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Work in Progress

Excavation Plan
for Phase B Soil Remediation of RZ-B
Addendum to the Removal Action Work Plan
Tronox LLC
Henderson, Nevada

June 10, 2010

Prepared For:

Tronox LLC
560 West Lake Mead Parkway
Henderson, Nevada 89015

Prepared By:

Northgate Environmental Management, Inc.
300 Frank H. Ogawa Plaza, Suite 510
Oakland, California 94612



Deni Chambers, CEM
Principal-in-Charge



Derrick Willis
Project Manager



Ted Splitter, P.E., CEM
Principal Engineer



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Responsible Certified Environmental Manager (CEM) for this project

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and, to the best of my knowledge, comply with all applicable federal, state and local statutes, regulations and ordinances.



Susan M. Crowley, CEM 1428 Exp.:03/08/11
Crowley Environmental LLC



TABLE OF CONTENTS

1.0	INTRODUCTION	2
1.1	SITE DESCRIPTION	2
1.2	BACKGROUND.....	3
1.3	RZ-B SITE CONDITIONS.....	4
2.0	SCOPE OF WORK	6
3.0	REMEDIATION.....	8
3.1	Work Area Preparation	8
3.2	Well Abandonment	8
3.3	Excavation.....	8
3.4	Post-Excavation Backfilling	10
3.5	Air Monitoring	10
4.0	INSTITUTIONAL AND ENGINEERING CONTROLS	11
5.0	REFERENCES	12

TABLE

- 1 Excavation Area Summary

FIGURES

- 1 RZ-B Excavation areas and Nature and Extent of Contamination
- 2 Approximate Locations of Utilities RZ-B
- 3 RZ-B Excavation Area Boundaries and Target Depths of Excavation
- 4 Location of Monitoring Wells RZ-B

APPENDIX

- A RZ-B Analytical Data



1.0 INTRODUCTION

Northgate Environmental Management, Inc. (Northgate) has prepared this Excavation Plan (EP) for Remediation Zone B (RZ-B) at the Tronox LLC (Tronox) facility located in Henderson, Nevada (the Site). This EP is an addendum to the *Removal Action Work Plan for Phase B Soil Remediation of Remediation Zones RZ-B through RZ-E* (RAW) that was issued on May 4, 2010 and approved by the Nevada Division of Environmental Protection (NDEP) on May 12, 2010. The EP presents the methods and procedures to be used to implement the remedial alternative approved by NDEP for RZ-B to address contaminated soil within 10 feet below ground surface (bgs) at the Site. The scope of work presented in this EP is based on the NDEP-approved scope of work contained in the RAW and incorporates the results of a pre-confirmation sampling program performed to identify the limits of the cleanup actions (described in Section 1.2). Soil remediation work will be performed in accordance with this EP, including the Standard Operating Procedures (SOPs) established by Basic Remediation Company (BRC, 2009a-j) for the Black Mountain Industrial (BMI) complex and the *Quality Assurance Project Plan* (QAPP; AECOM and Northgate, 2009). A human health risk assessment will be conducted for RZ-B in accordance with the *Health Risk Assessment Work Plan* (HRA WP; Northgate, 2010a).

The objective of this EP is to present a cleanup strategy that complies with the NDEP Order issued to Tronox on December 14, 2009 to remove impacted soil from RZ-B by the end of 2010. For purposes of the EP and designation of potential remediation areas, “contaminated soil” is generally defined as soil containing chemicals of potential concern at concentrations exceeding NDEP worker Basic Comparison Levels (BCLs), or modified risk-based goals agreed upon by NDEP. For metals whose background concentrations exceed BCLs (e.g., arsenic), “contaminated soil” is defined as concentrations that exceed the background for the RZ as a whole. There are no NDEP BCLs for asbestos. Therefore, asbestos-related “contaminated soil” is defined as one or more long fibers (amphibole) and/or five or more long fibers (chrysotile). The final soil cleanup goals will achieve a cumulative theoretical upper-bound incremental carcinogen risk level point of departure of 1×10^{-6} and a target organ specific non-cancer hazard index of 1 for each decision unit at the Site. If needed, NDEP may re-evaluate these goals in accordance with United States Environmental Protection Agency (USEPA) guidance.

1.1 Site Description

The Tronox Site is a portion of a larger complex that was first developed by the U.S. government in 1942 as a magnesium plant for World War II operations. The Tronox LLC facility currently produces electrolytic manganese dioxide, used in the manufacturing of alkaline batteries; elemental boron, a component of automotive airbag igniters; and boron trichloride, used in the pharmaceutical and semiconductor industries and in the manufacturing of high-strength boron



fibers for products including sporting equipment and aircraft parts. RZ-B consists of approximately 42 acres of chemical manufacturing facility buildings, manufacturing facility structures, ponds and open space located between East Lake Mead Drive to the south and West Warm Springs Road to the south in the portion of the Site. A complete description of the Site, history of its use, and historical environmental investigations are presented in the RAW.

1.2 Background

At the completion of the Phase A and B Investigations, a pre-confirmation sampling program was developed in concert with NDEP to refine remediation planning and establish the vertical and horizontal extent (“cutlines”) of the proposed excavations in shallow soils (0 to 10 feet bgs). The cutline identification also allowed final risk assessment calculations to be prepared in parallel with the excavation of contaminated soils, further facilitating completion of remedial excavation by the end of 2010 as required by the NDEP Order dated December 14, 2009 (NDEP, 2009).

Chemical analyses of soil samples collected in RZ-B during the Phase A and B Investigations showed that within the upper 10 feet of soil, there are locations where dioxin, hexachlorobenzene (HCB), other semi-volatile organic compounds (SVOCs); asbestos, metals, and/or perchlorate exceed the various BCL criteria. Remedial excavation areas for RZ-B have been developed using the Phase A and B soil analytical data supplemented by the pre-confirmation sampling. The excavation areas define portions of land with BCL exceedances or other criteria, as specified on Figure 1 of the RAW and defined in Footnote 1 of the RAW. Figure 1 shows the excavation area boundaries and the chemical data upon which they are based.

The analytical data for the samples collected from soil borings from the Phase A and B Investigations and the pre-confirmation sampling are included in a CD as part of Appendix A. The CD contains a set of summary tables of the above-described information segregated by analytical method. In addition, Appendix A also contains tables presenting the sampling data for those chemicals identified to be remediated in RZ-B (arsenic, perchlorate, dioxin/furans, polynuclear aromatic hydrocarbons [PAHS] and HCB). Although asbestos will also be remediated, it is not included at this time as data are still pending. The tables highlight in yellow the soil concentrations that will be eliminated from further evaluation based on soil removal. Any anticipated changes to the next version of the figures are also noted on the tables. As part of the RZ-B risk assessment, a complete evaluation of all validated data for all chemicals will be conducted to document soil concentrations removed from further evaluation due to soil removal activities.



Northgate has not yet received all of the step-out data and asbestos data from the pre-confirmation sampling program. When these data becomes available, an errata to this report will be prepared presenting the data and any changes in excavation areas or depths of excavations.

1.3 RZ-B Site Conditions

RZ-B is generally rectangular in shape, with the long axis running roughly east to west. A small peninsular portion of RZ-B extends northward to the southern boundary of RZ-C, and an approximate 20 foot wide strip extends approximately 300 feet south in the southeast corner of the Site as shown on Figure 1. The general land surface in RZ-B slopes toward the north at a gradient of approximately 0.023 feet per foot. The developed portions of RZ-B have been modified by grading to accommodate plant facility buildings, surface impoundments, access roads, and other features.

The major buildings that exist within RZ-B consist of Unit Buildings 1 through 6. These were the main buildings during World War II magnesium production. Unit Building 3 is currently used by Tronox for offices and storage. Unit Buildings 5 and 6 are currently used by Tronox for production of manganese dioxide, with Unit 5 also used for storage. Unit Buildings 1, 2, and 4 are not currently used and have been partially demolished. Other buildings exist on the Site, including an administrative office building, a wash room building, and Tronox's boron production facility.

Historical information indicates that the central basement portion of Unit Buildings 1 and 2 have been used for disposal of demolition materials. The structural slabs that previously overlaid the basements and the east and west basement walls have been demolished and the concrete debris dropped into the basements. Up to 10 percent of the demolition debris is estimated to contain asbestos. This asbestos containing material (ACM) is reportedly non- friable. The ACM materials reportedly consist of transite piping, transite barriers, insulation pads, transite siding, and Galbestos siding. Overlying the demolition debris is soil mixed with demolition debris and a thin cap of soil. The demolition debris will be removed from these basements as part of the remediation of RZ-B. Demolition debris removed from RZ-B will be handled as ACM material and disposed of at the Republic Landfill in Apex, Nevada.

The Site is crossed by asphalt concrete roads and dirt roads. An extensive network of active and inactive underground utility lines is present under the roads and some open areas at the Site. Figure 2 presents the approximate locations and types of utilities that are present in RZ-B. This figure represents the summation of the information provided by Tronox on known utility lines. The locations of the lines have been field-checked by Northgate where surface expressions of the utilities are present. It is likely that unknown utilities, both active and inactive, also exist on the



Site and may be encountered during the remediation. Field procedures to address the possibility of encountering unknown utilities will be included in the contractor plans and specifications. It is Northgate and Tronox's intent that the contractor be responsible for locating and avoiding underground utilities during remedial activities.



2.0 SCOPE OF WORK

The remediation program at RZ-B will consist of soil excavation and off-Site disposal. The proposed excavation areas were generated using information gathered during the previous investigations, the pre-confirmation sampling, a Conceptual Site Model (CSM) review, and a field check of the existing Site conditions.

Where the boundaries of proposed excavations are truncated by the presence of the Unit buildings or the membrane lined containment basin (LOU #28), the areas are evaluated using the CSM. It is Northgate's opinion that it is unlikely that these areas are contaminated. In the case of the Unit Buildings, the central portion of the building is underlain by one basement level approximately 10 feet below existing grades. The southern portion of the Unit Buildings are underlain by two basement levels (approximately 20 feet below adjacent grade). The northern portion of the Unit Buildings is built on footings with slab-on-grade construction. However, the Unit Buildings were built in the early 1940s before the Site became contaminated. Therefore, shallow soil contamination adjacent to the buildings is not likely to be present beneath the building. It has been reported to Northgate that the lined containment area LOU #28 was constructed by excavating a sufficient amount of soil to place a thick concrete slab and two or more feet of clean fill soil beneath the membrane liner. In addition, the area is depressed over three feet below the adjacent ground surface. In our opinion, the construction excavation would have removed most, if not all, of the contaminated soil in the depth range of 0 to 10 feet in the area of LOU #28. If contaminated soil remains, it will be addressed as a risk management issue.

The soil sampling performed in the area between Unit Buildings 4 and 5 shows that the shallow soil is impacted with HCB in the northern portion, and perchlorate and arsenic in the southern portion. Excavations of 1 ½ to 4 feet are proposed in these areas, respectively. Perchlorate is detected above screening levels in deeper soils only in the southern portion of the area. These deeper soils will be addressed as a risk management issue.

Based on NDEP guidance, the results of the Phase A and B Investigations, and the pre-confirmation sampling, Tronox/Northgate will excavate contaminated soil to the excavation boundaries shown on Figure 3. Excavation areas in RZ-B will extend to the depths shown on Figure 3 and presented in Table 1. The chemical group(s) driving the target excavation depths for each excavation area are also shown in Table 1. Excavated soil will be transported for permanent off-Site disposal at the Republic Landfill in Apex, Nevada or other approved landfills, in accordance with sampling results and landfill acceptance criteria.

All work conducted as part of this EP will be performed in accordance with the following plans:



- Dust Mitigation Plan and Clark County Dust Permit;
- Perimeter Air Monitoring plan;
- Stormwater Pollution Prevention Plan;
- Contractor's Site Specific Health and Safety Plan (HSP); and
- Transportation Plan

These plans are part of the RAW (Northgate, 2010) with the exception of the contractor's Site Specific HSP.



3.0 REMEDIATION

3.1 Work Area Preparation

This section describes the preparation activities that will be performed prior to excavating and transporting soil from RZ-B excavation areas. As described in the RAW (Northgate, 2010), the following remediation support features will be established/constructed prior to performing soil excavation activities. These features are delineated in Figure 5 of the RAW:

- Access routes for authorized visitor and contractor Site ingress and egress;
- Haul roads to the public access roads;
- Clearing and disposal of vegetation in excavation areas, access and haul roads;
- Dust-control water source(s);
- Visitor area;
- Management/engineering trailers;
- Parking areas for workers, vehicles, and heavy equipment;
- Debris storage area; and
- Vehicular and personnel decontamination areas.

3.2 Well Abandonment

Thirteen monitoring wells are located within RZ-B as shown approximately on Figure 4. Based on the location of excavation areas, two of the wells (M-13 and M-143) will be impacted during remediation activities. These wellheads will be protected during excavation by marking and placement of barricades and caution tape. The soil adjacent to the casings will be either hand-excavated or excavated using small excavation equipment. Northgate and Tronox do not expect that these wells will need to be removed. If wells become damaged beyond repair, they will be properly abandoned and similar wells will be reinstalled after the remediation work is completed, in order to continue groundwater characterization and remediation activities, as needed. Well abandonment procedures will be performed in accordance with Nevada Division of Water Resources (NDWR) requirements.

3.3 Excavation

This section describes the excavation of contaminated soil from RZ-B. The excavation areas are shown on Figures 3. The areas impacted with asbestos are shown in blue on the Figure. The



remainder of the areas are shaded in tan. The target depths of excavation areas are also summarized in Table 1.

In general, the cutlines represent the lateral limit of the bottom of the excavation area. The excavations will generally be sloped or benched outward and upward from the cutline at a 1:1 slope (horizontal to vertical). In cases where the excavation abuts a structure or feature that cannot be removed, the cutline represents the top-of-slope. Temporary fencing will be placed along the perimeter of excavations 5 feet or more in depth and in areas where the excavations represent a potential traffic or safety hazard. If excavations are to be left un-backfilled, the side slopes will be flattened to a 2:1 slope (horizontal to vertical). During construction, portions of the excavation sidewalls may also be flattened or the excavation partially backfilled to facilitate vehicle traffic or soil handling activities.

The target excavation depths may be revised in the field in response to encountering utilities, buried pavement, and other buried structures. Northgate will obtain NDEP approval of any changes to the excavation depths shown in Table 1 as field work progresses and if special cases are encountered.

It is anticipated the excavations deeper than 1 foot will be performed with heavy earth-moving excavators. Excavations less than 1 foot deep will be performed either with an excavator or motor grader (blade). The contractor may elect to stockpile soil in the excavation area or may load the soil directly into trucks for off-Site disposal.

The boundaries of the excavations for areas impacted with asbestos have been restricted to unpaved areas only. It is Northgate's opinion that the historic pavement areas preceded the event(s) that resulted in asbestos contamination. In addition, the thickness of the pavement section (asphalt concrete and aggregate base approximately 1-foot in thickness) are equal to or exceed the thickness of soil requiring removal. Because the elevation of the top of the pavement is approximately the same as the elevation of the adjacent unpaved soil surface, the impacted soil, if present during the time of pavement installation, would have already been removed.

As shown on Figure 3, there are two borings that were drilled adjacent to pavement surfaces RSAS8 (southeastern corner) and SA136 (adjacent to the Chemstar property). These borings are actually located on soil. However, due to survey issues they are shown on paved surfaces on the Figure. It should be noted that the limits of the excavation in these areas are based on the edge of the paved surface. These boring locations may be adjusted in the future.

Where trucks or other equipment will exit the excavation area onto clean active roadways, portable wheel-washing equipment will be required in accordance with the RAW.



3.4 Post-Excavation Backfilling

Tronox will backfill some or all of the excavations in RZ-B with clean material. Backfill will be required to maintain vehicle access in excavation areas where roadways exist. Such backfilling will be performed by the contractor in accordance with the remediation plans and specifications. Backfill materials will be tested by Northgate for geotechnical and environmental compliance requirements. The test results will be provided to NDEP for approval before the material is accepted for use in backfilling. It is anticipated borrow sources for soil backfill for RZ-B excavations will be from clean areas(s) on the project Site.

3.5 Air Monitoring

Air monitoring will be performed for fugitive dust emissions, chemicals of concern and volatile chemical emissions in accordance with the *Perimeter Air Monitoring Plan* (PAMP; Appendix B of the RAW) and the Contractor's Health and Safety Plan. The RZ-B specific list of constituents that will be monitored are presented in Table 1 of the PAMP. Because of the relatively small size of the excavation area in comparison to the overall Site, it is Northgate's opinion that perimeter monitoring at the edges of individual excavation areas is not necessary to demonstrate that the dust control measures are adequate. Northgate/ Tronox proposes to perform the perimeter air monitoring at the Site perimeter as described in the PAMP. In addition, PM10 real-time monitoring will be performed on selected workers in the work area. The perimeter and worker air monitoring will be used to evaluate the effectiveness of dust control measures in mitigating emissions. If emissions exceed the action levels outlined in the PAMP, actions will be taken in accordance with the PAMP to bring the emissions into conformance with the plan. Mitigation actions include additional wetting of the soil, covering of exposed soil stockpiles, use of dust palliatives, ceasing operations if the wind velocity exceeds the value set in the PAMP, and ceasing operations until effective measures are implemented.



4.0 INSTITUTIONAL AND ENGINEERING CONTROLS

It is Tronox's intent to excavate contaminated soils in RZ-B excavation areas to the lateral extent and to the depths described in Table 1 and shown on Figure 3. Currently there are no planned locations where institutional or engineering controls are proposed within RZ-B. If unforeseen conditions are encountered during remediation, Northgate/Tronox will notify NDEP and provide input regarding the conditions encountered. If a decision is made to institute institutional or engineering controls, the procedures will be in accordance with the NDEP approved the Revised Environmental Covenants, Institutional and Engineering Control Plan, submitted by Northgate/Tronox on June 9, 2210 for NDEP review and comment.



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FIGURES



TABLE



APPENDIX A
RZ-B ANALYTICAL DATA
(Provided on DVD)

