



*environmental management, inc.*

## MEMORANDUM

**From:** Deni Chambers, CEM.  
Ted Splitter, PE, CEM

**Date:** January 28, 2011

**To:** Shannon Harbour, PE  
Greg Lovato, PE  
Nevada Division of Environmental Protection

**RE:** Cost Evaluation Proposed Environmental Covenant Areas  
Tronox Henderson Remediation Project, Henderson, Nevada

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As requested by the Nevada Division of Environmental Protection (NDEP), Northgate Environmental Management, Inc (Northgate) has prepared a cost evaluation for the proposed Environmental Covenant, Institutional and Engineering Control Areas (IC/EC areas) at the Tronox Henderson site (Site). As you will note from this memo, the costs to remove impacted soil are 3 to 10 times higher if completed now, as opposed to soil removal at a later date when areas are no longer operational. Proposed engineering and institutional controls will be protective of these areas.

Northgate met with the NDEP and the Trust on December 13, 2010 at the Site to view and discuss the proposed IC/EC areas. Following that meeting, the Environmental Covenants, Institutional and Engineering Control Plan (IC/EC Plan), was revised and submitted to NDEP on December 20, 2010 (Appendix A to the Environmental Risk Management Plan). This plan is currently under review by NDEP.

During our weekly call on January 21, 2011, NDEP requested that Tronox provide a cost evaluation for the proposed IC/EC areas. The attached Table 1 provides estimated remediation costs for these IC/EC areas. It presents the IC/EC areas, with associated affected excavation polygons, excavation depths, estimated volume of impacted soil in the excavation areas, the estimated cost to remediate, and the estimated cost-per-cubic-yard. Table 2 describes the proposed IC/EC areas where NDEP has concurred that institutional and/or engineering controls are appropriate.

Northgate is available to NDEP and the Trust to meet and discuss the information provided in this memorandum and the Tables. Please contact us at your earliest convenience.

### ATTACHMENTS

- Table 1 Summary of Institutional and Engineering Control Areas
- Table 2 Summary of NDEP-Concurred Institutional and Engineering Control Areas
- Figure 1 Proposed Environmental Covenant Areas



**TABLE 1**  
**Summary of Institutional and Engineering Control Areas**

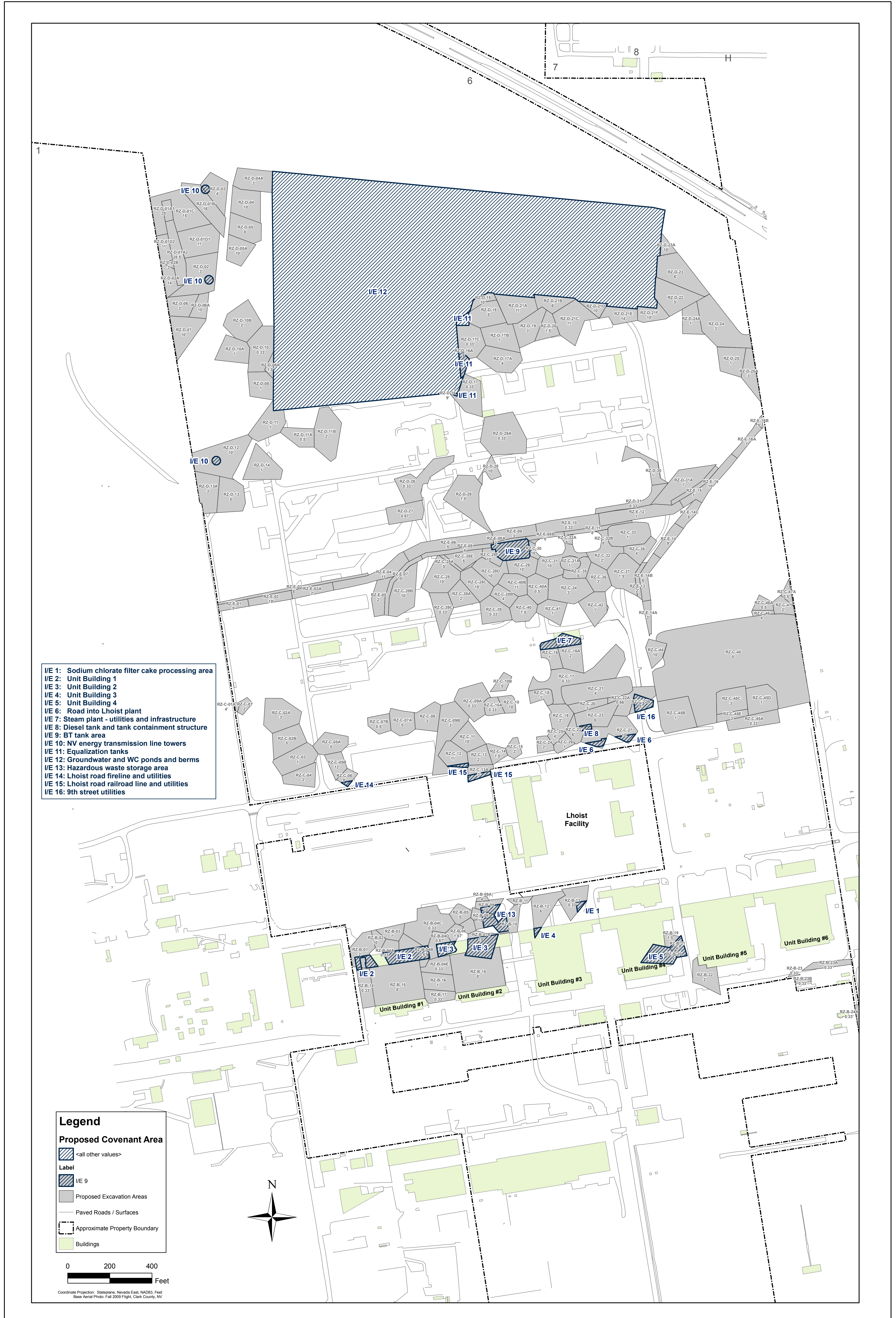
	IC/EC Area <sup>1</sup>	Affected Excavation Areas	Excavation Depth (feet)	Estimated Volume of Impacted Soil Left in Place (cubic yards)	Cost to Remediate	Cost/Cubic Yard
1	I/E 6: Lhoist Plant Road	RZ-C-27	10	482	See line 7	
2	I/E 11: Groundwater Treatment System Equalization Tanks	RZ-D-16	9	30	\$25,926	\$864 / CY
		RZ-D-16A	9	960	\$285,419	\$297 / CY
3	I/E 12: PRP Inlet/Outlet Pipelines	RZ-D-15	10	368	\$765,712	\$223 / CY
		RZ-D-21A	11	486		
		RZ-D-21B	6	177		
		RZ-D-21C	11	101		
		RZ-D-21D	10	551		
		RZ-D-21E	14	640		
		RZ-D-21F	10	515		
		RZ-D-22	5	184		
		RZ-D-23	6	221		
		RZ-D-23A	10	184		
4	I/E 14: Lhoist Road water line and other utilities	RZ-C-06	9	90	See line 7	
5	I/E 15: Lhoist Road, railroad line and utilities	RZ-C-12	11	207	See line 7	
		RZ-C-13A	3	306	See line 7	
6	I/E 16: 9th Street utilities	RZ-C-22B	8	1,592	\$585,237	\$368 / CY
7	I/E 6, I/E 14, I/E 15, Railroad line, water line & other utilities	RZ-C-27	10	482	\$559,625	\$516 / CY
		RZ-C-06	9	90		
		RZ-C-12	11	207		
		RZ-C-13A	3	306		

Notes:

- IC/EC areas are also referred to here as I/E areas.
- Typical 2010 / 2011 Excavation/Disposal Costs / Cubic Yard = \$75 / cubic yard.
- The estimated costs envision that utility lines that are necessary for plant operations and that cannot be supported in the excavations will be temporarily or permanently replaced prior to being taken out of service and the transition to the new or temporary lines have no associated plant shutdown time.
- Northgate has not included any costs associated with road closures. The cost estimates also assume that the project is continuing and no additional mobilization/demobilization costs are included.
- The volume estimates and costs for disposal include the side slope volumes and the cost/cubic yard is based on the volume of impacted soil as shown on the excavation plans.
- Where possible, Northgate obtained estimates from Las Vegas Paving and other specialty contractors to prepare the estimated costs.

**TABLE 2**  
**Summary of NDEP-Concurred**  
**Institutional and Engineering Control Areas**

	<b>IC/EC Area</b>	<b>Status</b>	<b>Affected Excavation Areas</b>	<b>Comments</b>
1	I/E 1: Sodium Chlorate Filter Cake Process Area	NDEP Concurrence	RZ-B-13	TRONOX OPERATIONAL AREA. Existing concrete slab-on grade in use by Tronox and cannot be taken out of service without replacement.
2	I/E 2: Unit Building 1	NDEP Concurrence	RZ-B-01	The chlorine transmission pipeline from Olin to TIMET is attached to the building 20 feet above grade. The building cannot be demolished without installing an alternate pipeline system.
			RZ-B-04A	
			RZ-B-04B	
			RZ-B-14	
3	I/E 3: Unit Building 2	NDEP Concurrence	RZ-B-04D	TRONOX OPERATIONAL AREA. The chlorine transmission pipeline from Olin to TIMET is attached to the building 20 feet above grade. The building cannot be demolished without installing an alternate pipeline system. The southern portion of Building 2 is used in the plant electrical supply system and cannot be taken out of service
			RZ-B-07B	
4	I/E 4: Unit Building 3	NDEP Concurrence	RZ-B-12	TRONOX OPERATIONAL AREA. The chlorine transmission pipeline from Olin to TIMET is attached to the building 20 feet above grade. The building cannot be demolished without installing an alternate pipeline system. The southern portion of Building 3 is used in the plant electrical supply system and cannot be taken out of service
5	I/E 5: Unit Building 4	NDEP Concurrence	RZ-B-20	TRONOX OPERATIONAL AREA. The chlorine transmission pipeline from Olin to TIMET is attached to the building 20 feet above grade. The building cannot be demolished without installing an alternate pipeline system. The southern portion of Building 4 is used in the plant electrical supply system and can not be taken out of service
6	I/E 7: Steam Plant and Associated Features	NDEP Concurrence	RZ-C-16	TRONOX OPERATIONAL AREA. The steam plant is an essential component of Tronox manufacturing operations and cannot be removed from service. The open areas outside the building are used for support of above ground utility lines. The supports for these lines are in poor condition and excavation in these areas would destabilize the above ground lines.
			RZ-C-16A	
7	I/E 8: Diesel Tank	NDEP Concurrence	RZ-C-22	TRONOX OPERATIONAL AREA. The above ground diesel Tank and its concrete containment are currently in service. This tank is an essential facility to provide emergency fuel to power the steam plant in case of an electrical failure. Without this facility the plant would be forced to shut down if there is a loss of power.
			RZ-C-23	
			RZ-C-27	
8	I/E 9: BT Tanks	NDEP Concurrence	RZ-C-28F	TRONOX OPERATIONAL AREA. Tanks are part of the groundwater treatment system operated by Veolia as part of the Perchlorate Removal Project. They cannot be removed from service.
			RZ-C-28	
			RZ-E-08A	
			RZ-C-30	
9	I/E 10: NV Energy Transmission Line Towers	NDEP Concurrence	RZ-D-01B	Transmission towers are owned by NV Energy and cannot be removed from service.
			RZ-D-02	
			RZ-D-03	
10	I/E 11: Groundwater Treatment System Equalization Tanks	NDEP Concurrence	RZ-D-18	VEOLIA OPERATIONAL AREA. Tanks are part of the groundwater treatment system operated by Veolia as part of the PRP system. They cannot be removed from service.
			RZ-D-17C	
11	I/E 12: GW-11 Pond and Berms and WC Ponds and Berms	NDEP Concurrence	N/A	VEOLIA OPERATIONAL AREA. The GW-11 pond is an essential part of the PRP treatment system. The WC ponds are in use by Tronox and are essential to their production operations and cannot be removed from service.
12	I/E 13: Former Hazardous Waste Storage Area	NDEP Concurrence	RZ-B-07A	TRONOX OPERATIONAL AREA. The two tanks and membrane-lined containment are for emergency storage of liquids by Tronox in the event of a spill. They are essential for safe operation of the plant.
			RZ-B-08	
			RZ-B-09	
			RZ-B-10	



SHEET NUMBER  
1

FIGURE NUMBER  
1

PROPOSED ENVIRONMENTAL COVENANT AREAS		
Tronox LLC Henderson, Nevada		
SCALE: 1 in = 200 ft	DATE: 01/28/2011	PROJECT NUMBER: 2027.07 T30

DESIGNED BY:	NO.:	REVISIONS	DATE:	BY:
AK		DESCRIPTION:		
DRAWN BY:				
MW				
CHECKED BY:				
OAS				
APPROVED BY:				
AK				

**northgate**  
 environmental management, inc.  
**TRONOX**  
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