste criteria established for the leachate extract generated from the soil samples.

The TCLP lead concentrations found in the leachate ranged from 99.1 mg/L (TP-1) to 3.72 mg/L (TP-5). Samples TP-1, TP-2 and TP-4 were tested to be hazardous waste since these samples exhibited lead concentrations above the USEPA criteria of 5.0 mg/L. Samples TP-3 and TP-5 are not considered a hazardous waste based on the analytical testing completed.

The copper concentration in the leachate was also tested and ranged from 69.1 to 526 mg/L. No hazardous waste criteria has been established for copper in soils.

TABLE 3.2						
TCLP ANALYTICAL TEST RESULTS FOR SUBSURFACE SOIL SAMPLES						
Parameter	Sample Location and Concentration (mg/L)					EPA Standard for Hazardous Waste Designation (mg/L)
	TP-1	TP-2	TP-3	TP-4	TP-5	
Arsenic	<0.35	<0.35	<0.18	<0.35	<0.35	5.0
Barium	3.09	2.25	2.25	2.08	1.72	100
Cadmium	0.10	<0.05	<0.025	<0.05	<0.005	1.0
Chromium	<0.10	<0.10	<0.05	<0.10	<0.03	5.0
Copper	293	526	78.2	209	69.1	NS
Lead	99.1	32.1	3.79	8.5	3.72	5.0
Mercury	<0.004	<0.004	<0.004	<0.002	<0.002	0.2
Selenium	<0.60	<0.60	<0.30	<0.60	<0.60	1.0
Silver	0.16	0.18	0.05	<0.10	0.03	5.0

NS -- No Standard.

T3.2

3.4 Supplemental Soil Sampling

Two additional soil samples were collected and analyzed to further characterize the soil contamination found on-site. One soil sample was collected from the foundry waste disposal area and one from the soil beneath the former chemical storage shed on December 14, 1990. The soil sample taken from the foundry waste disposal area was taken from approximately 1.5-feet below the ground surface in the area where test pit TP-2 was located. The soil sample collected from beneath the chemical storage shed was excavated from 0 to 6-inches below the ground surface. Each soil sample was analyzed for TCLP volatiles, TCLP semivolatiles, TCLP metals (including zinc and copper), total cyanide, pH, ignitability and reactivity. The additional data was collected to determine the acceptability of the contaminated soils for disposal into hazardous waste landfills, if required.

There were no TCLP volatiles or TCLP semivolatiles detected in either soil sample analyzed. The total and releasable cyanide, releasable sulfide, ignitability, pH and reactivity results are presented in Table 3.3. TCLP metals results including copper and zinc are presented in Table 3.4.

TABLE 3.3

ANALYTICAL TEST RESULTS FOR SUPPLEMENTAL SOIL SAMPLES

Parameter	Units	Sample Location		EPA Standard for Hazardous Waste Designation
		Foundry Sands	Surface Soils	
pH	S.U.	7.98	7.04	pH < 2 or pH > 12.5
Total Cyanide	mg/Kg	1.1	< 1.0	No Standard
Releasable Cyanide	mg/Kg as HCN	< 50	< 50	≥250
Total Releasable Sulfide	mg/Kg as H_2S	< 50	< 50	≥500
Ignitability	°F	> 160	> 160	< 140

TCLP Metals	Sample Location and Concentration (mg/L)		EPA Standard for Hazardous Waste Designation (mg/L)
	Foundry Sands	Surface Soil	
Arsenic	<0.18	<0.035	5.0
Barium	1.96	1.32	100
Cadmium	<0.025	<0.032	1.0
Chromium	<0.07	<0.03	5.0
Copper	429	12.1	NS
Lead	53.7	0.53	5.0
Mercury	<0.0002	<0.002	0.2
Selenium	<0.3	<0.06	1.0
Silver	<0.05	0.01	5.0
Zinc	107	7.06	NS

TABLE 3.4

ANALYTICAL TEST RESULTS FOR SUPPLEMENTAL SOIL SAMPLES[1]

1 -- Analytical testing of the supplemental soil samples did not identify additional characteristics of hazardous wastes other than the original parameters reported.

NS -- No Standard.

The results from the supplemental sampling indicated the soil sample collected from the foundry waste disposal area was considered a hazardous waste since the TCLP extraction test produced a lead concentration in the leachate of 53.7 mg/L. This confirmed the earlier Phase II testing presented in Table 3.2. The USEPA hazardous waste criteria for lead is 5.0 mg/L (TCLP analysis). Although the sample was also high in copper and zinc, no other constituents were detected above the USEPA hazardous waste criteria.

There were no hazardous waste criteria which failed for the supplemental surface soil sample collected from soils below the former chemical storage shed. The sample was not retested for toluene. As a result, ESI could not confirm the presence of toluene in the soil.

4.0 REMEDIAL INVESTIGATION

4.1 General

Empire Soils Investigations, Inc. (ESI) completed a Remedial Investigation (RI) at the Ellison Bronze Site during February and March, 1992. Specific field work and analytical testing included investigations of the surface and subsurface soils, sediments and ground water at the subject site. The methods, procedures and protocols used during the Remedial Investigations are described in this section. In addition, the purpose of the sampling, the sampling locations and the rationale for the analyses selected will be discussed.

Based on the current knowledge of the Ellison Bronze Site there was no surface water sampling included as part of the Remedial Investigation. Moreover, based on the analytical data collected during the Phase II Environmental Site Assessment (12/90) and the Remedial Investigation, there was no indication air emissions from the Ellison Bronze Site should be studied. The limited quantity of volatile contamination in the soils at the former chemical storage shed area was not considered a significant health threat to merit air emissions investigations as part of this study.

The objectives of the sampling and analytical testing of the soil, sediment and ground water were threefold. The first objective was to collect background data from on and near the subject site. The second objective was to complete investigations to verify the nature of contamination and to estimate the horizontal and vertical extent of contamination known to be present at the site. Finally, the third objective was to evaluate whether other regulated compounds are present in the various environmental media at or above state and federal standards.

The majority of the scope of work for the collection of environmental samples was determined with the assistance of the NYSDEC with respect to the number of samples, sample locations and analytical testing parameters. ESI notified the NYSDEC one week prior to initiation of the Remedial Investigation sampling activities. The purpose of this notification was to allow the NYSDEC to observe all work and/or obtain split samples at their discretion.

Based on the results of the Phase II Environmental Site Assessment analytical testing, two separate areas have been identified as contaminated. The foundry waste disposal area and the chemical storage shed area have been designated as Areas A and B, respectively (refer to Drawing Number 4 in Appendix A).

4.2 Soil Sampling and Analysis

4.2.1 Scope of Work

The specific tasks completed by ESI for the soil investigation phase of the Remedial Investigation included the following:

- o Collected six (6) background soil samples for analytical testing.
- o Advanced (27) test borings in Area A.
- o Advanced (5) test borings in Area B.
- o Collected soil samples in Area A for analytical testing.
- o Collected soil samples in Area B for analytical testing.

Sampling locations are shown on the Surface Soil and Sediment Sampling Plan (Drawing No. 5) and Monitoring Well and Test Boring Location Plan (Drawing No. 6) in Appendix A.

4.2.2 Background Soil Sampling and Analytical Testing

Six (6) background soil samples (grab samples) were collected on and adjacent to the Ellison Bronze Site to better define background concentrations of the metals of concern (i.e. lead and copper). The number and location of the background soil samples were determined by ESI with advisement of the NYSDEC. The actual sample locations are shown on Drawing No. 5 in Appendix A. A copy of the analytical test results for the background soil sampling can be found in Appendix D.

Two samples (BS-1 and BS-2) were collected from the grass covered area located on the south end of the site. The remaining four samples were taken from the Davidson's Restaurant property (BS-3), the northwest side of West Main Street (BS-6), PS 20,21,22

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the Village of Falconer property on the northeast side of Moon Brook (BS-5) and the front of the Ellison Bronze Plant along West Main Street (BS-4).

The background soil samples were collected by excavating soil between 0 and 6-inches below the ground surface with a precleaned stainless steel trowel. ESI used commercially precleaned I-Chem bottles for sample collection. All sampling tools were decontaminated between sampling locations. A Chain-of-Custody record was established and maintained on all samples. The soil samples were immediately shipped to Huntingdon Analytical Services, Inc. (HAS) in Middleport, New York for analytical testing. Huntingdon Analytical Services is a New York State Department of Health certified laboratory and a division of ESI.

Each soil sample was analyzed for lead and copper using USEPA Methods 7421 and 6010, respectively. The analytical test results of the background soil samples are presented in Table 4.1.

TABLE 4.1

ANALYTICAL TEST RESULTS FOR BACKGROUND SOIL SAMPLES

Sample Identification	Concentration (mg/Kg)	
	Copper	Lead
BS-1	118	103
BS-2	42.2	223 High
BS-3	358 High	126
BS-4	36.9 Low	27.7 Low
BS-5	91.4	144
BS-6	111	75.2
Average	126.3	116.5
Clean up level	25	Site Background

Pb Avg 116 ppm
Cu Avg 126 ppm
Based soil

Average background concentrations of copper and lead were 126.3 mg/Kg and 116.5 mg/Kg, respectively. Published average concentrations for New York State were reported to be <1-15 mg/Kg for copper and 1-12.5 mg/Kg for lead. However, the reported elevated metals concentrations are probably due to the urban, industrialized region where the Ellison Bronze Site is located.

4.2.3 Test Boring Program Completed in Area A

ESI advanced twenty-seven (27) test borings in Area A, of which nine (9) test borings were advanced in the employee parking lot. These test borings were completed to better define the vertical and horizontal extent of foundry waste contamination and to supplement the subsurface information obtained during excavation of test pits during the Phase II Environmental Site Assessment completed by ESI in December of 1990.

The nine (9) test borings advanced in the area currently used for employee parking were completed to determine if foundry wastes are also present beneath the parking lot. The test boring locations are shown on Drawing No. 6 in Appendix A.

The twenty-seven (27) test borings advanced in Area A were advanced to depths ranging from 4 to 16-feet. Each test boring was advanced using 2.25-inch inside diameter hollow stem augers to facilitate the advancement of split spoons for soil sampling purposes.

Representative soil samples of the overburden were obtained by driving a standard 2-inch outside diameter stainless steel split spoon sampler into the undisturbed material below the auger casing with a 140-pound hammer falling freely a distance of 30-inches (American Society of Testing Materials Method D-1586). The number of blows required to drive the split spoon each 6-inch interval was recorded. Standard Penetration Tests (SPT) conforming to ASTM Method D-1586 were completed as noted on the subsurface logs included in Appendix C.

Continuous split spoon samples were obtained through the entire length of each test boring for visual classification. The split spoons were decontaminated between each test boring using an Alconox soap wash and a distilled water rinse.

Visual descriptions of soils were completed in accordance with ASTM Method D-2488-84, "Standard Practice for Description and Identification of Soils". A general description of how the standard Empire Soils Investigations Subsurface Log is completed is presented in Appendix C along with the boring logs corresponding to each test boring. It should be noted that the on-site Environmental Engineer specifically focused on identifying the presence of foundry waste in the split spoon samples.

4.2.4 Subsurface Conditions (Area A)

Twenty seven (27) test borings were advanced in Area A to determine the extent of fill material and type of natural soils underlying the site. The underlying natural soils consist of brown sands and gravels ranging in grain size from fine to coarse. The depth of fill material ranged between 2-feet (B-24) and 9-feet (B-2) below ground surface. The fill material encountered consisted of soil (either from on-site or off-site) and foundry waste. The foundry waste material observed included foundry sands, grinding dust and other by-products generated from foundry operations such as slag and coal. Table 4.2 summarizes the observations made in the field during the test boring program completed in Area A.

TABLE 4.2

SUMMARY OF INFORMATION GATHERED DURING THE TEST BORING PROGRAM COMPLETED IN AREA A

Test Boring Number	Depth of Fill Material (feet)	Depth of Foundry Sands (feet)	Depth of Black Fill Material (feet)	Depth to Ground Water (feet)
1	0-8	0-8	0	9
2	0-9	0.5-5 5-9	0	9
3	0-8	0.5-2.5 4-6	0	9
4	0-3	0.25-2	2-3	-
5	0-3	0.25-3	0.25-3	-
6	0-4	0.25-4	0.25-4	-
7	0-1.5 5-6	0.25-1.5 5-6	0	7
8	0-5	0-5	0	6-7
9	unknown	2-3	0	7
10	0-7	0.5-4.5 4.5-7	0	7
11	0-3	0.33-3	0.33-3	-
12	0-2.5	0.5-2.5	0	-
13	0-2.5 4.5-6	2-2.5 4.5-6	0	7
14	0-3.5	2-2.5	0.33-2 2.5-3.5	-
15	0-3	0.5-3	0.5-3	-
16	0-3 4.5-6	0.33-3 4.5-5.75	0	7

TABLE 4.2 (Continued)				
SUMMARY OF INFORMATION GATHERED DURING THE TEST BORING PROGRAM COMPLETED IN AREA A				
Test Boring Number	Depth of Fill Material (feet)	Depth of Foundry Sands (feet)	Depth of Black Fill Material (feet)	Depth to Ground Water (feet)
17	0-4	0.5-4	0	7.5
18	0-3	0.5-3	0	-
19	0-3	0	0	-
20	0-7	0	0	7
21	0-3	0	0	6.5
22	0-3	0	0	6
23	0-2.5	0	0	6.5
24	0-2	0	0	6.5

The distribution of foundry sands and grinding dust was variable between test borings, however, some general observations may be made regarding the deposition of foundry waste.

General

- o Deposition of foundry waste decreases as the distance from the Ellison Bronze plant foundry increases;
- o Foundry waste was encountered primarily as a mixed waste consisting of foundry sand, grinding dust, other miscellaneous foundry waste and soil. However, in some areas homogeneous foundry sand seams (layers) were apparent;

Northeast of Parking Area (Banks of Moon Brook)

- o Significant layers of foundry wastes (2 to >8-feet) were observed in test borings advanced along the banks of Moon Brook near the Ellison Bronze plant. This area has been designated as Subarea A1 (refer to Drawing Number 4) and extends from the plant to an undetermined point located between monitoring well ESI-1 and test borings B-7, B-9 and B-10;

- Both homogeneous foundry wastes and foundry wastes mixed with other fill was encountered in the region bound by test borings B-7, B-9, B-12, B-17 and B-20 at varying depths. This region has been designated as Subarea A2.

- Foundry wastes were not encountered in test borings B-21, B-22, B-23 and B-24;

Employee Parking Area

- A limited portion of the parking lot (north corner in the vicinity of B-4) contains a layer of foundry sands less than two feet thick;

- A larger portion of the parking area (north end) contains foundry waste material consisting of a small amount of foundry sands;

- Foundry waste was not encountered in test boring B-19; and

- The northeast end of the employee parking lot has been designated as Subarea A3.

Black foundry waste was identified beneath the asphalt in the employee parking area and extended vertically from beneath the asphalt to the natural soils between 2.5 and 4.0-feet below the ground surface. This black fill material is heterogeneous in nature consisting of black fine grained material (potentially grinding dust) intermixed with foundry sand, slag, coal, cinders, brick, concrete, etc.. The black foundry waste was encountered in test borings B-4, B-5, B-6, B-11, B-14 , B-15 and B-33, however, was not present in test borings B-18 and B-19. The extent of the black foundry waste in the southwest direction was not delineated.

4.2.5 Analytical Testing of Area A Soil Samples

Foundry Waste Sample (Area A)

ESI collected a sample of the foundry waste from test boring B-31 between 3 and 4-feet below the ground surface. The foundry waste sample appeared as a black fine to medium grained material with a slight musty type odor. The sample was analyzed for copper, lead and total phenolics to confirm the chemical characteristics of the foundry waste. The analytical results for the foundry waste sample are presented in Table 4.3. A copy of the analytical test results for the Area A soil sampling can be found in Appendix D.

SAMPLE FROM BORING B-31, 3-4' deep

TABLE 4.3	
ANALYTICAL RESULTS FOR THE FOUNDRY WASTE SAMPLE	
Parameter	Concentration (mg/Kg)
Copper	12,900
Lead[1]	2,980
Total Phenolics	0.30

1 -- A cleanup guideline range of 500-1,000 mg/Kg was selected during a meeting between NYSDEC, NYSDOH, Ellison Bronze and ESI on January 29, 1992.

Concentrations of lead were reported in the foundry waste sample well above the NYSDEC cleanup guideline of 500-1000 mg/Kg. The Table 4.3 results confirms the Phase II Environmental Site Assessment Sampling completed in 1990.

Natural Soil Samples Collected from below the Foundry Waste (Area A)

ESI collected subsurface soil samples for analytical testing during the test boring program completed in Area A. Three soil samples (TB-1, TB-2 and TB-3) were taken from test borings B-12, B-13 and B-16. Each of these soil samples were collected from apparent natural soils beneath a seam of foundry waste identified in the field. The purpose of this sampling was to determine whether contamination from the foundry waste had leached into the natural soils. Each soil sample was analyzed for lead, copper and total phenolics. The analytical results for the three natural soil samples are presented in Table 4.4. A copy of the analytical test results for the natural soil samples can be found in Appendix D.

TABLE 4.4			
ANALYTICAL TEST RESULTS FOR NATURAL SOIL SAMPLES COLLECTED FROM BELOW FOUNDRY WASTE			
Sample Identification	TB-1	TB-2	TB-3
Sample Location	Test Boring B-12	Test Boring B-13	Test Boring B-16
Sample Depth	3.5-feet	3-feet	6-feet
Lead (mg/Kg)	35	102	285
Copper (mg/Kg)	142	765	4,920
Total Phenolics (mg/Kg)	0.44	0.39	0.42

The thickness of the foundry waste encountered in test borings B-12 (1 to 3-feet), B-13 (2 to 2.5-feet) and B-16 (5.5 to 5.75-feet) were 2, 0.5 and 0.25-feet, respectively (refer to the test boring logs presented in Appendix C). The soil samples were collected from 3.5, 3 and 6-feet below the ground surface, respectively.

The concentration of lead in the soil samples was 35 mg/Kg (TB-1), 102 mg/Kg (TB-2) and 285 mg/Kg (TB-3). Copper was present in the soil samples at concentrations of 142 mg/Kg (TB-1), 765 mg/Kg (TB-2) and 4,920 mg/Kg (TB-3). Based on the reported lead concentrations in the soil samples, it does not appear that the natural soils are significantly contaminated due to the buried foundry wastes. However, sample TB-3 (test boring B-16) was found to contain a level of copper above the average background concentration reported to be 126.3 mg/Kg. Currently there are no NYSDEC or USEPA soil standards or guidelines established for copper in soils.

Total phenolics were present in the soil samples at concentrations of 0.44 mg/Kg (TB-1), 0.39 mg/Kg (TB-2) and 0.42 mg/Kg (TB-3). In ESI's opinion, the soils at or below the depths where samples TB-1, TB-2 and TB-3 were collected are not considered contaminated to levels which would require remediation.

Employee Parking Area Foundry Waste Sample (Area A)

ESI advanced nine (9) test borings in the employee parking lot to evaluate the subsurface conditions in this area. Each of the test borings were characterized by the presence of foundry waste between the asphalt cover and the natural soils. The thickness of the fill material varied but was generally between 2 and 3-feet in the test borings.

The foundry waste present beneath the parking lot consisted of black fine grained (fine sand to silt grain size) material, foundry sand, slag, coal, cinders, brick, etc.. ESI collected a composite soil sample from the foundry waste taken from test borings B-5, B-6, B-11 and B-14 and analyzed the sample for USEPA Target Analyte List (TAL) metals and total phenolics. The analytical results corresponding to the parking lot fill material sample is presented in Table 4.5. A copy of the analytical test results for the employee parking area sample can be found in Appendix D.

From Composite of Borings B-5, B-6, B-11 & B-14

TABLE 4.5

ANALYTICAL TEST RESULTS FOR THE FOUNDRY WASTE SAMPLE COLLECTED FROM BENEATH THE EMPLOYEE PARKING AREA

Parameter	Concentration (mg/Kg)	NYSDEC Cleanup Guidelines	New York State Background Soil Concentrations (mg/Kg)
Aluminum	6,980	NG	1,000-25,000
Antimony	< 113	30	ND
Arsenic	13.2	80	3-12
Barium	125	4,000	15-600
Beryllium	< 11.3	0.16	0-1.75
Cadmium	< 11.3	80	ND
Calcium	15,000	NG	130-35,000
Chromium	107	NG	1.5-40
Cobalt	< 22.7	NG	2.5-60
Copper	7,820	NG	< 1-15
Iron	18,900	NG	17,500-25,000
Lead	2,550	500-1000[1]	1-12.5
Magnesium	3,270	NG	2,500-6,000
Manganese	397	2,000	50-5,000
Mercury	< 2.27	20	0.042-0.060
Nickel	132	2,000	0.5-25
Potassium	< 6,800	NG	8,500-43,000
Selenium	< 1.12	NG	< 0.1-0.125
Silver	< 22.7	200	ND
Sodium	179	NG	6,000-8,000
Thallium	< 2.25	6	ND
Vanadium	< 45.4	600	25-60
Zinc	3,240	2,000	37-60
Total Phenolics	0.35	NG	ND

Soil 'A'

1 -- Based on discussions between NYSDEC, NYSDOH, Ellison Bronze and ESI at a meeting held on January 29, 1992.

NG -- No guidance value presented. ND -- No data reported.

Chromium, copper, lead, nickel and zinc were found to be present in the composite parking lot sample above the published range for these metals found in New York State. However, only lead and zinc were above the NYSDEC cleanup guidelines presented in Table 4.5. It should be noted that the lead level found in the composite parking lot sample was similar to that in test pit TP-2 (refer to Table 3.2) which failed the TCLP test for lead. It may be inferred that the parking lot fill will likely also be considered a hazardous waste based on lead.

Although at this time there are no federal or state cleanup standards for contaminated soil used in New York State. The NYSDEC and NYSDOH evaluate each site on a case by case basis to determine whether remediation will be required.

Table 4.5 compares the reported metal concentrations to the NYSDEC cleanup guidelines found in Appendix C of the draft document entitled "Cleanup Policy and Guidelines" published in October, 1991. A cleanup guideline for lead of 500-1,000 mg/Kg was selected during a meeting between NYSDEC, NYSDOH, Ellison Bronze and ESI on January 29, 1992. The soil cleanup guidelines on Table 4.5 (excluding lead) are based on the HEAST Report which assumes ingestion of the soil. In ESI's opinion, due to the current and most probable future use of the site the ingestion of soil is an unlikely possibility at the Ellison Bronze Site.

4.2.6 Test Boring Program Completed in Area B

ESI advanced five (5) test borings in the former chemical storage shed area (Area B) to confirm soil contamination detected during the Phase II Environmental Site Assessment completed by ESI in December, 1990. One test boring (B-25) was advanced at the location (center of shed) from where the toluene contaminated surface soil sample was collected in 1990 (refer to Section 3.2). The other test borings were advanced at the four corners of the former chemical storage shed. Each test boring was advanced approximately 2-feet below the observed ground water table (10-feet in depth). The test boring locations are shown on Drawing No. 6 in Appendix A.

4.2.7 Subsurface Conditions (Area B)

The depth of fill material encountered in test borings B-25, B-26, B-27, B-28 and B-29 ranged between 2.0-feet (B-25 and B-28) and 2.5-feet (B-26, B-27 and B-29). The general characteristics of this fill material was soil (from on-site or off-site) with a small quantity of manmade materials such as brick or glass. There were no foundry sands or other suspect material encountered in the above mentioned test borings except for B-25 where a release of solvents occurred and contamination was present in the fill material approximately 0.25-feet below the surface.

4.2.8 Analytical Test Results of Area B Soil Samples

The on-site Environmental Engineer specifically focused on screening the split spoon samples for the presence of volatile organic compounds with an Hnu photoionization detector. Volatile organic contamination was detected 3-inches below the ground surface while advancing test boring B-25. Organic vapor concentration measurements of 70-92 ppm (parts per million) were recorded at this depth. The soil at this depth was collected and placed in precleaned sample jars for chemical analysis.

Each of the remaining split spoon samples were scanned with the Hnu and background (or close to background) measurements were recorded for test borings B-25 (2 to 10-feet), B-26, B-27, B-28 and B-29. The background organic vapor concentrations were 0.4 ppm for test borings B-25 and B-26 and 0.5 ppm for test borings B-27, B-28 and B-29. Composite soil samples were collected from test borings B-26, B-27, B-28 and B-29 from the ground surface to a depth of 10-feet below the ground surface. It should again be noted the ground water table was approximately 8-feet below the ground surface.

The analytical parameters selected to evaluate potential soil contamination in the vicinity of the former chemical storage shed was based on contamination previously detected at the site, an inventory of materials stored in the shed and discussions between Ellison Bronze management, NYSDEC and ESI. Each soil sample colected was analyzed for TCL volatiles and semivolatiles. The chemical compounds detected above detection limits are presented in Tables 4.6 and 4.7, respectively. A copy of the analytical test results for the Area B soil sampling can be found in Appendix D.

Examination of Table 4.6 indicates the toluene concentration reported in sample TB-25 was 600,000 ug/Kg or 600 ppm (parts per million), which is consistent with the 1990 Phase II sample analytical results (1,000 ppm).

TABLE 4.6			
TCL VOLATILE ORGANIC COMPOUNDS DETECTED IN THE SOIL SAMPLES TAKEN FROM AREA B[1]			
Parameter Detected	Sample Identification (Location)		
	TB-25 (B-25)	TB-27 (B-27)	TB-28 (B-28)
Toluene (ug/Kg)	600,000	5.2	ND
Total Xylene (ug/Kg)	1,100	6.2	7.6

1 -- Soil samples were analyzed using USEPA Method 8240.
ND -- Not Detected.

Based on field screening of the split spoon samples it appears the organic contamination was confined to the surface soils since there were no organic vapors detected above background below 3-inches from the ground surface. Total xylene was also reported to be present in sample TB-25 at a concentration of 1,100 ug/Kg or 1.1 ppm. The soil in the vicinity of TB-25 will require remediation between 0 and 2-feet below the ground surface based on the elevated levels of toluene. The horizontal and vertical extent of remediation will be determined in the field with an Hnu Photoionization detector and through verification sampling.

Toluene was also detected in sample TB-27 at a concentration of 5.2 ug/Kg. Total xylene was also reported in samples TB-27 and TB-28 at levels of 6.2 and 7.6 ug/Kg, respectively. The presence of toluene and xylene in test borings B-27 and B-28 is not expected to be at levels which would require remediation.

The six semivolatile compounds in Table 4.7 are present at concentrations approximately one part per million or below. These compounds may have been related to the combustion processes which have occurred at the site over the years such as the burning of coal during the time period when the blacksmith, plant boiler and/or foundry were in operation at the site. However, due to the limited number of compounds and the relatively low concentrations, the semivolatile contamination at Area B is not considered a significant problem based on the site use in ESI's opinion. Remediation of the toluene contaminated soils will also reduce the presence of the semivolatile compounds detected in this area.

TABLE 4.7

TCL SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN THE SOIL SAMPLES TAKEN FROM AREA B[1]

Parameters Detected	Sample Identification (Location)		
	TB-26 (B-26)	TB-27 (B-27)	TB-28 (B-28)
Benzo (b) Fluoranthene (ug/Kg)	410	ND	ND
Benzo (k) Fluoranthene (ug/Kg)	440	ND	ND
Bis (2-ethylhexyl) Phthalate (ug/Kg)	ND	390	ND
Fluoranthene (ug/Kg)	730	550	ND
Phenanthrene (ug/Kg)	890	430	ND
Pyrene (ug/Kg)	1,100	880	520

1 -- Soil samples were analyzed using USEPA Method 8270.
ND -- Not Detected.

4.3 Sediment Sampling and Results

4.3.1 Summary of Sediment Cleanup Criteria

In December, 1989 the New York State Department of Environmental Conservation (NYSDEC) published "Cleanup Criteria for Aquatic Sediments". The NYSDEC cleanup criteria for copper and lead is 19 mg/Kg and 27 mg/Kg, respectively. The cleanup criteria for total phenol is 0.6 ug/gram organic carbon. Total organic carbon was not determined for the sediment samples analyzed, however, a 1% assumed total organic content of the sediments would yield a cleanup criteria for total phenolics of 6 mg/Kg. A total organic carbon concentration of one percent is viewed as a conservative assumption when determining sediment cleanup criteria.

In 1988 the Ontario Ministry of the Environment (MOE) published pre-industrialized metals concentrations for the Great Lakes sediments. The NYSDEC recognizes the MOE study results as "background" concentrations. The background copper and lead concentrations presented in the NYSDEC Cleanup Criteria for Aquatic Sediments were 65 mg/Kg and 55 mg/Kg, respectively. It should be noted the cleanup criteria recognized by the NYSDEC for all metals are lower than the background concentrations reported. A NYSDEC recognized study conducted by Persaud (1989, MOE) determined the copper and lead sediment concentrations "which would be detrimental to the majority of species" to be 114 mg/Kg and 250 mg/Kg, respectively.

4.3.2 Sample Collection 6/25/92

ESI collected sediment samples from Moon Brook and the Chadakoin River to evaluate the environmental impact, if any, the foundry wastes may have had on the surrounding sediments. Four sediment samples were collected from Moon Brook and three from the Chadakoin River. The location of the sediment samples are shown on the Surface Soil and Sediment Sample Location Plan shown as Drawing No. 5 in Appendix A.

ESI intentionally collected sediment samples from upstream (off-site), adjacent to and downstream (off-site) of the subject property to evaluate the potential impact on the sediments from the site (if any). Sediment samples SED-1, SED-2, and SED-3 were collected from the Chadakoin River from upstream, adjacent to and downstream from the

Ellison Bronze Site, respectively.

ESI also collected sediment samples along Moon Brook for analytical testing. The sample locations were upstream (SED-7, off-site), adjacent to Area A (SED-5 and SED-6) and near the point where Moon Brook meets the Chadakoin River (SED-4).

Each sediment sample was collected with a Wildco-Ekman dredge attached to a polypropylene rope. The bottom sediment was placed into a precleaned stainless steel bowl until sufficient volume was recovered to complete the required analytical testing. ESI transferred the sediment directly from the stainless steel bowl into commercially cleaned I - Chem bottles.

A Chain-of-custody record was established and maintained on all samples. The sediment samples were immediately shipped to Huntingdon Analytical Services, Inc. (HAS) in Middleport, New York for analytical testing. Huntingdon Analytical Services is a New York State Department of Health (NYSDOH) certified laboratory and a division of ESI.

4.3.3 Analytical Test Results

The analytical test results for the sediment samples are presented in Table 4.8. The upriver sediment sample (SED-1) contained copper and lead concentrations of 64.3 mg/Kg and 44.3 mg/Kg, respectively. It should be noted that the upriver copper and lead concentrations were below both the pre-industrialized background concentrations and the concentrations detrimental to most species but were above the NYSDEC criteria. A copy of the analytical test results for the sediment samples can be found in Appendix D.

Sediment sample SED-2 was collected adjacent to the subject site and contained 140 mg/Kg copper and 68.5 mg/Kg lead. The copper concentration was 75.7 mg/Kg above the upriver sediment concentration and 26 mg/Kg above the concentration detrimental to most species (114 mg/Kg). The lead concentration was 24.2 mg/Kg above the upriver sediment concentration but was well below the concentration detrimental to most species (250 mg/Kg).

Sediment sample SED-3 was collected downriver from the site and contained 68.3 mg/Kg copper and 40.6 mg/Kg lead. The metals concentration were very similar upriver (SED-1) and downriver (SED-3) of the site.

TABLE 4.8			
ANALYTICAL TEST RESULTS FOR SEDIMENT SAMPLES			
Sample Identification	Concentration(mg/Kg)		
	Copper[1]	Lead[2]	Total Phenolics[3]
SED-1	64.3	44.3	<0.25
SED-2	140	68.5	<0.25
SED-3	68.3	40.6	<0.25
SED-4	236	21.4	<0.25
SED-5	23.7	10.9	0.28
SED-6	17.5	11.0	0.39
SED-7	14.9	13.0	<0.25

1 -- The NYSDEC criteria for copper in sediments is 19 mg/Kg. Ontario Ministry of the Environment (1988) pre-industrialized background copper concentrations for the Great Lakes sediments was 65 mg/Kg. Copper concentration which would be detrimental to the majority of species, potentially eliminating most (Persaud, 1989) was 114 mg/Kg.

2 -- The NYSDEC criteria for lead in sediments is 27 mg/Kg. Ontario Ministry of the Environment (1988) pre-industrialized background lead concentrations for the upper Great Lakes sediments was 55 mg/Kg. Lead concentration which would be detrimental to the majority of species, potentially eliminating most (Persaud, 1989) was 250 mg/Kg.

3 -- The NYSDEC criteria for total phenol is 0.6 ug/gram organic carbon or 6 mg/Kg assuming 1% organic carbon sediments.

All three sediment samples collected from along the Chadakoin River reportedly contained less than detection limit (0.25 mg/Kg) total phenolics. These concentrations are below the calculated criteria of 6 mg/Kg for total phenolics.

The upstream (Moon Brook) sediment sample (SED-7) contained copper and lead concentrations of 14.9 mg/Kg and 13.0 mg/Kg, respectively. It should be noted that both the lead copper sediment concentrations upstream (off-site) were below the NYSDEC sediment criteria of 27 mg/Kg and 19 mg/Kg, respectively.

The concentration of copper in the on-site sediment samples increased as the distance from the Ellison Bronze plant increased. Sediment samples SED-6, SED-5 and SED-4 contained copper concentrations of 17.5 mg/Kg, 23.7 mg/Kg and 236 mg/Kg, respectively. Sediment samples SED-6 and SED-5 were slightly below and slightly above the sediment criteria for copper of 19 mg/Kg. However, sediment sample SED-4 was well above the sediment criteria (19 mg/Kg), the pre-industrialized background concentration (65 mg/Kg) and the concentration detrimental to most species (114 mg/Kg). The concentration of lead in sediment samples SED-6 (11.0 mg/Kg), SED-5 (10.9 mg/Kg) and SED-4 (21.4 mg/Kg) were all below the NYSDEC sediment criteria of 27 mg/Kg.

Sediment samples SED-4 and SED-7 were found to have below detection limit (0.25 mg/Kg) levels of total phenolics. Sediment samples SED-5 and SED-6 contained 0.28 mg/Kg and 0.39 mg/Kg total phenolics, respectively.

4.4 Ground Water Sampling and Results

4.4.1 Scope of Work

Three ground water monitoring wells were installed at the Ellison Bronze Site to facilitate determination of the ground water quality and ground water flow pattern beneath the site. The number and placement of monitoring wells was determined based on evaluating ground water quality both up gradient as well as down gradient from the contaminated areas identified at the subject site. The three monitoring wells were installed to monitor the upper most aquifer which is the most probable location of ground water contamination (if any) at the site. The ground water monitoring wells were located as shown on the Test Boring and Monitoring Well Location Plan presented as Drawing

No. 6 in Appendix A. After the wells were installed, an optical survey was completed to determine the location and ground surface elevation of each well location.

The horizontal placement of monitoring wells was based on discussions between Ellison Bronze management, NYSDEC and ESI. The horizontal placement of the three ground water monitoring wells was selected to determine the ground water quality and flow pattern across the site. Ground water monitoring well ESI-3 was installed near the west corner of the Ellison Bronze plant. This well is considered an up gradient monitoring point which are typically used to determine background ground water quality. Monitoring well ESI-2 was located near the southwest corner of the employee parking area near the Chadakoin River. This well was located down gradient from where the former chemical storage shed was located (Area B). Monitoring well ESI-1 was located near the door to the Ellison Bronze plant foundry, on the banks of Moon Brook. This well is also located in the vicinity of where the thickest seams of foundry waste were identified during the Area A test boring program.

4.4.2 Ground Water Monitoring Well Installation

After advancing test borings B-30, B-31 and B-32 to the desired depth, ground water monitoring wells were installed in the borehole through hollow stem augers. Ground water monitoring wells ESI-2 and ESI-3 were installed with the ten foot long two inch inside diameter slotted screen section intersecting the top of the ground water. Ground water monitoring well ESI-1 was installed with five feet of two inch inside diameter PVC screen which was entirely below the expected ground water table. The slot size selected for the PVC screen was 0.020-inches. The remainder of the well consisted of two inch PVC riser pipe. A filter pack consisting of silica sand was constructed adjacent to the well screen. Above the filter pack a bentonite pellet seal was constructed. The remainder of the borehole annulus was backfilled to the surface with a cement/bentonite grout mix. A protective steel casing was installed over the well riser pipe and secured with a pad lock. A flush mounted curb box was installed over the top of well ESI-3, rather than a protective casing, because it was located in a parking lot. The monitoring wells were installed into the test borings under the supervision of an ESI Environmental Engineer. The monitoring well construction diagrams are presented in

Appendix C.

4.4.3 Ground Water Monitoring Well Development and Sampling

ESI obtained ground water levels and developed the three ground water monitoring wells (ESI-1 through ESI-3) on March 3, 1992. The ground water levels measured in the wells indicate that the general ground water flow is in an east-northeast direction. The well development was accomplished by pumping ground water from the monitoring wells with an ISCO mechanical pump. New tubing was used on each well. A minimum of 10 well volumes were removed from all three monitoring wells during well development and purging.

Well development is essential for collection of a representative sample of the ground water in the vicinity of the monitoring well. Representative water is assumed to have been obtained when pH, temperature and specific conductance measurements stabilize (variation of less than 10 percent over successive well volumes) during development and purging. In addition, turbidity measurements were also taken in an attempt to obtain a non-turbid (<50 NTU) ground water sample. The well development procedures and data were recorded on well development logs and are presented in Appendix C.

ESI collected representative ground water samples from the monitoring wells on March 3, 1992. The water levels in the monitoring wells were measured to verify a well recharge of at least ninety (90) percent prior to collecting the ground water samples. The water samples were collected by lowering a precleaned 3-foot long PVC bailer with a teflon check valve into the water and allowing it to fill. The bailer was then removed and the contents emptied into the appropriate precleaned sample bottles.

Ground water samples collected during sampling of monitoring wells ESI-1, ESI-2 and ESI-3 were poured into two 40-milliliter amber glass vials with septums (filled to capacity to prevent air bubbles), 1-liter plastic bottle and one-half gallon amber glass bottle. The containers were tightly sealed, labeled and cooled to 4 degrees Celsius in an ice cooler. The samples were subsequently shipped to Huntingdon Analytical Services, Inc. (HAS), a New York State Department of Health certified laboratory located in

Middleport, New York for analytical testing. Chain-of-Custody forms were completed on all samples with the required sample location and analysis.

4.4.4 Ground Water Analytical Test Results

Ground water samples ESI-1, ESI-2 and ESI-3 were obtained from the three ground water monitoring wells located at the Ellison Bronze Site on March 3, 1992. The analytical parameters selected to evaluate the ground water quality at the Ellison Bronze Site was based on contamination previously detected at the site, an inventory of materials stored or disposed of at the site and discussions between Ellison Bronze management, NYSDEC and ESI. The ground water samples collected were analyzed for the USEPA Target Compound List (TCL) volatiles and semivolatiles and USEPA Target Analyte List (TAL) metals. A copy of the analytical test results for the ground water samples are presented in Appendix D.

There were no TCL volatiles or semivolatiles detected in the ground water samples analyzed. Metals detected above the detection limit are presented in Table 4.9. Metals detected in the ground water samples were compared to NYSDEC Class GA ground water standards.

TABLE 4.9

ANALYTICAL TEST RESULTS FOR METALS DETECTED IN THE GROUND WATER SAMPLES COLLECTED FROM THE ELLISON BRONZE SITE

Parameter	Sample Location and Concentration (mg/L)			New York State Ground Water Standard[1]
	ESI-1	ESI-2	ESI-3	
Aluminum	15.7	17.4	2.10	NS
Arsenic	0.01	0.01	<0.01	0.025
Barium	0.76	1.53	0.18	1.0
Calcium	103	60.9	51.5	NS
Copper	<0.14	0.56	<0.10	1.0
Iron	33.9	29.5	2.10	0.3
Lead	0.07	0.095	0.023	0.025
Magnesium	32.8	13.6	7.92	NS
Manganese	5.15	7.81	0.70	0.3
Sodium	69.6	30.2	26.7	NS
Zinc	0.30	0.25	<0.20	5.0

1 -- Source: New York State Code of Rules and Regulations, Title 6, Chapter 10, Part 703.5.

NS -- No Standard.

[redacted]

Barium, iron, lead and manganese were present in one or more ground water sample above the NYSDEC Class GA ground water standards. It should be noted that background concentrations of these metals were significant and should be considered when determining contaminant loading attributed to the Ellison Bronze Site. In ESI's opinion the elevated metals detected in the samples collected from monitoring wells ESI-1 and ESI-2 are probably due to the presence of foundry wastes previously dumped on-site.

5.0 SITE CHARACTERIZATION

5.1 Sources of Contamination

Information on the sources of contamination at the Ellison Bronze Site has been gathered during the Phase II Environmental Site Assessment and the Remedial Investigation completed at the site. Information on historical foundry operations has been incorporated with soil, sediment and ground water sampling data to summarize the sources of contamination found on-site. Contaminants identified at concentrations above regulatory action levels are:

- o Subsurface Soil: Toluene and lead
- o Sediments: Copper
- o Ground Water: Iron, manganese, lead and barium

The foundry operations at the Ellison Bronze plant has historically generated foundry sands and grinding dust as waste materials. A fine grained grinding dust is generated from finishing (grinding) metal parts cast in the foundry. Foundry sands are generated from casting metal parts in the foundry. These wastes were often mixed together and dumped out the foundry door during the period from approximately 1932 to 1986.

Analytical test results of the foundry sand and grinding dust were supplied to ESI by the Ellison Bronze Company management and can be found in Appendix E. Based on the analytical testing results, it is probable that the primary source of hazardous waste contamination in Area A is the grinding dust buried on-site. However, due to the historical intermixing of the foundry sand and grinding dust, separation of the two wastes may not be feasible during remedial efforts.

There are no manmade or natural containment structures in place in either Areas A or B. The contaminants may migrate from Area A to Moon Brook, the Chadakoin River and/or ground water due to the absence of containment structures. Subareas A1 and A2 have been surveyed using an optical survey method and are illustrated on Drawing No. 3 in Appendix A.

ESI excavated test pits along Moon Brook (Phase II Environmental Site Assessment) to collect and analyze subsurface soil samples. The chemical characteristics of the subsurface soils/foundry waste include elevated levels of lead (hazardous waste levels), copper, zinc and phenol. Actual concentrations of these contaminants was summarized in Section 3. Based on the TCLP analyses of the test pit samples, soluble lead, copper and zinc may leach from the foundry waste into the surrounding environment.

The subsurface exploration completed at Area B indicated toluene contamination was present in a limited area. In addition, six semivolatile compounds were detected in the subsurface soils at near detection concentrations. The source of the toluene and semivolatile compounds is probably from the chemicals which were stored within the former shed.

5.2 Physical Site Characteristics

Physical site characteristics are important in the determination of the fate and transport of contaminants found on-site. As part of this determination the surface features, soils and hydrology of the site were studied.

Surface Features: Approximately two-thirds of the site is developed into the Ellison Bronze plant and office buildings. The majority of the land surrounding the plant is covered with asphalt and is used for parking or access to the front or rear of the building. The only undeveloped portions of the site extend between the employee parking area and the Chadakoin River or Moon Brook as well as the grass covered field located southwest of the employee parking area.

Soils: The natural soils identified to be present across the entire site consist of fine to coarse grain brown sands and gravels. In some areas along Moon Brook, sedimentation of silts and fine sands were apparent probably due to the periodic overflowing of Moon Brook.

Hydrology: The ground water level was measured in the three ground water monitoring wells to determine the likely direction of ground water flow beneath the site. From these measurements, it is estimated that the ground water flow is in an east-northeast direction towards Moon Brook or the Chadakoin River. The ground water level measurements are summarized in Table 5.1.

TABLE 5.1

SUMMARY OF GROUND WATER LEVEL MEASUREMENTS TAKEN BEFORE MONITORING WELL DEVELOPMENT[1]

Monitoring Well Location	Ground Water Table Elevation Measured on March 3, 1992[2]	Ground Water Table Elevation Measured on March 9, 1992
ESI-1	91.20	91.14
ESI-2	91.55	91.52
ESI-3	93.33	93.25

1 -- Elevations presented are based on an assumed benchmark elevation of 100-feet.

2 -- Ground water level measurements taken on March 3, 1992 were 24-hours after well installation but before development.

5.3 Nature and Extent of Contamination

The contamination found at the Ellison Bronze Site can be linked to two separate and distinct sources and locations. Subsurface soil, sediment and ground water contamination has resulted from the historical deposition of foundry waste along Moon Brook and beneath the employee parking area (north end). Subsurface soil contamination has resulted from a release of drummed solvents which were stored in a chemical storage shed formerly located on-site.

The extent of contamination related to the two above mentioned areas has been estimated based on observations made in the field and analytical test results of the various environmental media. The specific locations of Areas A and B are shown on Drawing No. 4 in Appendix A.

5.3.1 Area A

The nature and extent of contamination in Area A has been estimated based on observations made during test pit excavations (ESI Phase II Environmental Site Assessment), a test boring program and analytical test results of soil samples collected from this area. Based on the analytical testing of foundry sand and grinding dust presented in Appendix E, it is likely the nature of hazardous waste contamination in Area A is the grinding dust, however, the foundry sands are also viewed as non-hazardous fill which may also require removal from the site. Therefore, as part of the proposed Interim Remedial Measure (IRM), the foundry sands will be separated from the foundry waste when feasible to reduce the quantity of potential hazardous waste.

The test boring program completed in Area A was designed to evaluate the nature and extent of contamination due to buried foundry waste. Although the extent of buried foundry waste was not determined in the southwest direction, ESI has established an imaginary line for this purpose which runs perpendicular to the Ellison Bronze plant to the gas meter building and through test boring location B-19. The rationale for locating this as the southwest boundary line of the foundry waste is two fold. The first reason is that the observed quantity of buried foundry waste reduced with distance from the foundry door. The second reason is that test boring B-19 did not contain any apparent foundry waste.

Estimating the extent of foundry waste required dividing Area A into Subareas A1, A2 and A3 as shown on Drawing Number 4 in Appendix A. Subarea A1 is located on the northwest end of the banks of Moon Brook and contains an average foundry waste thickness of approximately 5-feet with the vast majority of this material located in the vicinity of the foundry room door. The aerial extent of this material is approximately 920 square feet. Subarea A2 is located on the southeast end of the banks of Moon Brook and contains an average thickness of foundry waste of approximately 2-feet. The aerial extent of this material is approximately 2,810 square feet. Subarea A3 is the part of Area A where the employee parking lot is located. ESI estimates the average thickness and aerial extent of the foundry waste in Subarea A3 to be approximately 3-feet and 4,690 square feet, respectively. Therefore, the volume of foundry waste which must be excavated from Subarea A3 is approximately 420 cubic yards. The total quantity of foundry waste targeted for remediation is approximately 900 cubic yards.

5.3.2 Area B

A subsurface investigation was completed in the vicinity of where the former chemical storage shed was located to determine the nature and extent of contamination (summarized in Section 4.2.6).

Four test borings were advanced on the approximate corners and one in the center of the former location of the chemical storage shed. An Hnu photoionization detector was used to obtain a qualitative indication of the presence of volatile organic compounds. Organic vapors measuring 70-92 ppm (parts per million) were recorded while scanning the soil sample obtained from 0-2 feet below the ground surface in the center test boring. Background or near background measurements were recorded for the other soil samples from all five test borings.

One grab soil sample was collected from approximately 3-inches below the ground surface in the center test boring. The soil at this depth was the most contaminated as determined using the Hnu. Four composite soil samples were collected, from the test borings advanced on the corners of the former shed location. Each composite sample was collected between 0 and 10-feet below the ground surface. The ground water table was noted at approximately 8-feet below the ground surface.

The analytical test results of the soil sampling indicated there was significant toluene contamination present directly below the ground surface in the center of the shed. However, the composite sample results showed near detection levels of total xylene and six semi-volatile compounds which are not considered a significant contamination problem.

Ground water monitoring well ESI-2 was located approximately 41-feet down gradient from the former chemical storage shed location. A ground water sample collected from monitoring well ESI-2 was analyzed for TCL volatiles and semivolatiles. There were no TCL volatiles or semi-volatiles detected in the ground water sample collected from monitoring well ESI-2.

Based on the subsurface soil investigation, sampling and analytical testing of the soil and ground water, it is ESI's opinion the extent of toluene contamination is between 3-inches and 2-feet in the vertical direction. The horizontal extent of toluene contamination was found to be within the four test borings advanced at the four corners of the former shed location. The area between the four test borings is approximately 125-square feet. Therefore, the horizontal extent of toluene contamination is not greater than 125-feet square.

6.0 PROPOSED INTERIM REMEDIAL MEASURE (IRM)

6.1 General

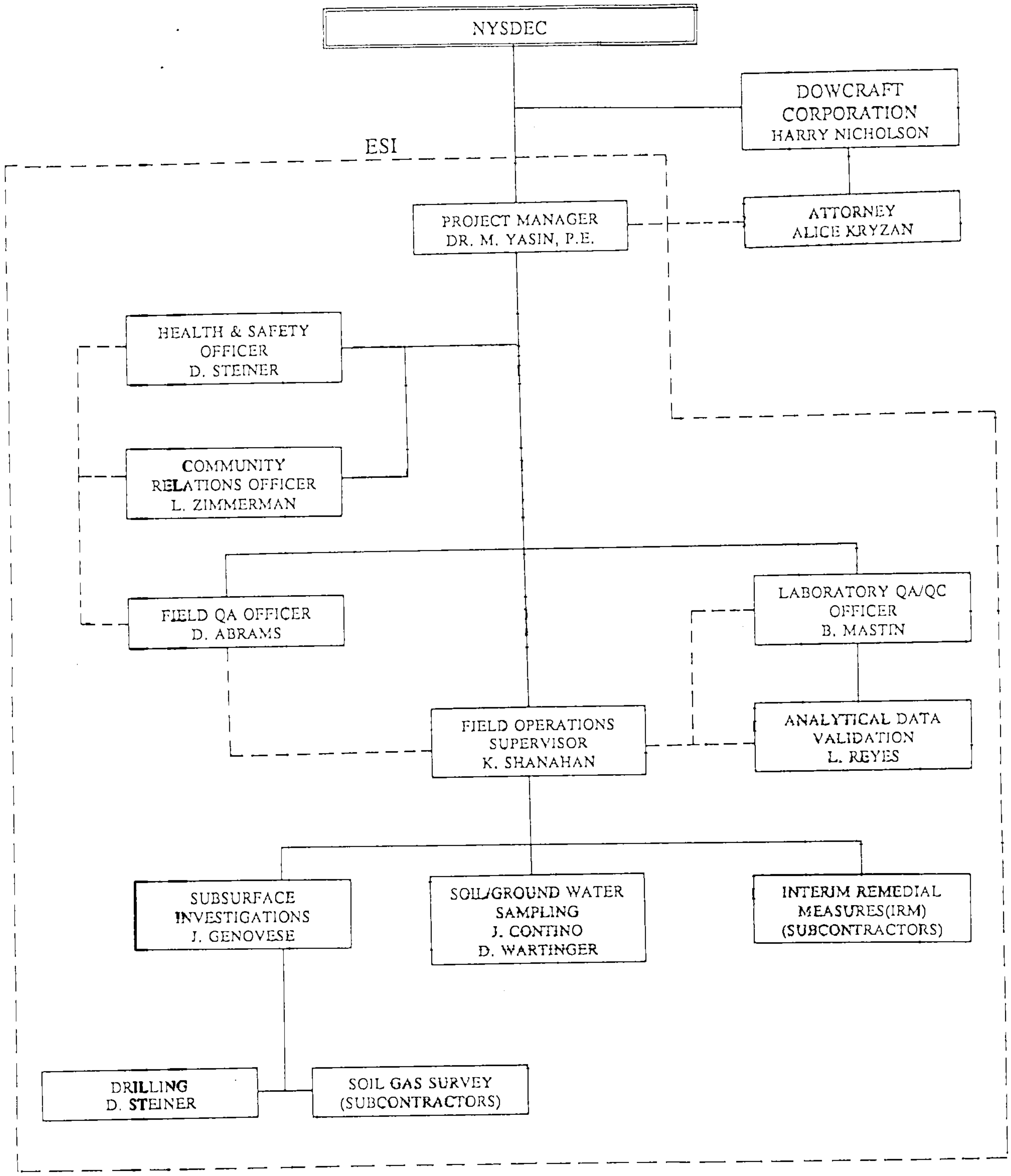
An Interim Remedial Measure (IRM) has been proposed to remediate contamination identified at Areas A and B as described in Sections 3 and 4 of this report. Due to the nature and extent of contamination defined at the site, the Ellison Bronze Company management has endorsed the excavation and on-site stabilization of the foundry wastes present at the site. The toluene contaminated soil is to be excavated and remediated off-site through incineration. On-site stabilization of foundry wastes and off-site incineration of the toluene contaminated soils is expected to be the most viable remediation alternatives based on the volume of contaminated soil present at the site. The Health and Safety Plan (HASP) and Quality Assurance Project Plan (QAPP) associated with the proposed IRM are found as Appendices F and G, respectively.

6.2 Project Organization and Management

Empire Soils Investigations, Inc. (ESI) will manage the IRM project. The proposed organizational structure (Figure 6.1) will provide specific responsibility and lines of communication for personnel working on the project.

The project manager will be Dr. Mohamed Yasin, P.E., a Senior Environmental Engineer with ESI. Dr. Yasin will be responsible for overall project coordination and final review of all technical aspects of the project. In addition, Dr. Yasin will be responsible for communication between the New York State Department of Environmental Conservation (NYSDEC) and the Ellison Bronze Company management.

Mr. Kevin Shanahan, an Environmental Engineer with ESI, will act as field supervisor. Mr. Shanahan will be responsible for implementation, coordination, notifications and scheduling of all field activities. This includes supervision and direction of all contractor activities, sample collection, field quality control and health and safety activities. As project supervisor, Mr. Shanahan will be responsible for documentation of all field activities and preparation of the final report detailing these activities.



EMPIRE SOILS INVESTIGATIONS INC.

PROJECT ORGANIZATION
FOCUSED IRM WORK PLAN
ELLISON BRONZE SITE
DOWCRAFT CORPORATION
FALCONER, NEW YORK

FIGURE 1-1

Mr. Donald B. Abrams, a Senior Environmental Geologist with ESI, will oversee and review the quality control measures for all aspects of the field work. This will include a review of the following:

1. Sample Collection Documentation
2. Sample Location Drawings
3. Calculations
4. Field Notebooks
5. Other documentation such as Chain-of-Custody forms.

All environmental media samples collected will be sent to Huntingdon Analytical Services, Inc. for analytical testing. Huntingdon Analytical Services is a New York State Department of Health (NYSDOH) certified laboratory and a division of ESI. Mr. Andrew Cliffton, the Environmental Laboratory Director of Huntingdon Analytical Services will have the following project responsibilities:

- Coordinate sampling activities with the Project Manager and Field Operations Supervisor;
- Ensure the samples are analyzed in accordance with the methods outlined in the Work Plan and that the analytical QA/QC goals are met;
- Ensure all samples are analyzed within the proper holding times; and,
- Produce the analytical portion of the final report which will include the information specified in the QA/QC plan.

Mrs. Lisa Reyes, the laboratory QA/QC Director at Huntingdon Analytical Services will be responsible for all analytical data validation and ensuring that all QA/QC goals and objectives are met.

6.3 Remediation Areas A and B

Two areas have been identified for remediation based on subsurface investigations, analytical testing of soil samples and information on historical operations at the Ellison Bronze Plant. The Foundry Waste Disposal Area and the Chemical

Storage Shed Area, designated as Areas A and B, are the two areas targeted for remediation.

Area A is defined by three distinct Subareas as shown on Drawing No. 4 in Appendix A. Subarea A1 is located on the northwest end of the banks of Moon Brook. Subarea A2 is located on the southeast end of the banks of Moon Brook. Subarea A3 is located in the north corner of the employee parking lot. The aerial extent of Subareas A1, A2 and A3 are approximately 920, 2,810 and 4,690-square feet, respectively. Area B is approximately 125-square feet as determined during the subsurface investigation completed (refer to Drawing No. 4).

6.4 Applicable and Relevant Cleanup Standards

The applicable cleanup standards for lead contaminated soils are typically determined on a case specific basis. An USEPA Directive entitled "Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites (9/89)" was put forth to set a cleanup standard for total lead at 500-1000 mg/Kg. The interim guidance adopts the recommendation of the 1985 Centers for Disease Control (CDC) statement regarding childhood lead poisoning. The CDC report indicates that blood lead concentrations in children above the background levels were reported when the concentrations in soil or dust exceeded 500 to 1000 mg/Kg. With the conclusion of more and more toxicoligcal studies on lead, the general trend reported within the regulatory agencies is that lead contamination is more serious that originally anticipated.

It is ESI's understanding that the NYSDEC currently is reviewing cleanup standards for metal constituents in soils, and therefore no standards exist. In October, 1989 the NYSDEC published a draft document entitled "Cleanup Policy and Guidelines" which presents soil cleanup guidance values for contaminated soil. The guidance values are based on the HEAST Report which assumes the ingestion of contaminated soil or dust from the site as the exposure route. A cleanup guidance value of 250 mg/Kg was cited for lead in soils.

The State of New Jersey regulatory agencies recognizes 250 mg/Kg as the cleanup standard for lead. The NYSDEC typically requests the New York State Department of Health (NYSDOH) to determine the appropriate cleanup standard for individual projects with lead contamination of the soils. In a conversation with the NYSDOH, ESI learned what factors are incorporated in the selection of applicable cleanup standards by the NYSDOH. The specific factors the NYSDOH acknowledged to be important are listed below:

- The background contaminant concentration in the nearby soils.
- The contaminant concentration in the soils targeted for remediation.
- Other contamination present on-site.
- Present and future site use.
- Potential exposure routes for contamination of humans and wildlife.

Currently the NYSDOH suggests a lead cleanup range between background levels and 1,000 mg/Kg depending on the above mentioned factors. ESI also contacted the EPA Region II Office regarding the current guidelines EPA has developed to establish soil cleanup standards for lead. The EPA personnel indicated each site was specific, however, currently the EPA has adopted a practice of selecting a cleanup range of 250 to 1000 ppm for lead.

A major consideration when evaluating the applicable cleanup standard is the potential exposure routes for contamination of humans and wildlife. The location of Moon Brook and the Chadakoin River instigated ESI to investigate the local hydrogeology to effectively determine whether the ground water leaving the subject site may be consumed as drinking water.

The State of New York Conservation Department Water Resources Commission produced a document entitled "Ground Water Resources of the Jamestown Area, New York". The report indicates water from the Chadakoin River may potentially migrate to the aquifer which supplies the Jamestown Well Field located within a few miles north of Falconer. The deltas on the Cassadaga Creek serve as a recharge source for the Jamestown Aquifer.

Deltas along the Chadakoin River have not been conclusively linked to the recharge mechanism observed in the Cassadaga deltas, however, there is some evidence the Chadakoin deltas are hydraulically linked to the Jamestown Aquifer. If the hydraulic connection between the two is possible or likely, the potential exposure route for humans is increased substantially.

The Ellison Bronze Site is located in an industrial area and will likely be used for industry in the future. Based on the current and most probable future land use, as well as the information gathered from research on lead cleanup guidelines and standards, ESI recommends implementing a lead cleanup level of 1,000 mg/kg.

The proposed cleanup level for toluene and xylene in Area B is below detection or 50 ug/kg, whichever is greater.

6.5 Interim Remedial Measure (IRM) Options

Several options have been identified as viable Interim Remedial Measure alternatives for the Ellison Bronze Site. In this section, each IRM option is discussed without focusing on cost considerations. Areas A and B targeted for remediation are shown on Drawing No. 4 in Appendix A. Common to each option is the excavation and off-site incineration of toluene contaminated soil at Area B. The following discussion of options 1 through 4 will not include a description of the remediation of Area B.

Area A targeted for remediation can be divided into three distinct regions. Each region is characterized by containing different types of material and to different average depths. Table 6.1 summarizes the three areas designated as subareas A1, A2 and A3.

TABLE 6.1

CHARACTERISTICS OF WASTE DISPOSAL SUBAREAS A1, A2 AND A3

Subarea	Aerial Extent	Average Depth of Fill	Expected Percent Hazardous	Expected Hazardous Volume	Expected Non-Hazardous Volume
A1	920-ft^2	5-feet	100	170-$yards^3$	0
A2	2,810-ft^2	2-feet	50	104-$yards^3$	104-$yards^3$
A3	4,690-ft^2	3-feet	75	391-$yards^3$	130-$yards^3$
TOTALS	8,420-ft^2	--	--	665-$yards^3$	234-$yards^3$

Option 1: Excavate and Dispose as Hazardous Waste

Soil samples have been collected and analyzed from the subsurface soils from both the employee parking lot and along Moon Brook. These samples contained lead at either hazardous waste levels (above 5.0 mg/L TCLP Analysis) or total lead levels which would likely test to be hazardous waste. Option 1 entails simply excavating the entire area targeted for remediation, pretreating the material and disposing the waste in a secure hazardous waste landfill. The actual depth of excavation will be visually determined in the field, from information gathered during the Phase II test pit data and the test boring program completed during the Remedial Investigation (RI) phase of this project. Based on the 1990 Land Ban Regulations, the waste material will likely require pretreatment prior to landfilling. The anticipated total volume of contaminated material excavated from Area A is expected to be approximately 900 cubic yards.

A verification sampling program will be completed in coordination with the excavation phase of the project to ensure the contaminated material has been removed. Soil samples will be collected from the bottom of the excavation and subjected to analytical testing. A grid with twenty foot spacing between sample locations was selected for verification sampling. Each soil sample will be analyzed for lead using USEPA Method 7421.

The analysis will be completed within 48-hours with the results being forwarded to the site immediately. In the event one or more samples were tested to be above the cleanup level specified, the contractor will excavate deeper in the vicinity of where the soil sample was collected. However, if there were no samples which were above the clean up level, no additional excavation will be required.

Option 2: **Excavate, Separate and Dispose as Hazardous and Non-Hazardous Waste**

Option 2 involves separation of excavated waste material in an effort to reduce the quantity of hazardous waste which must be remediated. Analytical data provided by Ellison Bronze Company management (Appendix E) indicates the foundry sand generated from the foundry operations is a non-hazardous waste. The grinding dust, also generated from the foundry operations was tested to be hazardous waste. The subsurface conditions in the area targeted for remediation vary significantly as described in Section 4.2.4. Separation of waste material would be done during the excavation phase of the project using visual observations as a means of distinguishing between probable hazardous waste and potentially non-hazardous material.

All potentially non-hazardous material would be placed in specialized roll-off bins designed for temporary storage of waste material. Composite testing of the material would determine whether the waste is hazardous or non-hazardous based on the lead concentrations.

In ESI's opinion, separation of the waste/soil material into hazardous and non-hazardous quantities will be a difficult process during remedial activities. The principle reason for this is the grinding dust was historically mixed with the foundry sands and dumped as a heterogenous waste. Small quantities of grinding dust interspersed with the foundry sands or soil used as fill material will probably be analyzed to be a hazardous waste. Based on observations made in the field, the assumed ratios used to estimate the quantity of waste separated to be non-hazardous will be 0 (Subarea A1), 50 (Subarea A2) and 25 (Subarea A3) percent. Therefore, the quantity of hazardous and non-hazardous waste expected from Option 2 is 665 and 234 cubic yards, respectively (refer to Table 6.1). Verification sampling will be completed as described in Option 1.

Option 3: **Excavate and On-site Stabilization**

Option 3 entails excavation of the contaminated material and on-site stabilization. The area to be excavated is shown on Drawing No. 4. The excavation of contaminated material will be closely monitored in order to ensure only contaminated fill and/or soil is excavated for on-site stabilization. The actual depth of excavation will be visually determined in the field and from information gathered during the Phase II test pit data and the test boring program completed during the Remedial Investigation. The contaminated material will be temporarily stored in covered roll-off bins supplied by the contractor. Verification sampling will be completed as described in Option 1.

On-site stabilization of the contaminated material will be completed after a portion of the excavation was verified to be clean. The material will then be transferred from the covered roll-off bins to a Pug Mill designed to perform high intensity mixing. An overview of the stabilization process is presented in Section 6.7.

A treatability study completed by the stabilization contractor and ESI will determine the optimum formula to ensure the final product will be chemically acceptable and strong enough to use for backfill purposes. The contaminated material will then be mixed in the Pug Mill and placed into the excavation in lifts to the desired level.

Option 4: Excavate, Separate and On-site Stabilization

Option 4 is a combination of Options 2 and 3 in an effort to reduce the quantity of waste which must be stabilized. The rationale and procedures for separation of the waste have been summarized in Option 2. Based on observations made in the field, the assumed ratios used to estimate the quantity of waste separated to be non-hazardous will be 0 (Subarea A1), 50 (Subarea A2) and 25 (Subarea A3) percent. The benefits to separating the waste are twofold:

1. Reduced Cost.
2. Reduce the overall increase in volume of stabilized material.

Verification sampling will be completed as described in Option 1.

6.6 Cost Comparison and Recommendation

The approximate costs associated with each of the four options have been determined based on the information presented in Table 6.2 and available disposal and/or stabilization costs. The cost associated with the remediation of Area B is not included in this discussion since the treatment technology for this area has been selected. A total waste volume of approximately 900-cubic yards are expected to be remediated in Area A during completion of the Interim Remedial Measure. This waste material can be subdivided further into 665 and 234 cubic yards of hazardous and non-hazardous waste, respectively. The cost estimates for each of the four options are presented in Table 6.2.

The cost to complete Option 1 is approximately $315,000. The unit cost of $350/cubic yard includes the cost for excavation, transportation, pretreatment, disposal, sample verification and site restoration.

The estimated cost to complete Option 2 is $241,700. This cost includes the same scope of work as Option 1, however, approximately one quarter of the waste would be separated and disposed as a non-hazardous industrial waste.

Option 3 will cost approximately $135,000 based on a unit cost of $150/cubic yard. This cost includes treatability testing, verification sampling and site restoration. The unit costs for stabilization will increase substantially if the actual volume of waste to be stabilized is below 500 cubic yards.

Option 4 will cost approximately $141,900. As with Option 3, the unit cost of $200/cubic yard includes treatability testing, verification sampling and site restoration.

TABLE 6.2

OPTIONS FOR INTERIM REMEDIAL MEASURE (IRM) FOR AREA A AT THE ELLISON BRONZE FACILITY

Option	Estimated Volume (cubic yards)	Unit Cost ($/cubic yard)	Approximate Cost	Approximate Total Cost[1]
1. Excavate and Dispose as Hazardous Waste	900	$350	$315,000	$315,000
2. Excavate, Separate and Dispose as Both Hazardous and Non-Hazardous Waste	665	$350	$232,800	$241,700
	234	$38	$8,900	
3. Excavate and Stabilization	900	$150	$135,000	$135,000
4. Excavate, Separate and Stabilize Hazardous Waste and Dispose Non-Hazardous Waste	665	$200	$133,000	$141,900
	234	$38	$8,900	

1 -- The cost to remediate Area B is not shown.

ESI recommends Option 4 based on the cost and potential to reduce the quantity of hazardous waste requiring stabilization. Due to the mixed waste present at the site, excavation, separation and stabilization will likely produce the optimum remedial alternative.

ESI has evaluated the four options presented on Table 6.2 and is recommending Option 4 based on the following considerations:

1. low cost.
2. potentially even lower cost if a greater than expected amount of non-hazardous waste can be separated.
3. lower volume due to offsite disposal of non-hazardous waste may offset the increase in volume due to stabilization.

6.7 Stabilization Plan and Treatability Study

The remedial technology chosen for Area A is excavation and on-site stabilization with alkaline cementitious reagents. A special additive may be included to the stabilization formula if the treatability study indicates it will be necessary.

The stabilization will be accomplished with excavation and high energy mixing procedures using conventional earth moving equipment and a mixer capable of making an acceptable product. The properties of an acceptable product will be dictated by the results of the treatability study. After mixing, the stabilized material will be placed back into the excavation where it will cure and solidify. A verification sampling program will be completed as part of the remediation plan to ensure the bottom of the excavation was uncontaminated prior to backfilling.

The objectives of the treatability study will be to evaluate various stabilization reagents and quantities to develop a formulation that will consistently produce a product that will pass the TCLP test for lead and which will have sufficient compressive strength to support asphalt and automobiles. The TCLP test will be used since the main concern is to prevent lead from leaching from the stabilized material.

ESI will provide the contractor with samples of soil and each type of waste observed at the site. The contractor will mix different proportions of at least four different reagents to equal quantities of the waste to generate a matrix of stabilized products. These samples will be allowed to cure for four weeks. Samples which can withstand 100 psi or greater will be subject to a TCLP test for lead. Samples which pass the TCLP test will be identified and bench scale testing will be completed with the appropriate formulations.

6.8 Excavation Plan

Excavation of foundry waste material will proceed from the area of worst contamination and extend in both the southeast and southwest directions. Results from the test pit program (Phase II Investigation), test boring program (RI Investigation) and analytical testing of the subsurface material indicates the most contaminated area is located in the vicinity of test borings B-1, B-2 and B-3.

The excavation process will consist of excavating the fill material down to the natural soils. The actual depth the contractor is to excavate will be determined in the field by the ESI Environmental Engineer. It will be ESI's responsibility to ensure no visible waste material remains in the excavation. The expected average depth of excavation in subareas A1, A2 and A3 is 5-feet, 2-feet and 3-feet, respectively.

The excavated material will be classified as probable hazardous waste or potential non-hazardous waste by the ESI Environmental Engineer supervising the contractor. Based on this classification, the material will be placed in the appropriate roll-off bin. The roll-off bins will be labeled "HAZARDOUS WASTE 1" and "HAZARDOUS WASTE 2" for the probable hazardous waste and potential non-hazardous wastes, respectively.

The excavation and stabilization phases of the Interim Remedial Measure will be completed during favorable weather (i.e. without precipitation or strong wind). Each roll-off bin will be covered upon completion of daily activities or the onset of adverse weather.

6.9 Cleanup Verification Sampling Plan

The cleanup verification sampling plan was designed to ensure the waste material and contaminated soils have been excavated to the level of confidence acceptable to the NYSDEC. The analytical test results of soil samples collected from the bottom of the excavation will determine whether additional excavation will be necessary or whether that portion of the excavation will be considered below the selected soil/cleanup levels.

A sample grid will be used for determining soil sample locations within the excavation. The spacing between the sample locations will be 20-feet in order to collect enough samples to ensure verification the waste material and/or contaminated soil has been removed from the excavation. The northwest and northeast boundaries of the sample grid will be located 10-feet from the Ellison Bronze Plant and the northeast edge of the excavation, respectively. Soil samples will be obtained by performing a surface scrape from a four-inch by four-inch area and placed directly into a precleaned 125 milliliter amber glass jar with teflon lid. Sufficient sample volume will be obtained for at least three analyses. A precleaned stainless steel hand trowel will be used to excavate the soil samples. Decontamination procedures will be used between sample locations to reduce potential cross contamination. The sample jars will be immediately shipped to Huntingdon Analytical Services, Inc. (HAS), a certified New York State Department of Health (NYSDOH) laboratory in Middleport, New York for chemical testing. Chain-of-custody records will be maintained for each sample with the sample location and required analysis.

Each soil sample will be analyzed for lead using USEPA Method 7421. The details of the analytical method can be found in an EPA document entitled "Test Methods for Evaluating Solid Waste" EPA SW-846, Third Edition. The samples will be analyzed within 48-hours of sample collection in order to speed the verification process. In doing so, the backfilling of stabilized waste may be completed as quickly as possible.

Huntingdon Analytical Services, Inc. will conduct the sample analysis incorporating the formal quality control and quality assurance program as outlined in the QA/QC Plan presented in Appendix G. All quality assurance and quality control QA/QC results will be included in the Interim Remedial Measure (IRM) Final Engineering Report.

In the event the analytical test results of the verification soil samples are above the cleanup level specified in Section 6.4, additional soil will be excavated from around the identified sample location. The soil to be excavated will be defined by a 20-foot square with the center located at the sample location which had failed. A depth of 1-foot will be re-excavated. The material will be designated as probable hazardous or potential non-hazardous based on the initial sample analytical results. The stabilized product may be backfilled into the excavation after all verification sample results were above the selected cleanup criteria.

Analytical Testing of Potential Non-Hazardous Waste

Contaminated material temporarily stored in the roll-off bin labeled "HAZARDOUS WASTE 2" will require analytical testing to verify the material is non-hazardous. Currently, the Ellison Bronze Company disposes foundry sands generated from the foundry operations at Ellery Landfill. Ellery Landfill will require a TCLP metals test to verify the material is a non-hazardous industrial waste.

One composite sample consisting of 10 subsamples will be collected from each roll-off bin labeled "HAZARDOUS WASTE 2". Provided the analytical results indicate the material is non-hazardous, the roll-off bin will be relabeled "NON-HAZARDOUS WASTE".

Stabilization of Contaminated Material

Contaminated material temporarily stored in roll-off bins designated for stabilization will be processed after verification sampling has been completed for that particular area. The contractor will load the contaminated material into a Pug Mill designed for high intensity mixing. The proper quantities of stabilization reagents will be added to the contaminated waste to form the stabilization product according to the formula as determined during the treatability study. The stabilized product will be backfilled into the excavation in lifts (if required) to allow proper curing.

One sample will be poured into a concrete cylinder every 100 cubic yards of processed waste material to be analyzed in the laboratory. A TCLP metals analysis will be conducted to verify the stabilized product has the same characteristics as expected from the treatability study results.

6.10 Site Restoration

The restoration of Area A will include the paving of the stabilized waste in order to facilitate automobile parking. The stabilized waste will be placed along the Moon Brook in such a way that the brook water will not flow directly into the stabilized waste under normal flow conditions. This will be accomplished through the placement of low permeability clay along the stabilized waste which is adjacent to the Moon Brook. An earthen cap will be placed on the stabilized waste between Moon Brook and the employee parking area. Grass will be planted in the earthen cover in this area to prevent erosion.

7.0 BASELINE RISK ASSESSMENT

This section summarizes the potential health risk(s) to public health and the environment at and in the vicinity of the Ellison Bronze Site. The objectives of this assessment are to determine the potential effects on human health and the environment associated with exposure to contaminants known to be present at the site. Additional information regarding health effects during intrusive and extrusive site work can be found in the site specific Health and Safety Plan (HASP) presented as Appendix F.

The three elements which control the potential risk of contaminants to public health and the environment are:

1. The presence of contaminants.
2. Routes of exposure.
3. Human or environmental receptors within the routes of exposure.

7.1 Potential Receptors

Potential human exposure may result from on-site contaminants or from contaminants migrating off-site through ground water, surface runoff or air emissions. Potential human exposure has been addressed for each appropriate environmental media. Measures to minimize exposure to workers and the public during the IRM are discussed in the HASP.

7.1.1 Contaminated Soil

Currently there are no manmade or natural barricades in place restricting access to either Areas A or B. Generally, the contaminated soils are buried by a thin (0 to 2-foot) cover consisting of gravel used during construction of the employee parking lot, topsoil or other uncontaminated material. Employees or the general public may be exposed to the contaminated soil by skin contact (dermal) or ingestion if the cover material is removed or disturbed.

7.1.2 Contaminated Ground Water

The Ellison Bronze Site is located in the center of the Town of Ellicott. Both residents and businesses in this area are supplied with drinking water from the City of Jamestown Board of Public Utilities (BPU) Water Division. There are no known potable

The restoration of Area B will entail the backfilling of the excavation with bank run gravel and an earthen cover. Grass will be planted in the earthen cover to prevent erosion.

6.11 Post Interim Remedial Measure Monitoring

The post Interim Remedial Measure monitoring will consist of quarterly sampling of the three existing ground water monitoring wells located at the site for a period of two years. Each of the ground water samples will be analyzed for iron, lead, manganese and zinc.

In ESI's opinion, the elevated metals detected during the Remedial Investigation will be reduced after the stabilization phase of the project is complete. After the two year monitoring program is complete, a report summarizing the results of the post IRM monitoring program will be submitted to the NYSDEC for review.

6.12 Excavate and Off-site Incineration (Area B)

The remedial technology chosen for Area B is excavation and off-site incineration of the toluene contaminated soil. Based on an aerial extent of 125-square feet and an assumed depth of 2-feet, the total volume to be incinerated is approximately 9-cubic yards.

ESI will monitor the excavation process with an Hnu photoionization detector to detect the presence of volatile organic compounds (VOC's). Soil will be excavated and placed into drums for off-site incineration until background measurements are noted with the Hnu photoionization detector.

Five verification samples will be collected from the four corners of the shed and in the center. The verification samples will be analyzed for TCL volatile organic compounds. In the event the analytical results indicate soil contamination exists above the cleanup criteria specified in Section 6.3, additional soil will be excavated from around the identified sample location. The excavation will be backfilled with clean fill after the requirements of the Sample Verification Plan have been met.

water wells within one-half mile from the Ellison Bronze Site. Therefore, ingestion of contaminated ground water is not a human exposure route.

7.1.3 Contaminated Surface Water

The surface waters which may be potentially affected from the Ellison Bronze Site are Moon Brook and the Chadakoin River. However, Moon Brook empties into the Chadakoin River at the southeast corner of the site. Contaminants entering either of these surface waters would migrate from the site and flow northeast ultimately discharging into the Allegheny River.

The location and direction of flow of the Chadakoin River caused ESI to investigate the local hydrogeology to effectively determine whether the surface water leaving the site may be consumed as drinking water. The New York State Conservation Department Water Resources Commission prepared a document entitled "Ground Water Resources of the Jamestown Area, New York". The report indicates water from the Chadakoin River may potentially migrate to the aquifer which supplies the Jamestown Well Field located within a few miles north of Falconer.

The Chadakoin River generally flows eastward into Cassadaga Creek. Cassadaga Creek flows generally southeastward into Conewango Creek which flows generally southward and into the Allegheny River. Deltas on Cassadaga Creek serve as a recharge source for the Jamestown Aquifer. Deltas along the Chadakoin River have not been conclusively linked to the recharge mechanism observed in the Cassadaga deltas, however, there is some evidence the Chadakoin deltas are hydraulically linked to the Jamestown Aquifer. If the hydraulic connection between the two is possible or likely, the potential exposure route for humans is increased substantially.

The impact of surface water contamination adjacent to the site would be significantly reduced due to natural dilution from the Chadakoin River and Moon Brook.

7.1.4 Air Contamination

Potential receptors of air emissions from the Ellison Bronze Site include employees at the site and the general public within the immediate vicinity of the site (less than 0.25-mile radius). The greatest potential health risk would occur during the proposed Interim Remedial Measure (IRM). The excavation and stabilization of contaminated soil may produce contaminated dust which could migrate from the work area to nearby humans and the environment.

Based on background Hnu photoionization measurements recorded at Area B, there is very limited volatilization of organic compounds from the undisturbed surface soils. However, excavation of contaminated soils at Area B during the proposed IRM may cause volatilization of organic compounds to the atmosphere.

7.2 Public Health Impacts

Applicable state and federal standards and guidelines are utilized as a basis for evaluating the impacts contaminants present in air, ground water and surface water may have on the general public. Table 7.1 presents the Applicable or Relevant and Appropriate Requirements (ARAR's) which are the specific regulations and guidelines pertaining to the Ellison Bronze Site.

TABLE 7.1	
REGULATORY STANDARDS AND GUIDELINES APPLICABLE TO THE ELLISON BRONZE SITE	
Standard or Guideline	Title
6 NYCRR Parts 701 and 703	New York State Water Quality Regulations
40 CFR Part 143	Secondary Drinking Water Regulations
10 NYCRR Part 5	Drinking Water Supplies
Safe Drinking Water Act	Recommended Maximum Contaminant Levels (MCL)
Clean Water Act	Water Quality Criteria for Human Health
Technical and Operations Guidance Series 1.1.1	Ambient Water Quality Standards and Guidance Values
Air Guide 1	Guidelines for the Control of Toxic Ambient Air Contaminants
6 NYCRR Part 374	Standards for Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
6 NYCRR Part 375	Inactive Hazardous Waste Disposal Sites

7.2.1 Applicable Water Quality Standards and Criteria

The surface waters in the State of New York are classified by the New York State Department of Environmental Conservation (NYSDEC) according to the "Best Usage of Waters". The Chadakoin River in the Falconer area is designated as Class C. New York State Water Quality Regulations (6 NYCRR, Part 701) identify the best usage of Class C surface water as follows:

"The usage of Class C waters is for fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit use for these purposes".

All ground water in New York State are designated by NYSDEC as Class "GA". New York State Water Quality Regulations (6 NYCRR, Part 703) identify the best usage of Class GA ground water as follows:

"The best usage of Class GA waters is as a source of potable water supply. Class GA waters are fresh ground water found in the saturated zone of unconsolidated deposits and consolidated rock or bedrock".

According to these regulations, standards applicable to Class GA ground water shall be the most stringent of those from the following sources:

1. New York State Water Quality Regulations (6 NYCRR, Part 703).
2. Maximum Contaminant Levels (MCL's) for drinking water promulgated by the New York State Department of Health (10 NYCRR, Subpart 5-1, Public Water Supplies).
3. Standards for raw water promulgated by the New York State Department of Health (10 NYCRR, Part 170, Sources of Water Supply).
4. Maximum Contaminant Levels for drinking water promulgated as Primary Drinking Water Regulations by the U.S. Environmental Protection Agency (USEPA) pursuant to the Safe Drinking Water Act (40 CFR, Part 141).

7.2.2 Comparison with Ground Water Standards

Parameters found to exceed ground water standards are presented in Table 7.2 with the maximum observed concentration and the appropriate standard. Also shown on Table 7.2 is the maximum soil concentrations found during the Remedial Investigation for comparative purposes.

Barium, iron, lead and manganese were the parameters found to be present in the ground water at concentrations above the New York State Class GA ground water standards. There was no surface water testing completed during the Remedial Investigation.

TABLE 7.2

PARAMETERS EXCEEDING GROUND WATER STANDARDS AT THE ELLISON BRONZE SITE

Parameter	Maximum Ground Water Concentration (ug/L)	Standard or Guidance Value Exceeded (ug/L)	Source[1]	Maximum Soil Concentration (ug/Kg)
Barium	1,530	1,000	703.5	125,000
Iron	33,900	300	703.5	18,900,000
Lead	95	25	703.5	2,550,000
Manganese	7,810	300	703.5	397,000

1 ---- 6 NYCRR Water Quality Regulations Part 703.5 Classes and Quality Standards for Ground Water.

7.2.3 Comparison with Sediment Guidelines

Copper and Lead were present in sediment samples above the NYSDEC Aquatic Sediment Cleanup Criteria (1989). Table 7.3 outlines the maximum sediment concentrations, cleanup criteria and maximum soil concentration. Background sediment samples collected upriver from the site were analyzed to contain 64.3 and 44.3 mg/Kg of copper and lead, respectively. The elevated levels of copper and lead in the vicinity of Area A does not pose a significant health risk and should be reduced after completion of the proposed Interim Remedial Measure.

TABLE 7.3

PARAMETERS EXCEEDING SEDIMENT STANDARDS AT THE ELLISON BRONZE SITE

Parameter	Maximum Sediment Concentration (mg/Kg)	Cleanup Criteria for Aquatic Sediments (mg/Kg)	Maximum Soil Concentration (mg/Kg)
Copper	236	19	12,900
Lead	68.5	27	2,550

1 ---- Cleanup Criteria for Aquatic Sediments (NYSDEC, 1989)

8.0 CITIZEN PARTICIPATION PLAN

The New York State Department of Environmental Conservation is committed to a citizen participation program as a part of its responsibilities for the inactive hazardous waste site remedial program. Citizen participation promotes public understanding of the Department's responsibilities, planning activities and remedial activities at inactive hazardous waste disposal sites. It provides an opportunity for the Department to develop a comprehensive remedial program which is protective of both public health and the environment.

Included in this section are the specific activities planned to be completed during the remediation of the Ellison Bronze Site. Some of the identified activities may be developed in phases as the project moves toward completion. The NYSDEC Project Manager and the Citizen Participation Specialist (ESI) will work together to evaluate the public response to the proposed remedial work and address the specific concerns highlighted through the public interaction. Public participation will be broken into the following distinct stages:

1. Prior to Approval of the Interim Remedial Measure (IRM) Work Plan by the NYSDEC.

2. After NYSDEC Approval of the Interim Remedial Measure (IRM) Work Plan.

3. During and After Completion of the Interim Remedial Measure.

8.1 Citizen Participation Activities Before IRM Work Plan Approval

- o Prepare a site mailing list of potentially affected citizens.
- o Establish a document repository at a local public facility.
- o Obtain NYSDEC approval of the documents to be placed in the document repository.

- Prepare a summary sheet describing the basic information pertaining to the site.

8.2 Citizen Participation Activities After NYSDEC Approval of the IRM Work Plan

- Prepare a public meeting notice that the Interim Remedial Measure Work Plan is available to the public for review.
- Establish a period of time when the public can comment on the project.
- Determine whether a public meeting would be beneficial to the community.
- Arrange for the public meeting including securing the public meeting room and advertisement.
- Periodically summarize the public comments and address the concerns of these citizens.

8.3 Citizen Participation Activities During and After Completion of the Interim Remedial Measure

- Notify the public, through the mail and in the newspaper of when the remedial work will be occurring.
- Summarize the remedial work completed.
- Describe the post IRM monitoring to the public.
- Place a copy of the Final Engineering Report in the document repository.
- Place a copy of the Post IRM Monitoring Report in the document repository.

9.0 FINAL ENGINEERING REPORT

A Final Engineering Report will be prepared by ESI summarizing the Ellison Bronze Site Interim Remedial Measure project. Included in this report will be the results of the treatability study, summary of excavation activities, verification and stabilization sample results, unit quantities processed and disposed of and details of the site restoration.

The Post Interim Remedial Measure monitoring program will also be discussed in the Final Engineering Report. Quarterly letter reports will be submitted to the NYSDEC presenting the ground water data generated.

ESI will not certify that the Ellison Bronze Site will be free from hazardous materials, however, the Final Engineering Report will be stamped by an ESI licensed Professional Environmental Engineer certifying the validity of the final report.

ESI hopes that this Interim Remedial Measure Work Plan will serve as both background and guidance for those involved with the Ellison Bronze Site remediation. Please contact either of the undersigned if there are any questions or comments regarding this project.

Respectfully Submitted,
EMPIRE SOILS INVESTIGATIONS, INC.

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