

**RCRA CORRECTIVE MEASURES
IMPLEMENTATION REPORT
THE ENSIGN-BICKFORD COMPANY
SPANISH FORK, UTAH**

Prepared for:

**The Ensign-Bickford Company
and
The Spanish Fork Technical Committee**

Prepared by:

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EXECUTIVE SUMMARY

In May 2007, The Ensign-Bickford Company (EBCo) completed a RCRA¹ Facility Investigation (RFI) of its facility located in Spanish Fork, Utah (the Site) and submitted a report (RFI Report) to the Utah Department of Environmental Quality (DEQ) Division of Solid and Hazardous Waste (DSHW). The RFI Report describes the physical and environmental setting of the Site and the environmental conditions of potentially affected media including soil, surface water, ground water and air. As identified during the RFI, constituents of potential concern (COPCs) at the facility consist of constituents of energetic materials (CEMs), metals (lead and antimony), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons and other compounds or groups of compounds, with CEMs typically representing the greatest contribution when estimating and addressing potential risks. The results of human health and ecological risk assessments were presented in the RFI Report, reflecting the conditions of the Site at the date the RFI Report was issued. The Division of Solid and Hazardous Waste approved the RFI Report on February 20, 2008.

In response to conditions described in the RFI Report, EBCo proposed corrective actions in the Revised Corrective Measures Study Report (CMS Report, Charter Oak 2008) and the Corrective Measures Implementation Work Plan (CMI Work Plan, Charter Oak 2008). DSHW approved these documents on April 2, 2008 and since then EBCo has implemented the proposed corrective measures. This RCRA Corrective Measures Implementation Report (CMI Report) describes final corrective actions completed at the Site. EBCo ceased manufacturing activities in February 2006 and since then has removed the potential sources of future impacts. The objectives of this report are to describe final environmental site conditions, present a risk assessment for those conditions, and demonstrate that the facility has been adequately remediated and that the provisions of the CMI Work Plan have been

¹ RCRA is the Resource Conservation and Recovery Act, which was enacted by Congress in 1976. RCRA's primary goals are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner.

satisfied. For certain limited areas, environmental covenants shall be recorded and a site-specific Site Management Plan will apply.

The following significant activities were completed as part of the RCRA corrective action or facility decommissioning processes (not necessarily in the order presented):

- Excavation and on-site thermal treatment of certain soils that contained CEMs or other COPCs exceeding applicable risk-based criteria. This activity was performed as an interim measure during the 2005 to 2006 time period.
- Excavation and off-site disposal of certain soils that contained CEMs or other COPCs exceeding applicable risk-based criteria. This activity was performed during both interim measures (2006 to 2007) and as part of the final corrective actions performed during 2008 and 2009.
- Excavation and on-site consolidation of soils containing residual concentrations (meeting industrial/commercial levels) of COPCs to ensure that all areas meet target risk criteria for designated future land uses. Those areas where soils have been consolidated are subject to Activity and Use Limitations (AULs) to be specified in an Environmental Covenant and a Site Management Plan, consistent with the risk assessment.
- Thermal treatment and removal of buildings and other infrastructure that may have contained potentially reactive residues from historical manufacturing activities; and,
- Open burning/open detonation of debris removed from the facility that potentially contained reactive products or residues.
- Backfilling of excavations and re-vegetation as applicable.

Following these activities, data have been collected in order to characterize the current conditions at the facility. This CMI Report presents the current conditions, following these substantial corrective actions. In the case of many areas (referred to as solid waste management units, or SWMUs), at least some of the data collected during earlier investigations are no longer relevant to the current conditions because they were data generated from samples of soils that have been removed for on- or off-site management. The

final human health and ecological risk assessments are, therefore, performed using data generated from samples taken only from soil remaining at the Site (representing the current Site conditions) and do not include data for soils that have been removed during interim or final corrective actions.

Consistent with the RFI Report, EPA guidance and DEQ criteria, the final site characterization and human health risk assessment (HHRA) evaluates multiple potential routes of human exposure to on-site conditions including: ingestion of soil; dermal contact with soil; inhalation of vapors and particulates; ingestion of produce (fruits and vegetables) grown in affected soils; and exposure via potential impacts to the regional aquifer (a.k.a. the migration to the regional aquifer (MTRA) assessment). The ecological risk assessment (ERA) presented in the RFI Report has also been updated, assessing potential risks to representative ecological receptors (e.g. plants, insects, birds, mammals). Characterization of the facility is sufficient to complete the risk assessments and to support potential future site development and land use. The final human health and ecological risk assessments indicate the following:

- The entire Site meets acceptable risk levels for industrial commercial use. Two specific areas of the Site require engineered vapor controls if buildings or utilities are constructed in order to maintain this status.
- The entire Site meets acceptable risk levels for a construction worker.
- The entire Site meets acceptable risk levels for a visitor-trespasser-recreationalist.
- The entire Site meets acceptable risk levels for an off-site resident (primarily the MTRA pathway).
- The entire Site meets the ecological risk criteria established by DEQ in the RFI Report approval.
- The vast majority of the Site (approximately 451 acres out of a total 481 acres) is suitable for unrestricted use, including residential uses.
- Portions of the Site (approximately 30 acres or less than 7% of the total area) meet acceptable risk levels when subject to certain AULs specified in a Site Management Plan and Environmental Covenants. The boundaries of the areas

subject to these limitations are supported by the data and risk assessment (See Figure ES-1).

- Use of ground water underlying approximately the northern half of the Site without treatment is restricted (see Figure ES-2).

Based on information presented in the RFI Report, a Hazardous Waste Management Unit (HWMU) closure report, No Further Action (NFA) Petitions and human health risk assessments performed in accordance with R315-101-5.2(b)1, the Utah Division of Solid and Hazardous Waste (DSHW) previously determined that 18 SWMUs (SWMUs 4, 8, 9, 11, 13, 14, 20, 21, 23, 25, 29, 32, 34, 37, 38, 40, 43, and 44) met the requirements for a “no further action” (NFA) determination as defined by Utah Administrative Code R315-101-6(c)(1) and, as such, are suitable for unrestricted use. With the submittal of this CMI Report, EBCo requests NFA determinations for three additional SWMUs (3, 15 and 27), bringing the total number of SWMUs satisfying NFA requirements to 21 of a total of 44 SWMUs.

Correspondingly, 23 SWMUs at the Site (or portions thereof), representing a total of approximately 30 acres, are subject to appropriate site management controls as specified in Environmental Covenants and the Site Management Plan. These areas, called “Controlled Areas”, are illustrated in Figure ES-1 provided as part of this Executive Summary. The Activity and Use Limitations (AULs) that apply to each Controlled Area are described in the Site Management Plan. With the imposition of these AULs, the entire site satisfies applicable risk criteria for future land use. Table ES-1 summarizes the corrective action status for each SWMU. The last column presents a checked box if this CMI Report contains the human health risk assessment for that SWMU.

Table ES-1: Corrective Action Status Summary

SWMU No.	SWMU Name	Final Corrective Action Status	Supporting Documentation	DSHW Approval Status	HHRA CMI Report
01	North Impoundment and Wastewater Conveyance Structure	AULs	CMI Report SMP CAMU Closure Report	Pending	✓

Table ES-1: Corrective Action Status Summary

SWMU No.	SWMU Name	Final Corrective Action Status	Supporting Documentation	DSHW Approval Status	HHRA CMI Report
01DA	Wastewater Dispersion Area	AULs	CMI Report SMP	Pending	✓
02	PETN Pack House and Sump	AULs	CMI Report SMP	Pending	✓
03	Former Acid Ponds	NFA	CMI Report	Pending	✓
04	SICBM Magazine	NFA	NFA Petitions (May 2009)	NFA approved 9/22/09	
05	Building 18	AULs	CMI Report SMP	Pending	✓
06	Building 17	AULs	CMI Report SMP	Pending	✓
07	Building 65	AULs	CMI Report SMP	Pending	✓
08	NCN Building and Tanks	NFA	RFI Report	NFA approved 9/9/08	
09	Dryer Building and Ditch	NFA	RFI Report	NFA approved 9/9/08	
10	Breakout Building	AULs	CMI Report SMP	Pending	✓
11	Explosives Burn Area	NFA	NFA Petitions (May 2009)	NFA approved 9/22/09	
12	Burn Pit and Burn Cage Storage Area	AULs	CMI Report SMP	Pending	✓
13	South End Steam Trap	NFA	RFI Report	NFA approved 9/2/08	
14	North End Steam Trap	NFA	RFI Report	NFA approved 9/2/08	
15	Inactive Thermal Treatment Area	NFA	CMI Report	Pending	✓
16	Quality Control Testing Area	AULs	CMI Report SMP	Pending	✓
17	Boiler Building, Blowdown and Fuel Oil Tanks	AULs	CMI Report SMP	Pending	✓
18	Building 3 and Sanitary Septic System	AULs	CMI Report SMP	Pending	✓
19	New PETN Nitration Building, Old RDX Recrystallization Building	AULs	CMI Report SMP	Pending	✓
20	New and Old Maintenance Buildings	NFA	NFA Petitions (May 2009)	NFA approved 9/22/09	
21	Laboratory Sump	NFA	SWMU 21 RCRA Closure Report	NFA approved 11/8/08	

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SWMU No.	SWMU Name	Final Corrective Action Status	Supporting Documentation	DSHW Approval Status	HHRA CMI Report
22	Building 20	AULs	CMI Report SMP	Pending	✓
23	Lab Building & Septic Field	NFA	RFI Report	NFA approved 9/2008	
24	Old Boiler Building, Blowdown and Storage Tank	AULs	CMI Report SMP	Pending	✓
25	Shell House	NFA	RFI Report	NFA approved 9/2008	
26	NW Manufacturing Complex	AULs	CMI Report SMP	Pending	✓
27	<i>Southeast Disposal Sites</i>	<i>NFA</i>	<i>CMI Report</i>	<i>Pending</i>	✓
28	East Central Disposal Sites	AULs	CMI Report SMP	Pending	✓
29	Mix Laboratory and Ballistic Pendulum Building	NFA	NFA Petitions (May 2009)	NFA approved 9/22/09	
30	Northeast Manufacturing Complex	AULs	CMI Report SMP	Pending	✓
31	Specialty Nitrates Manufacturing Complex	AULs	CMI Report SMP	Pending	✓
32	Southeast Waste Pile	NFA	RFI Report	NFA approved 9/2008	
33	Boneyard	AULs	CMI Report SMP	Pending	✓
34	Change House Septic System	NFA	RFI Report	NFA approved 9/2008	
35	Slurry House and Sump	AULs	CMI Report SMP	Pending	✓
36	Case House Complex	AULs	CMI Report SMP	Pending	✓
37	Drum Storage Area	NFA	NFA Petitions (May 2009)	NFA approved 9/22/09	
38	Locomotive Shed and Gasoline Tank	NFA	NFA Petitions (May 2009)	NFA approved 9/22/09	
39	Building 60	AULs	CMI Report SMP	Pending	✓
40	Upper QA Testing Area	NFA	NFA Petitions (May 2009)	NFA approved 9/22/09	
41	Old Dryer Building	AULs	CMI Report SMP	Pending	✓
42	RDX Accumulation Tanks	AULs	CMI Report SMP	Pending	✓

Table ES-1: Corrective Action Status Summary

SWMU No.	SWMU Name	Final Corrective Action Status	Supporting Documentation	DSHW Approval Status	HHRA CMI Report
43	South Gully	NFA	RFI Report	NFA approved 9/2008	
44	Northwest Leach Field	NFA	NFA Petitions (May 2009)	NFA approved 9/22/09	

Note: *Italics, bolded entries indicate SWMUs that are presented for NFA approval in this CMI Report.*

During the interim measures and final corrective actions at the Site, approximately 311,000 tons of soils were excavated and managed by a combination of on-site thermal treatment, off-site landfill disposal and on-site consolidation. Environmental characterization of the Site was accomplished through the collection and analysis of approximately 936 surface soil samples, 1,374 subsurface soil samples and 2,691 post-excavation confirmation soil samples during the RFI, interim measures and final corrective actions. Over 650 ground water samples have been collected from on-site monitoring wells.

Ground water conditions have been described extensively in previously issued site-related documents, including the Corrective Action Plan (CAP) (Charter Oak, 2002), the RFI Report and Ground Water Annual Reports and are not addressed further in this document. Site management controls related to on-site current ground water conditions, ground water corrective action, and ground water monitoring are addressed in the Site Management Plan. These data were used to establish the AUL for “no regional ground water use without treatment” for a portion of the Site.

EBCo has already implemented a ground water recovery program, beginning in 1998, to address existing on- and off-site conditions in the regional aquifer. The CAP, approved in a January 2007 Addendum to Stipulation and Consent Order (Docket No. GW 90-01-A) between the Utah Water Quality Board and The Ensign-Bickford Company, addresses existing conditions in the regional aquifer and includes the operation, maintenance and monitoring requirements of ground water recovery and treatment facilities. DWQ has responsibility and authority to administer corrective actions for the off-site regional aquifer. Applicable elements of the ground water corrective action program, including operation and

monitoring of on-site recovery well R-1 and associated treatment systems are included in the Site Management Plan for the Site.

Existing ground water recovery well R-1 (which operates under the CAP) captures constituents in regional ground water present in the northeast portion of the Site. The recovered ground water is currently treated and made available for beneficial use as secondary irrigation water to Spanish Fork City. This well will continue to operate in this manner until such time as DSHW approves a request to discontinue operation of this well for ground water recovery purposes.

Table ES-2 summarizes the key environmental reports that have been submitted to DEQ in relation to the on-site corrective actions.

Table ES-2: Key Documentation Regarding Environmental Conditions at the Site

Document	Date Submitted	Description	DEQ Approved
Final Revised RFI Work Plan - Volumes I and II (Montgomery Watson, 1998)	December 1998	Work Plan for implementation of the RCRA Facility Investigation.	✓
Corrective Action Plan (Charter Oak, 2001)	July 2001 Revised: May 2002 Amended: August 2004	Comprehensive assessment of hydrogeologic characteristics and ground water quality conditions of the Site and surrounding area. Presents a description and assessment of implemented ground water corrective actions.	✓
Migration to Regional Aquifer Assessment Work Plan (Charter Oak, 2004)	January 2004 Response to Comments: 7/1/2004	Work Plan for assessing the soil to ground water (MTRA) pathway. MTRA methods were refined extensively as described in the RFI Report.	✓
Proposed Human Health Risk Assessment Methods, RCRA Closure of Open Burning/Open Detonation Units (Charter Oak, 2004)	December 2004 Response to Comments: 6/1/2005 6/29/2005	Presents proposed human health risk assessment methods for the RFI, including toxicity values for COPCs, relevant exposure scenarios and dose equations. These proposed HHRA methods were subsequently modified as described in two “response to comments” submittals and updated in the RFI Report.	✓
Revised Tier I Screening Level Ecological Risk Assessment Report (Charter Oak and Terra Technologies, 2004)	March 2004	Screening Level Ecological Risk Assessment	✓

Table ES-2: Key Documentation Regarding Environmental Conditions at the Site

Document	Date Submitted	Description	DEQ Approved
RCRA Closure Report and Certification for Solid Waste Management Units 11 & 12 (Charter Oak, 2006)	September 2006	Summary of closure activities for the Explosives Burn Area and Burn Pit, including equipment disposal, soil excavation, sampling and analysis, human health risk assessment and certification of closure to an industrial/commercial standard.	✓
RCRA Interim Measures Report (Charter Oak, 2007)	February 2007	Summary of soil excavation, treatment and management for the 2005-2007 interim measures program at the EBCo site. Treated soil analytical data are contained in this report.	✓
RCRA Facility Investigation Report (Charter Oak, 2007)	May 2007 Response to Comments: 10-10-07 12-13-07 1-15-08 2-4-08 2-18-08	Comprehensive assessment of soil and ground water conditions at the Site as of May 2007 based on the RFI and completed interim measures. Presented human health and ecological risk assessment methods and results for every SWMU based on conditions at that time.	✓
Revised Corrective Measures Study Report (Charter Oak, 2008)	February 2008	Presented alternatives for completing corrective actions at the Site and establishing potential site management controls	✓
Corrective Measures Implementation Work Plan (Charter Oak, 2008)	March 2008	Describes methods and procedures for final corrective actions of soils to be completed at the Site	✓
Proposed Methods for Evaluating Cumulative MTRA Risks (Charter Oak, March 2008)	March 2008 Response to Comments: 7/9/08	Describes methods for evaluating cumulative MTRA risks at the Site.	✓
No Further Action Petitions for Selected Solid Waste Management Units (Charter Oak, 2009)	May 2009	Presented data and human health risk assessment results for eight SWMUs where additional corrective actions resulted in the SWMUs meeting requirements for NFA determinations.	✓
Corrective Measures Implementation Report (Charter Oak, 2009)	December 2009	Presents final site conditions, human health and ecological risk assessments. Identifies areas of the Site that do not satisfy NFA requirements and are subject to AULs.	
Site Management Plan (Charter Oak, 2009)	December 2009	Defines AULs for the Site. Describes short and long-term actions for management of portions of the Site subject to AULs.	

In conclusion, this CMI Report is the culmination of an extensive investigation and remediation program at the Site. The analytical data, corrective measures and risk assessments presented herein demonstrate that the Site has been rendered suitable for future site development and land use.