Site-Specific Land Disposal Restrictions Treatability Variance Petition

Strebor Inc., Kalamazoo, Michigan

November 2016
Revision 00

Prepared for:

Strebor Inc.
2305 Superior Avenue
Kalamazoo, Michigan 49001

Prepared by:

Bay West
Customer-Focused Environmental & Industrial Solutions

Bay West LLC
5 Empire Drive
St. Paul, Minnesota 55103

Table of Contents

List of Tables

List of Figures

Appendices

Acronyms and Abbreviation

%	percent
ACT 451	Natural Resources and Environmental Protection Act, 1994 PA 451, as amended
Aptus	Aptus Environmental Services
Bay West	Bay West LLC
BDAT	best demonstrated available technology
CAS	Chemical Abstract Service
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
Dow	Dow Chemical Company
Enforceable Agreement	Agreement for a Limited Industrial Remedial Action Plan
ETG	ETG Environmental, Inc.
FR	Federal Register
ft	feet
GAC	granular activated carbon
GWTS	groundwater treatment system
HxCDD	hexachlorodibenzo-p-dioxin
HxCDF	hexachlorodibenzofuran
IC	institutional control
ID	identification
lb	pound or pounds
KP	klozur persulfate
Laidlaw	Laidlaw Environmental Services
LDR	land disposal restriction
LNAPL	light non-aqueous phase liquid
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MDNRE	Michigan Department of Natural Resources and Environment
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
Michigan Program	Michigan Hazardous and Liquid Industrial Waste Management Program
MTTD/BCD	medium temperature thermal desorption and base-catalyzed decomposition
NA	not analyzed
OU	operable unit
PCP	pentachlorophenol
PeCDD	pentachlorodibenzo-p-dioxin
PeCDF	pentachlorodibenzo-furan
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
ppt	parts per trillion
RCRA	Resource Conservation and Recovery Act
RGIS	Revetment Groundwater Interception System
RRD	Remediation and Redevelopment Division
SOU	soil operable unit
SSOU	subsurface soil operable unit
Strebor	Strebor Inc.
Swan Hills	Swan Hills Treatment Center
TCDD	tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofuran
TCLP	toxicity characteristic leachate procedure
TEF	toxicity equivalence factor
TEQ	toxicity equivalence
USEPA	United States Environmental Protection Agency

UST	underground storage tank
UTS	Universal Treatment Standards
Veolia	Veolia Environmental Services
Wayne Disposal	Wayne Disposal, Inc.
WDS	Waste Data System
Wheeler	Wheeler Consolidated Industries
WHO	World Health Organization

CERTIFICATION

The following certification is made pursuant to the requirements of 40 Code of Federal Regulations (CFR) 268.44 for a variance from a treatment standard:

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this petition and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Strebor Inc.

Lorraine Cancro

Signature

Lorraine Cancro

Vice President

Date 10/12/16

1.0 INTRODUCTION

1.1 Petition for Treatability Variance

In accordance with 40 CFR §260.20, this petition provides the following information:

(1) The name, address, facility identification (ID) number, and contact information is as follows:

Strebor Inc. (Strebor)
2305 Superior Avenue
Kalamazoo, Michigan, 49001
United States Environmental Protection Agency (USEPA) ID Number MID005342134
Michigan Department of Environmental Quality (MDEQ) Site ID No. 39000006
MDEQ Waste Data System (WDS) Number 393300

Facility Contact: Mike McClish, Bay West LLC
Address: 2305 Superior Avenue
Kalamazoo, Michigan, 49001
Direct dial (269) 381-1100 cell (269) 743-8396
Email: mikem@baywest.com

Correspondence related to this treatability variance petition should be directed:

Paul T. Walz, P.E.
Bay West, LLC
5 Empire Drive
St. Paul, MN 55103
paulw@baywest.com
Direct dial (651) 291-3491; cell (651) 341-3268

A site location map depicting the location of the facility is presented in **Figure 1-1**.

(2) Strebor is seeking a treatability variance to establish alternate treatability standards for disposing of spent carbon, personal protective equipment (PPE)/debris, and soil containing concentrations of pentachlorophenol (PCP), dioxins, and furans that exceed the treatment standards for hazardous waste code F027, as listed in 40 CFR 268.40 (CFR, 2015), directly to Wayne Disposal, Inc. (Wayne Disposal) Site #2, in Belleville, Michigan. See **Section 1.4** for additional detail.

(3) The Michigan Hazardous and Liquid Industrial Waste Management Program (Michigan Program) regulates companies and businesses that generate, store, treat, and dispose of hazardous waste in Michigan. The Program administers the hazardous waste management requirements of Part 111, Hazardous Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451). To handle cases where the waste cannot meet the land disposal restriction (LDR) standards, the USEPA has established treatability variance procedures. The requirements for treatability variance petitions are contained in 40 CFR 268.44. The Michigan Program is also authorized to administer the Federal Resource Conservation and Recovery Act (RCRA) hazardous waste requirements on behalf of the USEPA Region 5 Administrator. The regulatory framework supporting the treatability variance is presented in **Section 2.1**.

(4) The proposed treatability variance to establish alternate treatability standards represents the most technically and environmentally appropriate solution to manage contaminated soil, spent carbon, and select PPE/debris generated by soil and groundwater remedial efforts at the site. Justification for the treatability variance, including supporting tests and studies, is included in **Section 3**.

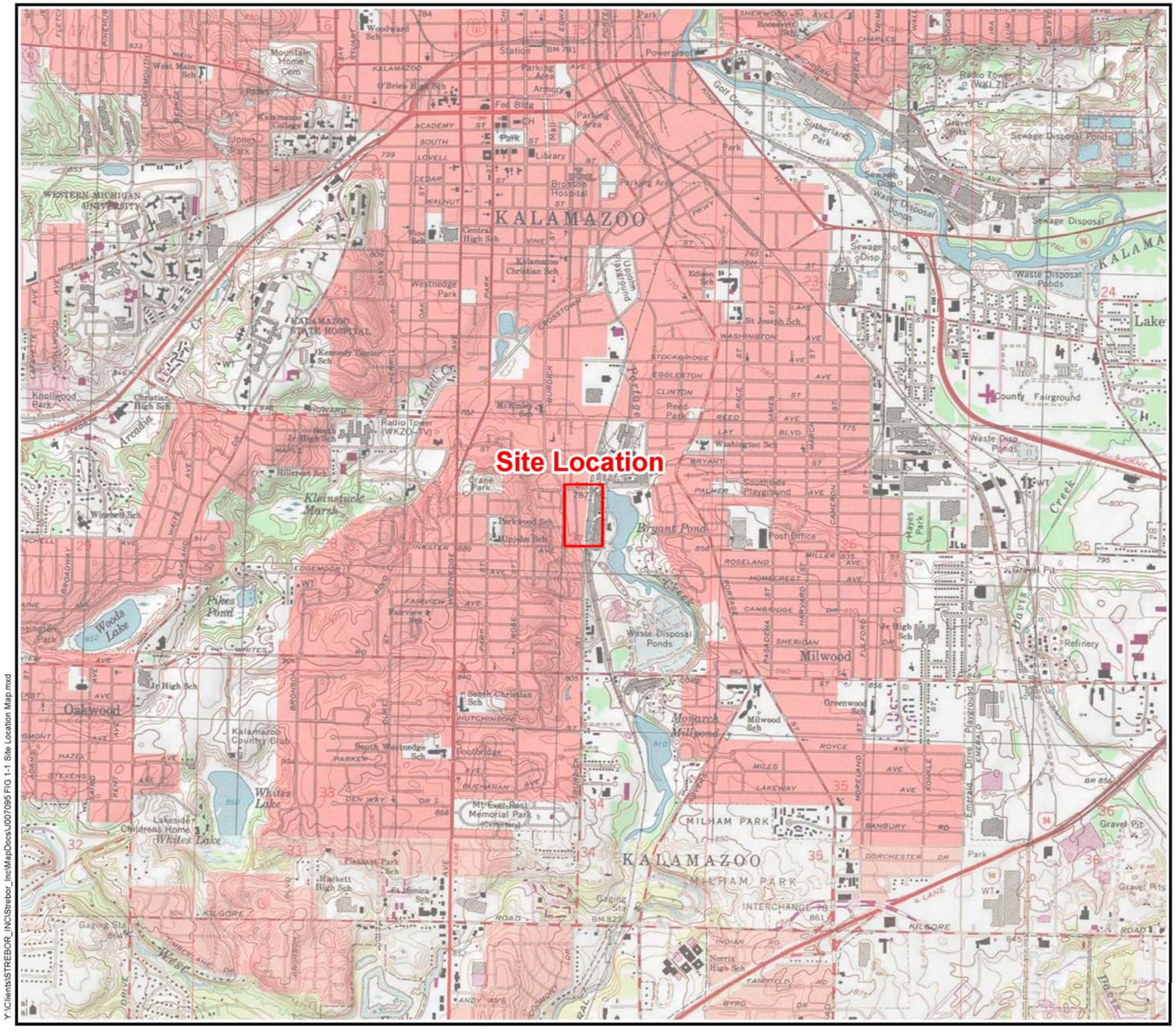


Figure 1-1

Site Location Map

Strebor Inc

Map Projection: NAD 1983 StatePlane Michigan South Feet
Basemap: National Geographic Society, i-cubed Topographic WMS

0 0.5 1 Miles

0 0.75 1.5 Kilometers

Site Location

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: S.G. Date Drawn/Revised: 2/12/2016 Project No. J007095

1.2 LDR Variance Petition Contents

The content of this treatability variance petition is based on information provided in the federal variance assistance guidance: Land Disposal Restrictions Treatability Variances and Determinations of Equivalent Treatment, (USEPA, not dated) and on the historical precedent of a similar variance request that was made by the Dow Chemical Company (Dow) in 1996 (Dow, 1996) and was extended and revised in 2008 (Dow, 2008). The format of Strebor's variance request generally follows that of the Dow petition, so the content specified in the Variance Assistance Document and the location of the associated information is summarized in the following outline:

A. Administrative Information—Submission of completed applications and identifying information are presented in **Section 1.1**.

B. Background Information—General site background is presented in **Section 1.3**. Background information includes the petitioner's interest in the proposed action **(Section 1.4)**, the specific LDR standard from which a variance is requested **(Section 1.5)**, the technology upon which that standard is based **(Section 1.5)**, the rationale for the variance request **(Section 2.0)**, the specifics of the proposed equivalent treatment **(Section 1.5)**, and a signed certification **(Certification Section)**.

C. Petition Development and Information Gathering Process:

   a. Identification of applicable waste codes **(Section 1.1)**.

   b. Identification of applicable LDR standards **(Section 1.5.1)**.

   c. Characterization of initial waste stream and treatment residuals **(Section 3.0)**.

   d. Conduct engineering evaluation showing that either the treatment standard cannot be met or the best demonstrated available technology (BDAT) used to develop the standard is not appropriate for the waste **(Sections 1.3**, **1.4**, **1.5.2**, and **2.0)**. **Sections 1.3.1** and **1.3.2** also discuss previous attempts to treat spent activated carbon and soil.

   e. Description of waste generation process **(Sections 1.3** and **3.2)**.

   f. Description of the proposed waste treatment process **(Section 2.2** and **Appendix A)**.

   g. Gather data on the proposed waste treatment process—incorporated by reference to the permitted Subtitle C landfill.

   h. Evaluation of the proposed waste treatment process with respect to BDAT criteria **(Section 2.2)**.

In preparation of this petition, Bay West also reviewed an LDR treatability variance request submitted to MDEQ (US Ecology, 2015) to treat hazardous waste containing leachable selenium prior to disposal in a Subtitle C landfill.

1.3 Site Background

Strebor is a former industrial facility that mixed and packaged various wood treatment solutions, thread-cutting oils, glues, and premanufactured adhesives beginning in the early 1900s. The bulk of facility operations involved the mixing and packaging of wood treating solutions. During an internal environmental audit in May 1987, light non-aqueous phase liquids (LNAPLs) and associated dissolved constituents were detected in the surficial aquifer beneath the site. Following the audit, the Michigan Department of Natural Resources (MDNR), a predecessor agency to the MDEQ, was notified, and Strebor initiated a series of environmental evaluations

and investigations. In September 1988, all facility operations were discontinued and the facility was closed. Investigation results suggested that surface soils in the drainage ditch bordering the eastern site boundary, subsurface soils, and groundwater were impacted by PCP and various petroleum-based compounds from accidental spills and releases of the wood treating solutions that were formerly mixed and packaged at the Strebor facility. Cleanup of the impacted soil and groundwater is regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which is administered and overseen by MDEQ. On October 15, 2009, the MDEQ and Strebor executed the Agreement for a Limited Industrial Remedial Action Plan for the site in Kalamazoo County, Michigan (Enforceable Agreement; MDEQ, 2009). The Enforceable Agreement was modified on June 30, 2015 (MDEQ, 2015), to address various updates and changes to site activities and planning documents that have occurred since the Enforceable Agreement was originally executed. The Enforceable Agreement provides for the continued implementation of the Proposed Remedial Action Plan for Strebor (Bay West, 1993).

The Proposed Remedial Action Plan addresses three operable units (OUs); the groundwater operable unit, the surface soil operable unit (SOU), and the subsurface soil operable unit (SSOU). Actions taken at each of the OUs are described below, along with waste characterization and disposal of waste generated during implementation of these actions.

1.3.1 Groundwater Treatment System

A groundwater/LNAPL recovery system and a groundwater treatment system (GWTS) were installed to capture and remediate the LNAPL and groundwater plumes. The GWTS has been in operation since 1990 and has received numerous upgrades to enhance the capture of LNAPL and the capture and treatment of impacted groundwater using an oil/water separator for pretreatment and a combination mixed media filtration and granular activated carbon (GAC) adsorption system for groundwater treatment. Routine GWTS operation and groundwater monitoring have been performed at the site since 1990. Since start-up, the GWTS has resulted in an estimated 98 to 99 percent (%) reduction in the size of the LNAPL plume and a 74% reduction in the size of the dissolved plume, respectively (Bay West, 2015). Wastes generated by GWTS operation include spent GAC, spent bag filters, spent sorbent pads, PPE, disposable sampling equipment/supplies, general debris, and recovered LNAPL. For the remainder of this petition, these waste streams are referred to as spent carbon, PPE/debris, and recovered product.

In situ chemical oxidation has been under evaluation as a potential remedial technology to expedite groundwater remediation efforts at the site. Two pilot studies involving injection of sodium persulfate and post-injection monitoring were performed to evaluate the efficacy of using this technology to treat groundwater in an area of historically high PCP concentrations. The first pilot study was conducted between December 2012 and February 2013. Based on recommendations from the first pilot study, a second pilot study was conducted between July and October 2014.

In March 2013, a laboratory bench-scale study was conducted for Strebor by FMC Environmental Solutions to evaluate the effectiveness of Klozur® Activated Persulfate for treating spent activated carbon from the GWTS. In February 2013, prior to the laboratory bench-scale study, the MDEQ approved a request from Strebor to grant an extension of the RCRA 90-day storage limit for the spent carbon contained within two covered roll-off boxes on-site. This extension was required to provide the time needed to conduct the laboratory bench-scale study. On March 1, 2013, prior to the test, in a conference call between Strebor, Bay West, and MDEQ, the MDEQ acknowledged that if chemical oxidation reduced contaminant concentrations in the spent carbon to a level below the LDR limits, landfilling at an appropriately permitted facility would be an acceptable disposal alternative. The laboratory bench-scale study proceeded on this basis.

The laboratory bench-scale test consisted of a control (untreated) sample, a low dosage sample (10% persulfate by mass), and a high dosage sample (20% persulfate by mass). The pH of the samples was raised to activate the persulfate. After one week of treatment, more than 50% of the persulfate had been consumed in both the low and high dosage samples. Samples were analyzed for semi-volatile organic compounds (including select phenols), dioxins, and furans. Results (which are summarized in **Table 1-1**) show that constituent concentrations in the low and high persulfate dosage samples were actually higher than the concentrations in the control sample for many compounds. These concentration increases were attributed to differences in the starting concentrations in the original three samples due to sample aliquot variability. As there was no clear evidence that constituent concentrations decreased as a result of persulfate treatment, despite more than 50% of the persulfate being utilized, the bench-scale study was terminated and the spent carbon was transported off-site for disposal at Swan Hills Treatment Center (Swan Hills) in Alberta, Canada.

Table 1-1 Persulfate Bench Scale Test Analytical Results

LDR Regulated Constituents for Hazardous Waste Number F027	After One Week Treatment		
	FMC #53186 Control Analytical Conc. µg/kg dry	FMC #53187 10% KP Analytical Conc. µg/kg dry	FMC #53188 20% KP Analytical Conc. µg/kg dry
2,3,4,6-Tetrachlorophenol	<160	<290	<260
2,4,5-Trichlorophenol	<81	<150	<130
2,4,6-Trichlorophenol	<81	<150	<130
Pentachlorophenol	2,400	3,400	4,300
HxCDDs (All Hexachlorodibenzo-p-dioxins)	26	140	23
HxCDFs (All Hexachlorodibenzofurans)	0.92	2.4	0.58
PeCDDs (All Pentachlorodibenzo-p-dioxins)	20	98	17
PeCDFs (All Pentachlorodibenzofurans)	0.22	0.66	0.15
TCDDs (All Tetrachlorodibenzo-p-dioxins)	3.7	16	3.3
TCDFs (All Tetrachlorodibenzofurans)	0.12	0.20	0.083

Notes:
KP = klozur persulfate

1.3.2 Surface and Subsurface Soil Excavation and Disposal

During the late 1980s and early 1990s, soil excavated to accommodate GWTS installation (and believed to be impacted) was placed in roll-off boxes and 55-gallon drums and was stored within an on-site containment area under an interim RCRA storage permit while a viable disposal option was identified. To address the SOU, impacted near-surface soils within the drainage ditch bordering the site's east property line were excavated in November 1991 and the drainage ditch was capped. The excavated soil was also stored in the on-site containment area.

In February 1994, Strebor implemented a comprehensive soil sampling and analysis program to determine if the stored soil met the Michigan Environmental Response Act, 1982 PA 307 (Act 307), Type B cleanup criteria, with the objective of disposing of soil that met the criteria at the Strebor site by direct land application rather than off-site. The cleanup criteria in place at the time were specified in the Michigan Environmental Response Act Operational Memorandum #8, Revision 3. Sample collection and analysis were conducted in accordance with MDNR guidance documents relevant at the time. PCP was detected in several samples, with concentrations ranging from below the reporting limit to 1,400 mg/kg, exceeding the 11 mg/kg cleanup criterion in many samples. Four samples were also analyzed for dioxins and furans. Several dioxin and furan concentrations in each sample exceeded the corresponding Type B criteria (Bay West, 1995). Based on the analytical results, the stored soil would require incineration or other additional treatment before direct land application.

At the time the soils were generated, there were no commercial facilities within the United States permitted to treat F027 waste. Beginning in 1993, Aptus Environmental Services (Aptus) in Coffeyville, Kansas, was permitted by the USEPA to treat and dispose of F027 waste via incineration. Strebor identified and screened several soil remedial technologies in order to identify a more technically appropriate and environmentally sound treatment alternative to incineration at the Aptus facility. To be considered in the screening process, the technology had to be suitable for on-site implementation and be capable of removing/destroying the compounds identified during the comprehensive soil sampling and analysis program.

Based on the screening activities and two bench-scale treatability studies, physical/chemical soil treatment via medium temperature thermal desorption and base-catalyzed decomposition (MTTD/BCD) showed the greatest potential to treat the soil to Act 307 cleanup criteria. With MDNR concurrence, ETG Environmental, Inc. (ETG) set up and operated MTTD/BCD equipment at the Strebor facility from October 1996 through March 1997 to treat the stored soil. Initial post-treatment soil analytical results indicated MDNR's Type B criteria for dioxins and furans were not being met consistently. To improve the performance of the MTTD/BCD equipment, ETG adjusted batch size and process time, but ultimately approximately 80% of the treatment batches were above the MDNR's type B criteria for dioxins and furans.

During the execution of its work, ETG failed to adequately segregate the treatment batches, so soil meeting MDNR's type B criteria could not be separated from soil requiring disposal as F027 waste. In March 1997, the entire lot (approximately 210 cubic yards) of treated, stored soil and test batches was transported to the Laidlaw Environmental Services (Laidlaw) facility in Pecatonica, Illinois, as hazardous waste. Laidlaw subsequently transported the soil for disposal to Laidlaw Environmental Services, Sarnia/Corunna, Lambton County, Ontario, Canada. Following the disposal of the excavated soil, MDEQ approved closure of the three on-site RCRA hazardous waste storage areas (MDEQ, 1999, 2000).

While institutional controls (ICs) were selected as the remedy for the SSOU, in 2001 Strebor voluntarily performed a removal action from the settling lagoon associated with the SSOU to reduce the contaminant mass available for dissolution and infiltration to groundwater. The lagoon was excavated to approximately 6 to 8 feet (ft) below grade (the estimated high water level). Approximately 1,960 tons of soil were removed and exported to Recupère Sol in Quebec, Canada, for incineration and disposal. Based on verification sampling conducted at the excavation boundaries, the removal action did not result in the complete removal of contaminated soil from the SSOU to concentrations below cleanup standards.

Sampling conducted during and after the excavation activities suggests that up to 2,000 cubic yards of soil remains in place that has concentrations of various compounds exceeding cleanup standards. Additional soil delineation and waste characterization sampling will be required prior to implementing any potential future soil excavation activities at the site. Soil sampling approaches will be detailed in a future sampling plan, if an LDR variance is approved and additional soil excavation is proposed for the SSOU at a future date.

1.3.3 Waste Characterization and Disposal

Since the initiation of environmental investigation and restoration work in the late 1980s and early 1990s, waste generated at the site has fallen into one of the following two general categories:

1. Building materials and equipment, including decontaminated or cleaned building materials and equipment; and
2. Other waste media known to have been exposed to discarded, unused wood treating solutions containing PCP after these solutions had been released to the environment (e.g., soil); and wastes generated as a result of GWTS operations (e.g., bag filters, GAC, sorbent pads, sampling equipment).

Historically, building materials and process equipment that were not known or suspected to have been exposed to discarded, unused wood treating solutions were cleaned if visually impacted and tested for PCP using the USEPA's toxicity characteristic leachate procedure (TCLP). From a historical perspective, all building materials met the toxicity criterion for disposal as a non-hazardous waste and were subsequently disposed of as non-hazardous wastes. Some materials removed during the cleaning process (e.g., floor sweepings) exhibited the characteristic of toxicity when tested using the TCLP and were subsequently disposed of as a characteristic waste (D037). Building materials and process equipment were not considered a listed waste (F027) as there was no known information indicating that the low-level PCP detections were from "discarded, unused formulations containing trichlorophenol, tetrachlorophenol, or PCP, or discarded, unused formulations containing compounds derived from these chlorophenols," the non-specific source definition for F027 in 40 CFR 268.40. Historically, other waste media known or suspected to have been exposed to discarded, unused wood treating solutions was disposed of as a listed waste (F027).

In 2010, the Main Building at Strebor was demolished. Historically, the Main Building was used for manufacturing, warehousing, laboratory, and office space. Equipment associated with the GWTS is located in an adjacent building, known as the Maintenance Building. In conjunction with Main Building demolition, Bay West completed a review of internal Strebor records concerning the historic use of PCP in Strebor's manufacturing process, the effective LDR date for PCP, various sections of the CFR, Federal Register (FR), and USEPA hazardous waste guidance documents. On September 10, 2010, Bay West submitted a correspondence on behalf of Strebor that summarized analytical results and the disposal plan for each of five types of waste material generated during the Main Building demolition (Bay West, 2010). One of the five types of materials, the concrete floor and footings from a former underground storage tank (UST), was in contact with groundwater contaminated with PCP. Based on Strebor facility

records, the manufacturing, production, packaging, and storage of PCP-containing wood treating solutions was discontinued by March 1987, prior to the effective LDR date (November 8, 1988) for PCP (USEPA, 1986). Additionally, all remaining PCP-containing product was shipped off-site and all USTs that contained a PCP-based wood treating solution were cleaned by that date as well. As such, all historical releases of PCP-containing wood treating solutions occurred prior to the effective LDR date for PCP. Consistent with CFR and FR language, as well as USEPA hazardous waste guidance, LDRs do not apply to media impacted by releases that occurred prior to the effective LDR date. Therefore, as stated in the letter dated September 10, 2010, the historic approach of classifying remediation waste materials generated at Strebor that are known or suspected to include unused, discarded wood treating solutions as a F027 waste is viewed to be overly conservative. However, the Environmental Resource Management Division of the Michigan Department of Natural Resources and Environment (MDNRE), a predecessor agency of the MDEQ, responded that it had not yet been determined that the concrete material is non-hazardous (MDNRE, 2010). While Strebor did not and does not agree with this conclusion, Strebor voluntarily chose to dispose of the concrete material as a F027 waste rather than wait on MDNRE's determination. The concrete material was profiled as an F027 waste with Veolia Environmental Services (Veolia) and shipped to Veolia's Menomonee Falls, Wisconsin, facility on January 27, 2011. Veolia subsequently transported the waste to Swan Hills in Alberta, Canada, for incineration. Along with the concrete material, used PPE and soil cuttings from a post-demolition monitoring well installation were profiled as a second and third waste stream with Veolia and were shipped to Swan Hills for incineration.

There are currently approximately 1,200 gallons of recovered product in storage at the site. Historically, Strebor transported seven shipments of recovered product to Wheeler Consolidated Industries (Wheeler) in Whitewood, South Dakota, for beneficial reuse. Wheeler has since discontinued accepting the recovered product for beneficial reuse.

From closure of the Strebor facility in 1988 to the first shipment of Strebor's F027 waste in 1993 to Aptus's newly licensed incinerator in Coffeyville, Kansas, Strebor's F027 hazardous waste streams were stored on-site under provisions of a RCRA-Part A (interim) permit. Following the opening of the Coffeyville facility until approximately 1996, Strebor's F027 waste streams were incinerated at the Coffeyville facility. After 1996, intermittent incineration and disposal of Strebor's F027 waste at the Coffeyville facility continued until the facility's final closure in 2001. From approximately 1996 to Canada's implementation of LDRs in 2010, most of Strebor's F027 waste was disposed at the landfill located in Sarnia, Ontario, Canada, which is currently owned by Clean Harbors. The exception being the soil generated during the 2001 lagoon excavation project described in **Section 1.3.2**, which was incinerated and disposed of at the Recupère Sol incinerator located in Quebec, Canada. Since 2010, incineration and disposal of Strebor's F027 hazardous waste streams has been at Swan Hills.

Historically, regulatory oversight of hazardous waste operations at the Strebor facility has been performed by the MDEQ or one its predecessor agencies. Since the closure of the Strebor facility in 1988, numerous site compliance inspections have been conducted to evaluate Strebor's compliance with Part 111, Hazardous Waste Management, and Part 121, Liquid Industrial By-Products, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended; Subtitle C of RCRA; and any administrative rules or regulations promulgated pursuant to these acts. The latest inspection was conducted by the MDEQ, Office of Waste Management and Radiological Protection on October 6, 2016. Consistent with previous inspections, results of the October 6, 2016 inspection found Strebor to be in compliance with applicable rules and regulations. A copy of the MDEQ inspection report from the October 6, 2016 inspection is provided in **Appendix B**.

1.4 Petitioner's Interest in the Proposed Action

Strebor is seeking a treatability variance to establish alternate treatability standards for the disposal of spent carbon, PPE/debris, and soil containing concentrations of PCP, dioxins, and/or furans that exceed the treatment standards for hazardous waste code F027 (40 CFR 268.40) directly to Wayne Disposal Site #2, in Belleville, Michigan. As described in detail in **Section 2.0**, there are numerous environmental, logistical, and practical considerations associated with transportation and disposal of both contaminated soil and wastes generated by the GWTS in a foreign country. From a technical, environmental, and risk minimization perspective, disposal at Wayne Disposal Site #2 is a more appropriate approach to manage risk than incineration in a foreign country.

It is recognized that in certain limited circumstances a limited amount of material with concentrations in excess of the alternate treatability standards presented herein may need to be treated via incineration in Canada. It is noted that recovered product and debris/PPE visibly contaminated with recovered product are not included in this request for variance.

1.5 Land Disposal Restriction Treatment Standards

Presented in this section is a discussion of the LDR treatment standards established for PCP, dioxins, and furans; the applicability of these standards to soil and other materials; and the proposed alternate treatment standards.

1.5.1 Treatment Standards from Which a Variance Is Being Sought

A hazardous waste may be land disposed only if it meets the established treatment or technology standards found in 40 CFR 268.40. Historically, waste media including soil and GWTS waste streams (e.g., spent carbon and PPE/debris known or suspected to have been exposed to discarded, unused wood treating solutions) from the site have been disposed of as a F027 waste. Treatment standards for hazardous wastes with a waste code F027 from 40 CFR 268.40 are reproduced in **Table 1-2**, with an additional column added for the Phase IV LDR standards for contaminated soil, promulgated in 1999 and incorporated into the CFR (CFR, 2015), which are equivalent to 10 times the original LDR standards for non-wastewaters.

Table 1-2 Treatment Standards for F027 Wastes from 40 CFR 268.40

Regulated Hazardous Constituent for F207 Wastes		Wastewaters*	Non-Wastewaters*	Soils*
Common Name	**CAS Number**	**Concentrations (mg/L)**	**Concentrations (mg/kg)**	**Concentrations (mg/kg)**
HxCDDs	Not applicable	0.000063	0.001	0.01
HxCDFs	Not applicable	0.000063	0.001	0.01
PeCDDs	Not applicable	0.000063	0.001	0.01
PeCDFs	Not applicable	0.000035	0.001	0.01
Pentachlorophenol	87-86-5	0.89	7.4	74
TCDDs	Not applicable	0.000063	0.001	0.01
TCDFs	Not applicable	0.000063	0.001	0.01
2,4,5-Trichlorophenol	95-95-4	0.18	7.4	74
2,4,6-Trichlorophenol	88-06-2	0.035	7.4	74
2,3,4,6-Tetrachlorophenol	58-90-2	0.030	7.4	74

Notes:
** Wastewater and non-wastewater concentrations from 40 CFR 268.40; soil concentrations from 40 CFR 268.49 (CFR, 2015)*
CAS = Chemical Abstract Service
mg/L = milligrams per liter

1.5.2 Alternative Treatment Standard

Soil, spent carbon, and filter bags that contain relatively low PCP, dioxin, and furan concentrations are significantly different materials than F027 waste, described as discarded unused formulations containing specific pentachlorophenols or containing compounds derived from these chlorophenols. However, the "derived from" rule states that residuals derived from the treatment, storage, or disposal of listed hazardous waste must continue to be regulated as hazardous waste (see 40 CFR 261.3[c][2]; USEPA, 2001).

It is not technically or environmentally appropriate to manage soil and GWTS waste streams as if they were discarded, unused formulations; therefore, an alternate treatment standard is being pursued. In 40 CFR 268.44, it is stated that a site-specific variance from an applicable treatment standard may be approved if it is not physically possible to treat the waste to the level specified in the treatment standard or by the method specified as the treatment standard, or it is technically or environmentally inappropriate to require the waste to be treated to the specified level or by the specified method, even though such treatment is technically possible. For example, treatment resulting in combustion of large amounts of mildly contaminated environmental media, where the treatment standard is not based on combustion of such media, would be technically inappropriate. Treatment of remediation wastes to the specified level or by the specified method may be deemed environmentally inappropriate if it would likely discourage aggressive remediation (CFR, 2015).

In the case of Strebor, additional technical factors to consider are that there are currently no known facilities permitted to accept F027 waste in the United States. Additionally, since Canada began phasing in LDRs in 2007, beginning with Ontario, F027 waste streams can no longer be landfilled in Canada. This leaves incineration in a foreign country as the only current disposal option, even for relatively large qualities of waste with relatively low levels of contamination, unless an LDR variance is granted. An important health and safety factor to consider with respect to waste disposal in Canada is the additional human health and environmental risk associated with potential accidents during international over-the-road transportation of wastes long distances.

The approach for establishing alternative treatments standards for the Strebor site closely follows an established precedent set by the variance request that was made by Dow in 1996 (Dow, 1996) and was extended and revised in 2008 (Dow, 2008). Additional information regarding the Dow variance request, regulatory approvals, and relevance to the alternative treatment standard approach detailed for Strebor are presented in **Section 2.1**. USEPA guidance on alternative treatment standards (USEPA, 2002) and management of dioxin contaminated soils (USEPA, 2011) was also reviewed during development of this variance request. To establish an alternate treatment standard, USEPA guidance Superfund LDR Guide #6A (USEPA, 1990a) and Superfund LDR Guide #6B (USEPA, 1990b) were used to develop this treatability variance request. Highlight 2 in either document, entitled "Alternative Treatability Variance Levels and Technologies for Structural/Functional Groups," shows the concentration ranges or percentage reduction ranges that can be used to establish the alternative standards depending on the concentrations of the constituents in the waste. The guidance documents state that (1) if the concentration of a restricted constituent is less than a specified threshold concentration, the waste should be treated to within a specified concentration range, and (2) if the waste concentration is above the threshold, the waste should be treated to reduce the concentration of the waste to within the specified percentage reduction range. In both these cases, it is presumed that the starting waste concentration is above the specified concentration range. Therefore, wastes with concentrations that are already within the specified concentration range do not require further treatment, as they already meet the criteria (1). This is the basis for the alternative treatment standards presented below and summarized in **Table 1-3**, based on these guidance documents.

Specifically for F027 constituents, if the halogenated phenol (including PCP) concentrations in soil are less than the threshold concentration of 400 mg/kg (parts per million [ppm]), then an alternate treatability standard can be established in the range of 0.5 ppm to 40 ppm (500 parts per billion [ppb] to 40,000 ppb). This would apply to each regulated halogenated phenol compound for soil listed in **Table 1-3**. Phase IV LDR standards for contaminated soil, which were promulgated in 1999, after the USEPA guidance was published, were also used (CFR, 2015). In the case of soil, the established standard from the Phase IV LDR rules is 74 ppm, which is a higher concentration than would be derived using the older guidance. Therefore, the alternative PCP standard for soil is based on the Phase IV rules, while the alternative PCP standard for other materials is based on the guidance documents.

In the case of dioxins, if the concentration of dioxins in soil is less than the threshold concentration of 0.5 mg/kg (ppm), then an alternate treatability standard can be established in the range of 0.00001 to 0.05 ppm (10 parts per trillion [ppt] to 50 ppb), based on the USEPA guidance (USEPA, 1990a, 1990b). Although the guidance does not specifically address furans, because of the similarity of these compounds to dioxins, this concentration range is also proposed as the alternate treatability standard for furans. Strebor also proposes that dioxin/furan concentrations be evaluated as toxicity equivalence (TEQ) using 2005 World Health Organization (WHO) dioxin toxicity equivalence factors (TEFs), in addition to using the standards established for individual congener groups. In the case of dioxins/furans, the alternative treatment standard derived from the guidance results in a higher concentration than the Phase IV LDR rules would for soil, so the higher concentration is used to establish the alternative dioxin/furan standards for both soil and other materials. A summary of the alternative standards and the source for each proposed alternative standard is presented in **Table 1-3**.

Table 1-3 Proposed Alternative Treatment Standards for F027 Wastes

Regulated Hazardous Constituent for F207 Wastes	Soil Standard (mg/kg)	Source	Other Non-Wastewaters Standard (mg/kg)	Source
HxCDDs	0.05[a]	USEPA Guidance[b]	0.05[a]	USEPA Guidance[b]
HxCDFs	0.05[a]	USEPA Guidance[b]	0.05[a]	USEPA Guidance[b]
PeCDDs	0.05[a]	USEPA Guidance[b]	0.05[a]	USEPA Guidance[b]
PeCDFs	0.05[a]	USEPA Guidance[b]	0.05[a]	USEPA Guidance[b]
Pentachlorophenol	74	Phase IV Soil LDR	40	USEPA Guidance[b]
TCDDs	0.05[a]	USEPA Guidance[b]	0.05[a]	USEPA Guidance[b]
TCDFs	0.05[a]	USEPA Guidance[b]	0.05[a]	USEPA Guidance[b]
2,4,5-Trichlorophenol	74	Phase IV Soil LDR	40	USEPA Guidance[b]
2,4,6-Trichlorophenol	74	Phase IV Soil LDR	40	USEPA Guidance[b]
2,3,4,6-Tetrachlorophenol	74	Phase IV Soil LDR	40	USEPA Guidance[b]

Notes:
[a] For dioxins and furans, standards are met if all individual congener limits are met, and/or the 2,3,7,8-TCDD TEQ is met.
[b] USEPA Guidance refers to Superfund LDR Guides #6A and #6B (USEPA, 1990a, 1990b).
mg/kg = milligrams per kilogram
HxCDD = hexachlorodibenzo-p-dioxin
HxCDF = hexachlorodibenzofuran
PeCDD = pentachlorodibenzo-p-dioxin
PeCDF = pentachlorodibenzo-furan
TCDD = tetrachlorodibenzo-p-dioxin
TCDF = tetrachlorodibenzofuran

2.0 RATIONALE FOR SEEKING A TREATABLITY VARIANCE

2.1 Regulatory Framework and USEPA Policy

The Michigan Program regulates companies and businesses that generate, store, treat, and dispose of hazardous waste in Michigan. The Michigan Program administers the hazardous waste management requirements of Part 111, Hazardous Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451). State authorization is a rulemaking process through which the USEPA delegates the primary responsibility of implementing the RCRA hazardous waste program to individual states in lieu of the USEPA. The Michigan Program is authorized to administer the federal RCRA hazardous waste requirements on behalf of the USEPA, Region 5 Administrator, including reviewing and approving or denying delisting petitions and LDR treatability variance petitions.

As summarized in the LDR Variance Assistance Document, the Hazardous and Solid Waste Amendments of 1984, require the USEPA to promulgate regulations restricting the land disposal of untreated hazardous waste. This effort is generally referred to as the LDR program. The LDR program identifies levels or methods of treatment that substantially reduce the toxicity of a waste or the likelihood of migration of hazardous constituents from the waste.

To handle cases where the waste cannot meet the LDR standards, the USEPA has established equivalent treatment and treatability variance procedures. These two types of variances correspond to the two basic types of LDR standards. Determination of equivalent treatment applies to LDR standards expressed as a specific technology; a treatability variance applies to numerical LDR standards. Per 40 CFR 268.40, for F027 wastes, only numeric LDR standards have been promulgated. Technology standards for F027 have not been promulgated. With respect to numerical standards, treatability variances may be granted for wastes that have LDR standards that are expressed as concentrations of hazardous constituents in the waste or waste extract. The requirements for treatability variance petitions are contained in 40 CFR 268.44.

In addition to applicable federal and state regulations, correspondence relating to an LDR variance petition submitted by Dow to the USEPA and a follow-up Dow petition for a treatability variance submitted to MDEQ were used in preparation of this Strebor LDR variance petition. The original Dow petition was submitted on January 4, 1996, and approved by USEPA on June 10, 1997 (USEPA, 1997). Since the time of the USEPA's approval of the original Dow LDR variance petition, the LDR regulations were amended and MDEQ received USEPA authorization to review and approve site-specific LDR variance petitions. The second Dow petition, to extend and revise the original petition that was set to expire 10 years from the approval date, was submitted on October 1, 2007, revised on January 22, 2008, and approved by MDEQ on July 2, 2008 (MDEQ, 2008). While some of the specific issues addressed in the Dow petitions do not apply to the Strebor LDR variance petition, the following portions of the Dow petition were used by Strebor in support of developing the alternative treatment standards:

- Similarities between the Dow and Strebor LDR variance petitions are that they both include soil that was contaminated by listed hazardous wastes and that some of the soil contains dioxin/furan concentrations that exceed the Universal Treatment Standards (UTS) tabulated in 40 CFR 268.40.
- The 1996 Dow petition used Superfund LDR guidance (USEPA, 1990a, 1990b) to establish an alternative treatment standard of 50 ppb in soil or debris for each dioxin and furan congener group as listed in **Table 1-3**, which is equivalent to 50 times the UTS for non-wastewater.

- The second Dow LDR petition incorporated the Phase IV soil UTS but kept the alternative treatment standard at 50 ppb, specifying it as five times the soil UTS rather than 50 times the non-wastewater standards.
- The second Dow LDR petition requested that dioxin/furan concentrations be evaluated as total international TEQs but also retained the standards for individual congener groups. The USEPA recommends using the 2005 WHO TEFs (USEPA, 2010).

Therefore, as discussed in **Section 1.5.2**, Strebor is following the Dow historical precedent, using USEPA guidance documents to establish alternative treatment standards for PCP, dioxins, and furans and applying the TEQ approach for dioxins and furans that has been widely adopted for risk assessment and cleanup purposes.

2.2 Environmental Benefits of a Treatability Variance

In addition to being consistent with USEPA guidance and policy for issuance of treatability variances, the proposed variance offers environmental benefits, namely as follows:

- Reduction of combustion of soil impacted with trace concentrations of contaminants;
- Equivalent or superior protection of human health and the environment;
- Removal of economic burden imposed by high costs of incineration, allowing redirection of funds into more aggressive remediation of the site, leading to an early closure; and
- Reduction of risk to human health and the environment during the transportation of waste to, and incineration of waste in, Canada.

As described in **Section 1.3.3**, from a historical perspective, Strebor's F027 wastes have been recycled for beneficial reuse, landfilled in Canada, or incinerated first in Kansas and later in Canada. Strebor conducted laboratory bench-scale chemical oxidation testing off-site to treat spent carbon as well as thermal desorption testing on-site to treat excavated soil, as discussed in **Sections 1.3.1** and **1.3.2**, respectively. Neither test was successful at achieving the applicable criteria. With the exception of incineration in Canada, there are no longer any other known disposal options available. For the reasons/benefits stated above, a treatability variance is an appropriate course of action for the site. Wayne Disposal Site #2, the proposed disposal facility associated with this variance petition, is RCRA Subtitle C land disposal facility permitted by MDEQ, EPA ID# MID048090633, with an approved waste management plan. This Petition for Treatability Variance has been reviewed by senior management at US Ecology. Management has confirmed they will accept all materials included in this Petition for Treatability Variance, once approved by MDEQ, for disposal at Wayne Disposal Site #2. An overview of the landfill's features is presented in **Appendix A**. A letter from US Ecology which confirms their conditional acceptance of the waste covered by this Petition for Treatability Variance is also included in **Appendix A**.

3.0 DESCRIPTION OF THE MATERIAL SUBJECT TO TREATIBLITY VARIANCE

3.1 Previous Characterization of Material Subject to Treatability Variance

Sampling of soil associated with the former settling lagoon was conducted between 1999 and 2000 to delineate the extent of contamination and to characterize the excavated material for disposal. Additional sampling of soil outside of the limits of the excavation was conducted between 2000 and 2002. Analytical results for the soil that remains in place are presented on **Figure 3-1** and are summarized in **Table 3-1**. Analytical laboratory reports, including samples of material that was removed during the excavation, are included as **Appendix C**.

Table 3-1 shows that the PCP concentration in one sample of residual soil was 200 mg/kg, which exceeds the proposed alternative LDR treatment standard by a factor of 2.7. This indicates that although the majority of the contaminated soil that remains in place will meet the alternative treatment standards, a limited amount of soil may exceed the proposed standards. However, it is possible that naturally occurring processes such as dissolution/infiltration and biodegradation may have reduced concentrations to below the proposed standards. Further evaluation may be necessary, including consideration of possible statistical treatment of random sampling data, as discussed in MDEQ guidance entitled *Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria* (MDEQ, 2002b) to quantify the amount of soil that may exceed the proposed alternative treatment standards. Once an LDR variance is granted for this material, Strebor will evaluate additional source removal as an option to facilitate site cleanup. If additional source removal is pursued, a sampling plan will be submitted to MDEQ for approval prior to removal action implementation. Potential additional sampling associated with the SSOU is further discussed in **Section 3.3**.

Sampling of spent carbon was conducted for waste disposal characterization in 1993, 2012, and 2013. Three carbon contactors, with a total combined carbon loading of 35,000 pounds (lb) are periodically backwashed to maintain their maximum hydraulic efficiency. Polyester filter bags are used to filter out GAC fines during these periodic backwash events. Filter bags are only used during the periodic carbon contactor backwash events and are, therefore, considered to be adequately characterized by the analytical results for the spent carbon. PPE and general debris contaminated by soil or spent carbon are also considered to be adequately characterized by soil and spent carbon analytical results. Analytical results from the most recent spent carbon change-out event in 2012 are summarized in **Table 3-2**. Carbon sampling results, including those from 1993, are included in **Appendix C**. The spent carbon from the most recent carbon change-out event was sampled twice, once for characterization in 2012 and again in 2013 as the control sample for the alternative treatment approach using sodium persulfate, which was being considered at the time **(Section 1.3.1)**. **Table 3-2** shows that the spent carbon from the most recent carbon change-out event exceeded the proposed alternative LDR treatment standards for a limited number of individual dioxin and furan congeners, but met the treatment standard when expressed as TEQ and, therefore, met the alternative treatment standard. As documented in the annual reports and summarized in **Section 1.3.1**, the GWTS has significantly reduced the LNAPL and dissolved plumes and concentrations of PCP, dioxins, and furans in groundwater since 1990. Therefore, results from the most recent carbon change-out event have been presented as representative of the spent carbon that is generated during current remedial operations. Using the TEQ approach for dioxins and furans, the 2012 and 2013 analytical results for spent carbon demonstrate that the spent carbon will meet the alternative treatment standard.

Estimated volumes of material covered by this treatability variance over the 10-year period include up to 2,000 cubic yards of soil, 120,000 lb of spent carbon, and 40 drums of debris and PPE not directly contaminated with recovered product.

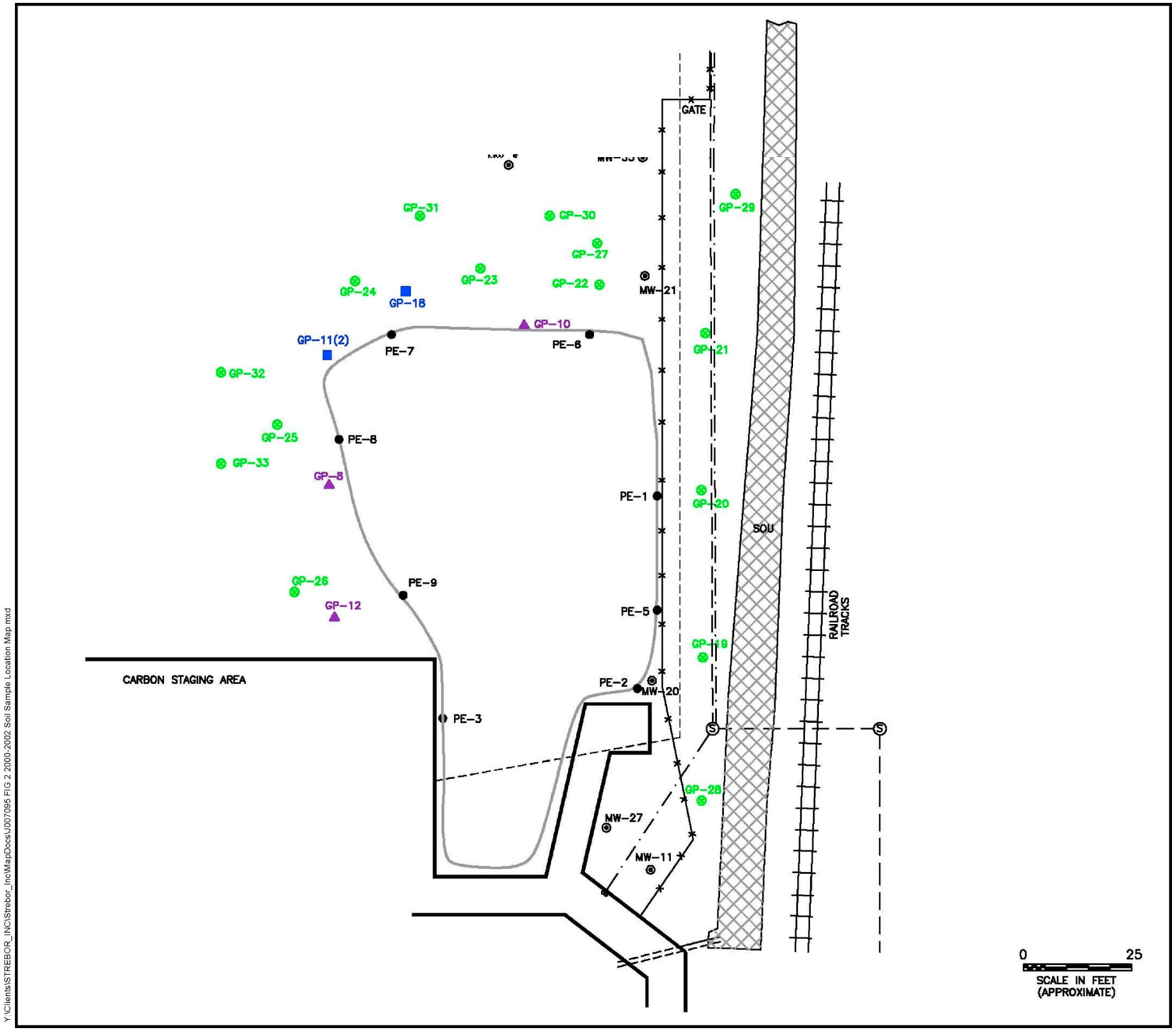
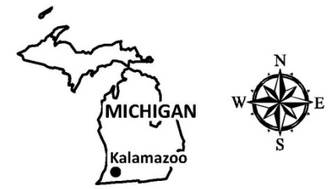


Figure 3-1

2000-2002 Soil Sample Location Map

Strebor Inc



Map Projection: NAD 1983 StatePlane Michigan South Feet
Scale: As shown on map

LEGEND:

- MONITORING WELL LOCATION
- 2000 GEOPROBE BORING LOCATION
- 2001 GEOPROBE BORING LOCATION
- 2001-2002 HAND AUGER SAMPLE LOCATION
- POST EXCAVATION SAMPLING POINT
- FENCE
- RECOVERY SYSTEM UNGROUND PIPING
- LIMITS OF EXCAVATION
- SANITARY SEWER MANHOLE
- SANITARY SEWER
- NPDES SOIL OPERABLE UNIT
- SOU SURFACE SOIL OPERABLE UNIT
- LOCATION OF SOU LINER

NOTE:
Sample locations inside the excavation footprint not shown

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: S.G. Date Drawn/Revised: 2/12/2016 Project No. J007095

Table 3-1 Proposed Alternative Treatment Standards for Soil Containing F027 Waste and Historic Lagoon Excavation Soil Analyses Outside Lagoon Excavation Footprint

Common Name	CAS #	Proposed Alternative Treatment Standard for Soils (mg/kg)	KAR Labs 006175 Pace Labs 006175-03 GP-8 @ 3.3 ft 12/12/00	KAR Labs 006175 Pace Labs 006175-05 GP-10 @ 3.2 ft 12/12/00	KAR Labs 006175 Pace Labs 006175-07 GP-12 @ 3.4 ft 12/12/00	Pace Labs GP-11(2) @ 3.2 ft 01/12/01	Pace Labs GP-18 @ 3.5 ft 01/15/01	KAR Labs 011317 Pace Labs PE-1 03/29/01	KAR Labs 011317 Pace Labs PE-2 03/29/01	KAR Labs 011317 Pace Labs PE-3 03/29/01	KAR Labs 011429 Pace Labs PE-5 03/29/01	KAR Labs 011429 Pace Labs PE-6 03/29/01	KAR Labs 011429 Pace Labs PE-7 03/29/01	KAR Labs 011429 Pace Labs PE-8 03/29/01	KAR Labs 011429 Pace Labs PE-9 03/29/01	KAR Labs 013577 GP-19 @ 3.5 ft 07/24/01	KAR Labs 013577 GP-20 @ 3.0 ft 07/24/01
HxCDDs	NA	0.05[a]	0.005400	0.004400	0.000580	0.008900	0.004400	0.002400	0.005900	0.004900	0.016000	0.002000	0.014000	0.007500	0.011000	NA	NA
HxCDFs	NA	0.05[a]	0.005400	0.001900	0.000630	0.005700	0.004700	0.000250	0.007700	0.007600	0.000710	0.000850	0.017000	0.003900	0.011000	NA	NA
PeCDDs	NA	0.05[a]	0.000380	0.000460	0.000030	0.001400	0.000030	0.000400	0.000470	0.000470	0.002700	0.000140	0.001100	0.001200	0.000480	NA	NA
PeCDFs	NA	0.05[a]	0.001200	0.000860	0.000099	0.001600	0.001500	0.000190	0.001400	0.001300	0.000920	0.000430	0.005800	0.002400	0.002900	NA	NA
Pentachlorophenol	87-86-5	74	<0.33	<0.33	<0.33	NA	NA	3.200000	<0.80	<0.80	<0.80	<0.80	1.800000	<0.80	**200**	49.0000	<0.33
TCDDs	NA	0.05[a]	0.000012	0.000140	0.000022	0.000250	0.000022	0.000044	0.000058	0.000075	0.000320	0.000084	0.000110	0.000190	0.000160	NA	NA
TCDFs	NA	0.05[a]	0.000190	0.000150	0.000024	0.000300	0.000024	0.000023	0.000400	0.000210	0.000100	0.000055	0.000560	0.000280	0.000340	NA	NA
2,4,5-Trichlorophenol	95-95-4	74	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	88-06-2	74	NA	NA	NA	NA	NA	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	1.000000	<0.33	<0.33
2,3,4,6-Tetrachlorophenol	58-90-2	74	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD Equivalence	NA	0.05[a]	0.000890	0.000940	0.000100	0.000800	0.000540	0.000120	0.001000	0.000920	0.000620	0.000240	0.002300	0.001100	0.003000	NA	NA

Common Name	CAS #	Proposed Alternative Treatment Standard for Soils (mg/kg)	KAR Labs 013577 GP-21 @ 3.5 ft 07/24/01	KAR Labs 013577 GP-22 @ 2.0 ft 07/24/01	KAR Labs 013577 GP-23 @ 2.5 ft 07/24/01	KAR Labs 013577 GP-23 @ 3.5 ft 07/24/01	KAR Labs 013577 GP-24 @ 3.0 ft 07/24/01	KAR Labs 013577 GP-25 @ 3.0 ft 07/24/01	KAR Labs 013577 GP-26 @ 3.0 ft 07/24/01	KAR Labs 013577 GP-26 @ 4.0 ft 07/24/01	KAR Labs 013577 GP-27 @ 3.0 ft 07/24/01	KAR Labs 020830 GP-28 @ 3.5 ft 03/04/02	KAR Labs 020830 GP-29 @ 3.0 ft 03/04/02	KAR Labs 020830 GP-30 @ 2.5 ft 03/04/02	KAR Labs 020830 GP-31 @ 2.5 ft 03/04/02	KAR Labs 020830 GP-32 @ 3.0 ft 03/04/02	KAR Labs 020830 GP-33 @ 3.0 ft 03/04/02
HxCDDs	NA	0.05[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HxCDFs	NA	0.05[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PeCDDs	NA	0.05[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PeCDFs	NA	0.05[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	87-86-5	74	2.700000	<0.33	0.670000	<0.33	<0.33	<0.5	<0.33	<0.33	<0.33	1.600000	23.000000	<0.33	<0.33	<0.33	<0.33
TCDDs	NA	0.05[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TCDFs	NA	0.05[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	95-95-4	74	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	88-06-2	74	<0.33	<0.33	<0.33	<0.33	<0.33	<0.5	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,3,4,6-Tetrachlorophenol	58-90-2	74	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD Equivalence	NA	0.05[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
[a] *For dioxins and furans, standards are met if all individual congener limits are met and/or the 2,3,7,8-TCDD TEQ is met.*
***Bold** indicates standards exceeded.*
*Only results for parameters with F027 treatment standards are shown. Additional results for analytical parameters included in the test methods are provided in the analytical reports presented in **Appendix C.***
All results and standards in mg/kg.
NA = not analyzed

Table 3-2 Proposed Alternative Treatment Standards for F027 Waste and Historic Spent Carbon Analyses

Common Name	CAS #	Proposed Alternative Treatment Standard for F027 Wastes (mg/kg)	Pace 10214461 12/19/12	Pace 10222116-53186 Carbon Control 03/09/13
HxCDDs	NA	0.05[a]	**0.150000**	0.026000
HxCDFs	NA	0.05[a]	0.003100	0.000920
PeCDDs	NA	0.05[a]	**0.130000**	0.020000
PeCDFs	NA	0.05[a]	0.000780	0.000220
Pentachlorophenol	87-86-5	40	2.000000	2.400000
TCDDs	NA	0.05[a]	0.023000	0.003700
TCDFs	NA	0.05[a]	0.000420	0.000120
2,4,5-Trichlorophenol	95-95-4	40	<0.081	<0.081
2,4,6-Trichlorophenol	88-06-2	40	<0.081	<0.081
2,3,4,6-Tetrachlorophenol	58-90-2	40	<0.081	<0.081
2,3,7,8-TCDD TEQ	NA	0.05[a]	0.011000	0.001900

Notes:
[a] For dioxins and furans, standards are met if all individual congener limits are met and/or the 2,3,7,8-TCDD TEQ is met.
***Bold** indicates standards exceeded.*
*Only results for parameters with F027 treatment standards are shown. Additional results for analytical parameters included in the test methods are provided in the analytical reports presented in **Appendix C**.*
All results and standards in mg/kg.

3.2 Proposed Spent Carbon Sampling

A spent carbon sampling plan has been developed in support of demonstrating the spent carbon meets the proposed alternative LDR treatment standards prior to each discrete carbon disposal event. A summary of GAC system capacity, operation, and change-out protocol is provided below, followed by the proposed spent carbon sampling plan.

3.2.1 GAC Treatment System Operational Summary

Strebor's GAC treatment system consists of three GAC contactors designated as Contactor A, Contactor B, and Contactor C. Contactors A and B, which are interchangeable, each contain the maximum GAC capacity of 15,000 lb and are only utilized as the lead or intermediate stage contactors. Contactor C has a maximum capacity of 10,000 lb, but only contains 5,000 lb of GAC and is only utilized as the polish stage contactor. The GAC treatment system is designed for down-flow operation only and is only permitted for operation in three-stage series mode, though during maintenance periods the contactors could be configured for parallel or single-stage mode. When the GAC within a lead carbon contactor reaches its adsorptive capacity as determined by routine (i.e., monthly) GWTS sampling, the spent carbon is replaced with virgin carbon. Following replacement of the spent GAC, the contactor containing the fresh GAC becomes the intermediate contactor and the contactor that was in the intermediate position becomes the lead contractor. During a GAC change-out event, spent GAC is transferred from the lead contactor via a slurry method for temporary storage in two 20-cubic-yard roll-off boxes owned by Strebor. The roll-off boxes are specially equipped to allow dewatering of the spent carbon in preparation for disposal. Drain water from the roll-off boxes is treated through the intermediate and polish GAC contactors prior to being discharged to the sanitary sewer system with concurrence from the local publicly owned treatment works.

3.2.2 Proposed Spent GAC Sampling Plan

After each GAC change-out event and prior to spent carbon disposal, a sample of the spent carbon will be collected and analyzed for all parameters identified in **Table 3-2**. The purpose of the sampling is to document that analyte concentrations meet the proposed alternative LDR treatment standards prior to disposal at Wayne Disposal Site #2. Analytical results will be provided to MDEQ upon their receipt, along with confirmation that Wayne Disposal Site #2 is the final waste disposal location. In the unlikely event that analytical results do not meet the proposed alternative LDR treatment standards, MDEQ will be informed of how and where the spent carbon will be disposed of, which will likely be via incineration in Canada.

Spent carbon sampling will include the following elements:

- After the spent carbon has been dewatered, each 20-cubic-yard roll-off box will be gridded into 10 equal sections consisting of two grids across the width of the box and five grids across the length of the box. In the case of Strebor's roll-off boxes, each grid measures approximately 41 inches wide by 48 inches long.
- Each grid will be numbered 1 through 10. Using a random number generator, five grids from each box will be selected for sample collection.
- At each grid selected by the random number generator for sample collection, the top 3 to 6 inches of carbon will be removed from a location near the center of the grid and a 1-liter sample will be collected in a 1-liter sample container utilizing a small garden trowel. All 10 samples will be transferred to a clean common container.
- A composite sample will be created by mixing the ten 1-liter samples until uniformly blended.
- After the required sample containers supplied by the laboratory are filled, the remaining sample volume will be returned to one of the roll-off boxes.
- Samples will be analyzed for phenols by SW846 8270 and dioxins/furans by SW846 8290. Dioxin/furan results will also be reported as 2,3,7,8-TCDD equivalents using 2005 WHO TEFs.
- Protocols for sample preservation, handling, and analysis will be as outlined in the MDEQ Remediation and Redevelopment Division Operational Memorandum No. 2 (MDEQ, 2002a).

3.3 Proposed Subsurface Soil Sampling

As noted previously in this variance petition, additional soil excavation is a potential alternative to the current approved SSOU remedy. Additional soil excavation will be considered for the site once the treatability variance is approved. If landfilling of PCP- and dioxin/furan-contaminated soil is approved through an LDR variance, a new cost-benefit analysis will be conducted to assess the efficacy of additional soil excavation and disposal as compared to maintaining and enforcing the approved SSOU remedy of ICs. This analysis will likely include additional soil sampling to confirm the results of the investigation completed in 2002 and to estimate the accessible volume of soil that can be removed. A separate sampling plan will be submitted to the MDEQ for review and approval prior to any additional soil sampling. The sampling plan will address confirmation of previous soil sample analytical results, statistical methods for evaluating random sampling data for comparison to standards, and any data gaps in the previous confirmation sampling.

4.0 CONCLUSIONS

The treatability variance proposed herein represents the most technically and environmentally sound solution to manage contaminated soil, spent carbon, and select PPE/debris generated by soil and groundwater remedial efforts at the site. Two treatment technologies, thermal desorption and persulfate oxidation, were previously applied to soil and spent carbon, respectively, and found to be unable to achieve the level of contaminant reduction required to meet the applicable state and federal standards to allow disposal without a variance. The treatability variance does not cover recovered product or minimal quantities of debris/PPE visibly contaminated with recovered product.

The treatability variance is consistent with USEPA policies discussed in **Sections 1.5.2** and **2.1** regarding management of environmental media contaminated with hazardous wastes. Further, no environmental risks are anticipated to be posed by the proposed variance; rather, significant environmental benefits including reduction of risks to human health and the environment will result, as noted in **Section 2.2**. Historical analytical results demonstrate that PCP and dioxin/furan concentrations using the toxicity equivalence approach will meet the proposed alternative treatment standards. Additional testing is proposed for future carbon change-out events to verify that each shipment of carbon meets the alternative treatment standards and can be accepted by the Subtitle C landfill. If the alternative treatment standards are approved for soil, Strebor will reevaluate the efficacy of additional SSOU-contaminated soil excavation, including a cost-benefit analysis of excavation and disposal in a Subtitle C landfill, versus continued management and enforcement of land use restrictions. Based on previous sampling, a limited amount of the contaminated soil remaining in place in the SSOU may not meet the alternative treatment standards. Therefore, additional sampling and evaluation of statistical methods that could apply to random sampling data will be conducted. A sampling plan addressing these issues will be submitted to MDEQ for review and approval prior to any subsurface soil sampling.

5.0 REFERENCES

Bay West LLC (Bay West), 1993. Proposed Remedial Action Plan for Strebor, Revised. October 28.

Bay West, 1995. Soil Remediation Work Plan for Strebor Inc., Kalamazoo, Michigan. February.

Bay West, 2010. Analytical Results and Planned Waste Disposal, Non-Building Material Waste Streams Encountered During Facility Demolition, Strebor Inc., Kalamazoo, Michigan. September.

Bay West, 2015. Final 2015 Annual Report, Strebor Inc., Kalamazoo, Michigan. December.

Code of Federal Regulations (CFR), 2015. Land Disposal Restrictions, Subpart D – Treatment Standards. Title 40, Sec 268.40-268.49.

Dow Chemical Company (Dow), 1996. Treatability Variance Petition for Soils Generated From Maintenance and Repair of Revetment Groundwater Interception System (RGIS) at the Dow Chemical Company Michigan Division, Midland Plant. March.

Dow, 2008. Revised Petition for the Treatability Variance for Soils Generated From Maintenance and Repair of RGIS and Corrective Action Management Systems, U.S. Environmental Protection Agency (USEPA) Facility ID Number MID 000 724 724. January.

Michigan Department of Environmental Quality (MDEQ), 1999. Release from Financial Capability Requirements for Partial Closure, Hazardous Waste Storage Areas 1 and 2, Strebor, Inc., Kalamazoo County, MID 005 342 134. June.

MDEQ, 2000. Release from Financial Capability Requirements for Final Closure, Hazardous Waste Storage Area 3, Strebor, Inc., Kalamazoo County, MID 005 342 134. June.

MDEQ, 2002a. Remediation and Redevelopment Division (RRD) Operational Memo No. 2, October 22.

MDEQ, 2002b. Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria. August.

MDEQ, 2008. Site-Specific Land Disposal Restrictions Treatability Variance Approval, The Dow Chemical Company, Midland, Michigan, MID 000 724 724. July.

MDEQ, 2009. Agreement for a Limited Industrial Remedial Action Plan, Strebor, Kalamazoo County, Michigan, October 15.

MDEQ, 2015. Modification of the Agreement for a Limited Industrial Remedial Action, MDEQ Reference No. RAP-LANDUSE-RRD-08-004. June.

Michigan Department of Natural Resources and Environment, 2010. Email from Mark Ducharme, MDNRE, to Paul Walz, Bay West, Subject: Strebor, November 13.

US Ecology, 2015. Land disposal Restriction Treatability Variance, Request for Selenium LDR Variance. October.

U.S. Environmental Protection Agency (USEPA); not dated. The Variance Assistance Document: Land Disposal Restrictions Treatability Variances and Determinations of Equivalent Treatment.

USEPA, 1986. Hazardous Waste Management System; Land Disposal Restrictions, Final Rule, Federal Register, Vol. 51, No. 216, November 7, 1986, Rules and Regulations, pp. 40572-40654.

USEPA, 1990a. Superfund LDR Guide #6A (2nd Edition) Obtaining a Soil and Debris Treatability Variance for Remedial Actions. Superfund Publication 9347.3-06FS. September.

USEPA, 1990b. Superfund LDR Guide #6B Obtaining a Soil and Debris Treatability Variance for Removal Actions. Superfund Publication. 9347.3-O6BFS. September.

USEPA, 1997. Petition for Site-Specific Treatability Variance from Land Disposal Restrictions Treatment Standards for Hazardous Wastes, 40 CFR 268.44 (h), Notification of Approval. June.

USEPA, 2001. Land Disposal Restrictions: Summary of Requirements, EPA530-R-01-007 August.

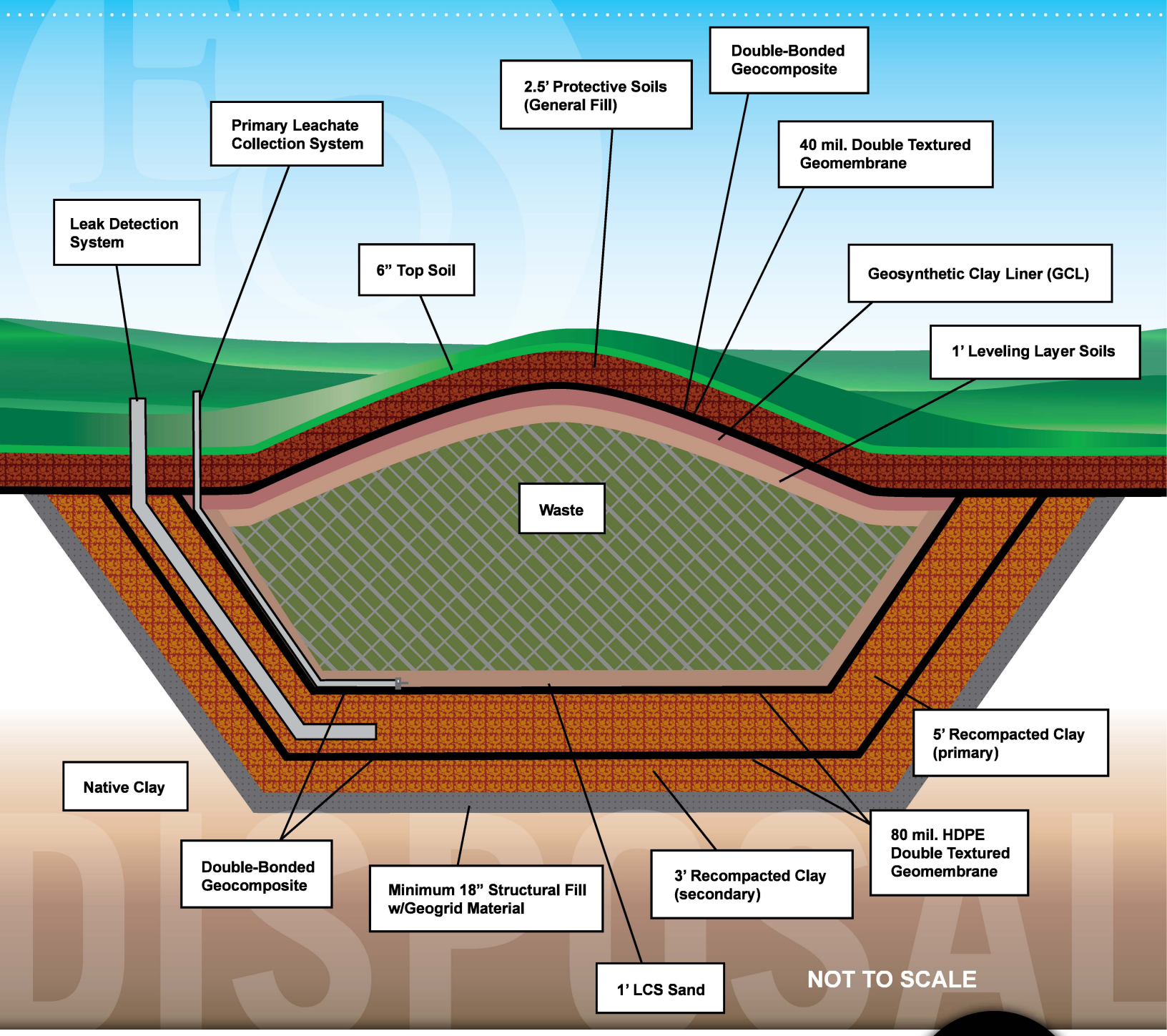
USEPA, 2002. Guidance on Demonstrating Compliance with the Land Disposal Restrictions (LDR). Alternative Soil Treatment Standards – Final Guidance, EPA530-R-02-003, July.

USEPA, 2010. Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds. Risk Assessment Forum, Washington, DC. EPA/100/R-10/005. December.

USEPA, 2011. Fact Sheet on the Management of Dioxin Contaminated Soils. May 9.

Appendix A

Wayne Disposal Site #2 Landfill Fact Sheet and US Ecology Letter of Conditional Approval



HAZARDOUS WASTE DISPOSAL SOLUTIONS

Wayne Disposal, Inc. (WDI) in Belleville, Michigan offers safe and cost-effective disposal solutions for a wide variety of process and remedial hazardous waste streams. In conjunction with our treatment facilities, EQ has pioneered stringent approval and waste handling procedures that surpass regulatory requirements. ISO certification demonstrates our commitment to provide quality environmental services that exceed customer expectations, protect the environment, ensure safety and maintain compliance with regulatory standards.

HAZARDOUS WASTE DISPOSAL SOLUTIONS

WDI is the one of the few TSCA permitted landfills in the United States, accepting PCB contaminated wastes with concentrations above 50 ppm. Easily accessible by truck or rail, WDI provides flexible waste management solutions. Waste is transferred from customer trucks to our dedicated in-cell equipment via a transfer station within the cell itself.

Environmentally Safe and Compliant Features:

- RCRA permitted, Subtitle C Landfill
- TSCA approved
- Only RCRA/TSCA landfill in the Midwest
- NORM/TENORM permitted
- Accepts over 630 waste codes
- On-site laboratory providing analytical services
- Extensive leak detection and groundwater monitoring systems
- Automated perimeter air sampling stations
- Soil, sediment and surface water monitoring
- Natural clay liner with maximum permeability of 1 x 10-7 cm/sec
- State-of-the-art double composite HDPE liner system
- Computerized landfill waste tracking system
- Daily waste location surveys
- Best industry practice -automated, high pressure wheel wash and under carriage flush for all waste delivery trucks exiting the site
- On-site wastewater treatment facilities for landfill leachate and stormwater runoff
- ISO 9001/14001 and OHSAS 18001 Certified
- Coordinate door-to-door pick-up and delivery
- Rail delivery available

For over fifty-five years, EQ – The Environmental Quality Company has been proudly providing innovative environmental solutions for our customers. When our customers face a hazardous waste disposal challenge, they know that EQ offers the complete answer.

Need the QR Code App to read this? Download the right App for your phone at mobile-barcodes.com.

EQ IS THE **ANSWER** WWW.**EQONLINE**.COM

US ecology

251 E Front St., Suite 400, Boise, ID 83702
P 800.590.5220 F 208.331.7900

October 27, 2016

To Whom It May Concern,

After having the opportunity to review the LDR Variance Petition prepared by Bay West for Strebor Inc., US Ecology has made the determination that the waste streams identified in the petition are conditionally approved for disposal at Wayne Disposal Inc. (WDI) in Belleville, MI. Final approval will be made provided that:

- The variance is granted by the Michigan Department of Environmental Quality (MDEQ)
- The generator submits all appropriate wastes stream profiles to WDI for approval with any additional requirements that US Ecology may have (e.g. additional waste characterization and/or approval requirements)

Thank you,

Scott Wisniewski
Environmental Program Manager

Appendix B

MDEQ Site Inspection Letter

STATE OF MICHIGAN

DEPARTMENT OF ENVIRONMENTAL QUALITY

KALAMAZOO DISTRICT OFFICE

RICK SNYDER
GOVERNOR

HEIDI GRETHER
DIRECTOR

October 10, 2016

Bay West
Mr. Michael McClish
2305 Superior Avenue
Kalamazoo, MI 49009

Dear Mr. McClish:

SUBJECT: Strebor, Kalamazoo County
Site Identification Number MID 005 342 134 (WDS: 393300)

On October 6, 2016, the Department of Environmental Quality (DEQ), Office of Waste Management and Radiological Protection (OWMRP), staff conducted an inspection of Strebor, located at 2305 Superior Avenue, Kalamazoo, Michigan, to evaluate compliance with Part 111, Hazardous Waste Management, and Part 121, Liquid Industrial By-Products, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA); Subtitle C of the federal Resource Conservation and Recovery Act of 1976, as amended (RCRA); and any administrative rules or regulations promulgated pursuant to these acts. A copy of the completed inspection form can be obtained by contacting this office.

Based upon information obtained and observations made during the inspection, OWMRP staff has determined that Strebor is in compliance with the requirements of Part 111 and Part 121 of the NREPA and Subtitle C of the RCRA that were evaluated.

If you have any questions, please feel free to contact me at the telephone number below or by e-mail at clemensk@michigan.gov.

Sincerely,

Kirsten S. Clemens, P.E.
Environmental Quality Analyst
Kalamazoo District Office of
Waste Management and
Radiological Protection
269-567-3592

KC: ne

cc: Fred Sellers, DEQ