961802

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5

Amendment to the 1991 and 1994 Records of Decision for the Lemberger Landfill, Inc. and Lemberger Transport & Recycling Superfund Sites Town of Franklin, Wisconsin

January 2021

TABLE OF CONTENTS

APPENDICES

LIST OF ACRONYMS & ABBREVIATIONS

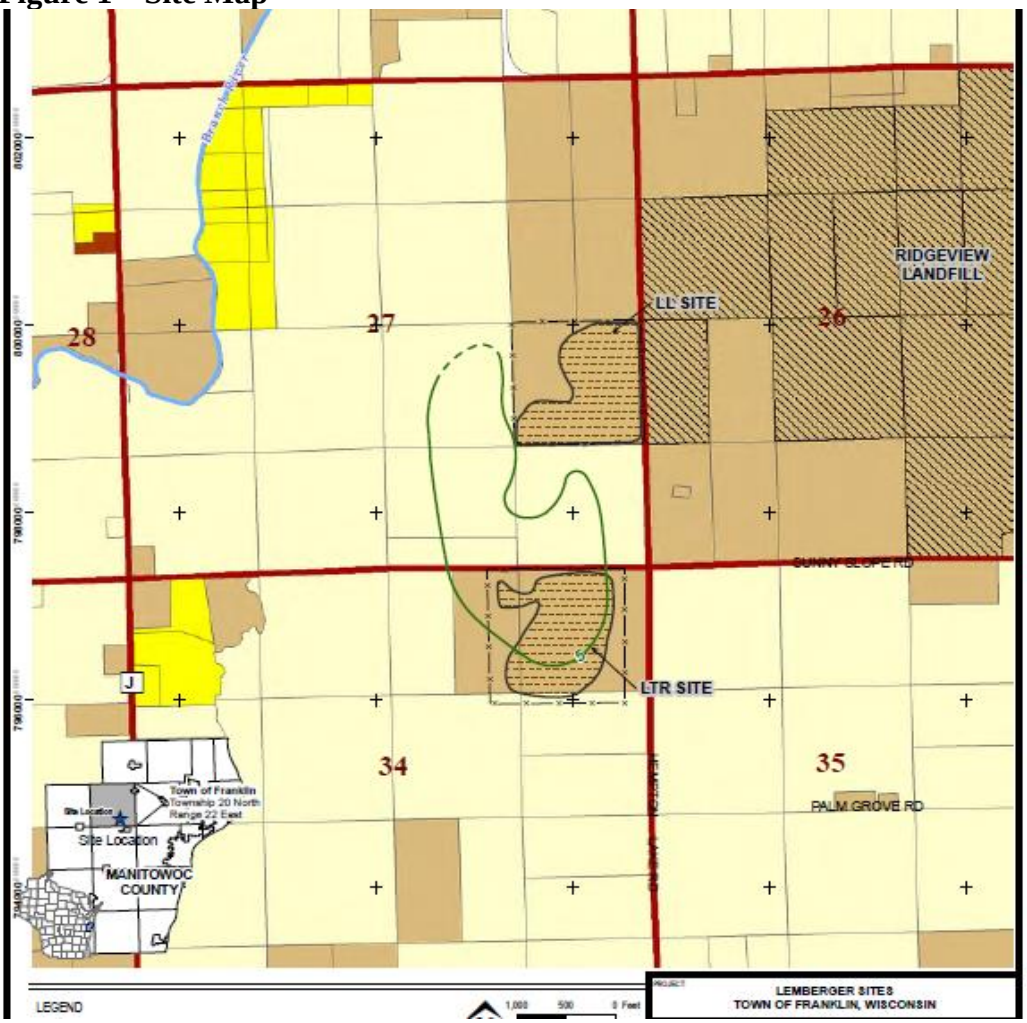
AOC	Administrative Order on Consent
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
CSM	conceptual site model
CU	Cohesive Unit
DCA	dichloroethane
DCE	dichloroethene
DNA	deoxyribonucleic acid
EPA	U.S. Environmental Protection Agency
ES	enforcement standard
ESD	Explanation of Significant Differences
ICs	institutional controls
LGS	lower groundwater system
LGU	Lower Granular Unit
LL	Lemberger Landfill
LTR	Lemberger Transport & Recycling
Lemberger Sites	Lemberger Landfill, Inc. and Lemberger Transport & Recycling Superfund Sites
MCL	maximum contaminant level
MNA	monitored natural attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OU	operable unit
PAL	preventive action limit
PCBs	polychlorinated biphenyls
PCE	tetrachloroethene
PCOR	Preliminary Close Out Report

PFAS	per- and polyfluoroalkyl substances
PRPs	potentially responsible parties
RAOs	remedial action objectives
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
SVOC	semi-volatile organic compound
TCA	trichloroethane
TCE	trichloroethene
TMV	toxicity, mobility, or volume
UCU	Upper Clay Unit
µg/kg	micrograms per kilogram
µg/l	micrograms per liter
UGS	upper groundwater system
UGU	Upper Granular Unit
UU/UE	unlimited use and unrestricted exposure
VOC	volatile organic compound
WDNR	Wisconsin Department of Natural Resources

I. INTRODUCTION TO SITE AND STATEMENT OF PURPOSE

The Lemberger Landfill (LL) and Lemberger Transport & Recycling (LTR) Superfund Sites (collectively known as the "Lemberger Sites") are located in a lightly populated rural area in the Town of Franklin, Manitowoc County, Wisconsin. The U.S. Environmental Protection Agency (EPA) placed the LTR Site on the National Priorities List (NPL) in September 1984 and placed the LL Site on the NPL in June 1986. The LL and LTR Sites are located approximately one-quarter mile from each other (see Figure 1). Other land in the immediate vicinity is generally undeveloped, is used for agriculture, or includes widely spaced rural residences. The general area is also used for hunting. Some land has also been used for rock quarrying and rubble disposal. All residences in the area rely on groundwater for drinking and other residential uses. The Branch River, which is shown in the upper left-hand portion of Figure 1, is used for recreational purposes, including swimming, fishing, and canoeing.

Figure 1 – Site Map



This decision document amends the Operable Unit 1 (OU1) site-wide groundwater remedy that EPA selected in a September 23, 1991 Record of Decision (ROD) for both Lemberger Sites and also amends EPA's September 29, 1994 ROD for Operable Unit 2 (OU2) of the LTR Site. This decision document does not address or change the source control remedy for the LL Site that was selected in the 1991 ROD for OU1. EPA is the lead agency for the Lemberger Sites and the Wisconsin Department of Natural Resources (WDNR) is the support agency. The EPA Identification Numbers for the Lemberger Sites are as follows: LL Site – WID980901243; LTR Site – WID056247208.

This ROD Amendment was developed in accordance with the requirements of Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or "Superfund"), as amended, and Section 300.435(c)(2)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This ROD Amendment was developed after considering state and public comments on the proposed revisions to the remedies for the Lemberger Sites and explains the factual and legal bases for amending the remedies.

The 1991 ROD for OU1 at both Sites selected a site-wide groundwater remedy comprised primarily of groundwater extraction and treatment. Following operation of the groundwater extraction and treatment system for nearly 10 years, EPA issued an Explanation of Significant Differences (ESD) in September 2006. The ESD modified the 1991 ROD for OU1 by allowing the temporary shutdown of the groundwater extraction and treatment system as part of a pilot study to evaluate the effectiveness of monitored natural attenuation (MNA) to address the remaining groundwater contamination at the Sites. EPA, in consultation with WDNR, decided to issue this ROD Amendment after evaluating the results of the pilot study and subsequent groundwater monitoring events which demonstrated that MNA can effectively address the remaining groundwater contamination at the Lemberger Sites.

EPA, in consultation with WDNR, also decided that revisions to the remedy for OU2 of the LTR Site are required. The 1994 ROD for OU2 of the LTR Site selected "No Further Action" for the LTR waste materials because appropriate response actions were being implemented through an emergency removal action. However, since waste materials remain in place at the LTR Site at levels that do not allow for unlimited use and unrestricted exposure (UU/UE), institutional controls (ICs) should be a required component of the remedy to ensure protectiveness.

This ROD Amendment therefore documents EPA's decision to change the OU1 groundwater remedy for both Lemberger Sites from extraction and treatment to MNA. In conjunction with this fundamental change to the groundwater remedy, EPA is also updating the selected groundwater cleanup levels for the Sites to reflect how promulgated groundwater quality standards in Wisconsin are currently implemented by WDNR and EPA. Finally, this ROD Amendment documents that ICs are a required component of the remedy for the LTR OU2 waste materials, since wastes remain in place above levels that allow for UU/UE.

The information supporting this decision document is contained in the Administrative Record file for the Lemberger Sites. The Administrative Record index is provided in Appendix 1. This

ROD Amendment will become part of the Administrative Record, as required by Section 300.825(a)(2) of the NCP. The Administrative Record is available for public review at the following locations:

Manitowoc Public Library 707 Quay Street Manitowoc, Wisconsin 54220 (920) 686-3000 Call for hours	EPA Region 5 Records Center 77 W. Jackson Blvd. (SRC-7J) Chicago, Illinois 60604 (312) 353-1063 Mon-Fri – 8 am to 4 pm Call for appointment

The Administrative Record is also available online at: www.epa.gov/superfund/lemberger-transport and www.epa.gov/superfund/lemberger-landfill.

II. SITE HISTORY, CONTAMINATION AND SELECTED REMEDY

Site History and Summary of Contamination Problems

The LL Site was used as a township open dump from 1940 to 1969, with a portion of the Site excavated as a gravel quarry prior to 1951. The LL Site was licensed by WDNR as a sanitary landfill in 1969. The LL Site fence encloses approximately 40 acres of land, of which 21 acres were used for disposal. The LL includes an estimated 479,000 cubic yards of waste, with the waste being approximately 23 feet thick, but the quantity of hazardous or toxic wastes within the landfill is unknown. Under the WDNR licenses, waste disposal in the LL was supposed to be limited to municipal waste and power plant fly and bottom ash, and industrial waste should have been diverted to LTR. The LL did not have a leachate collection system. Operators were required to place soil over the wastes daily. WDNR requirements provided that, after closure, the LL should have been covered with two feet of compacted soil, adequately sloped, and vegetated. Inspection reports for the LL state that fly ash and bottom ash were used for daily cover instead of being buried with other wastes. It was also reported that fly ash was used to help bring the LL to final grade.

Prior to being used for waste disposal, part of the LTR Site was used as a gravel pit. The LTR Site was licensed by WDNR for industrial waste disposal in 1969 and then operated as an unlined disposal area from 1970 to 1976. Similar to the LL Site, the LTR Site fence encloses approximately 40 acres of land, of which 16 acres were used for disposal. The LTR waste disposal area did not have an engineered liner or leachate collection system. Wastes were deposited in trenches excavated to a depth of approximately five feet, and the documented total quantity of waste disposed at the LTR Site is approximately 870,000 gallons of liquid and an unknown amount of solid waste. Most of the waste (55%) was categorized as wood tar distillates, while 35% was aluminum dust, 5.5% was oil-water mixtures and 1.8% was paint waste. Site investigation activities showed that solid wastes and drums of wastes at the LTR Site were intermixed with fill material.

The Lemberger Sites were closed in 1976, with varying degrees of soil or clay cover placed over the wastes. After discontinuation of operations, a 1- to 4-foot-thick soil cover was installed at the LL that consisted of various types of soil. At the LTR, one foot of clay soil was placed over the waste disposal areas. Although more cover was placed over waste in the early 1980s, wastes were still observed on the surface of the LTR in the early 1990s. In 1980, local residents living west of the LL complained that leachate was seeping onto their properties. In response to these complaints, WDNR ordered the LTR Site owners to conduct an investigation. However, a bankruptcy petition in 1983 resulted in termination of these investigation activities. Subsequently, WDNR recommended that both Lemberger Sites be added to the NPL. As mentioned previously, EPA added the Sites to the NPL in 1984 (LTR) and 1986 (LL).

In 1985, in response to complaints, WDNR sampled 43 residential wells in the area. Volatile organic compounds (VOCs) were detected in seven of the residential wells. From 1985 to 1987, these seven residential wells were abandoned and replaced through Wisconsin's Well Compensation Program. The replacement wells were cased to about 250 feet below ground surface (bgs).

In 1988, EPA began a remedial investigation/feasibility study (RI/FS) at the Lemberger Sites, which included sampling and analysis of the following: surface soils at both Sites; soil borings, sediments, and surface water from areas that receive drainage directly from the LL; leachate seeps from the LL; groundwater from the upper groundwater system (UGS) near the LL and down-gradient from both Lemberger Sites; groundwater from the lower groundwater system (LGS) down-gradient from both Sites; and residential wells located near the Sites. Samples were analyzed for VOCs, semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyl (PCBs), metals, and cyanide. The following contaminants were detected:

Groundwater at both LL and LTR

- The upper aquifer contained high concentrations (between 3,000 and 5,000 micrograms per liter (µg/l)) of acetone, 2-butanone, calcium, magnesium, iron and sodium. Moderate concentrations of methylene chloride, 1,2-dichloroethene (1,2-DCE) and tetrachloroethene (PCE) were also found in the upper aquifer.
- The lower aquifer contained extensive VOCs at concentrations greater than 1,000 µg/l, including chloroethane, methylene chloride, 1,1-dichloroethane (1,1-DCA), 1,2-DCE, and 1,1,1-trichloroethane (1,1,1-TCA). Phenol, phthalates, pesticides, PCBs, and other VOCs (such as 1,1-dichloroethene (1,1-DCE)) were also found in the lower aquifer.

Soils

- VOCs, SVOCs and pesticides were detected in surface and subsurface soils at the LL.
- Surface soils containing VOCs with concentrations ranging from 230 to 2,000 micrograms per kilogram (µg/kg) and SVOCs with concentrations ranging from 94 to 2,000 µg/kg were found at the LTR. The pesticides aldrin and dieldrin were also found in surface soils. Subsurface soils at the LTR had the same contaminants detected, but at lower concentrations.

Sediment, Surface Water and Leachate

- Sediment and surface water around the LL and LTR showed low concentrations of VOCs including methylene chloride, acetone and phthalates.
- Four leachate samples were collected from the one location where a leachate seep was found, which was at the northwest corner of the LL.

According to the RI, this contamination was likely to migrate off-site to the west in the UGS and recharge adjacent wetlands. The confining unit appeared to be continuous below the LL, so it was believed that contamination was very unlikely to migrate through the confining unit into the LGS. However, the RI noted that low-level detections of 2-butanone in one of the monitoring wells (MW-11) indicated the possibility that some migration through the confining layer was occurring. High concentrations of VOCs were detected in the LGS, particularly near the LTR.

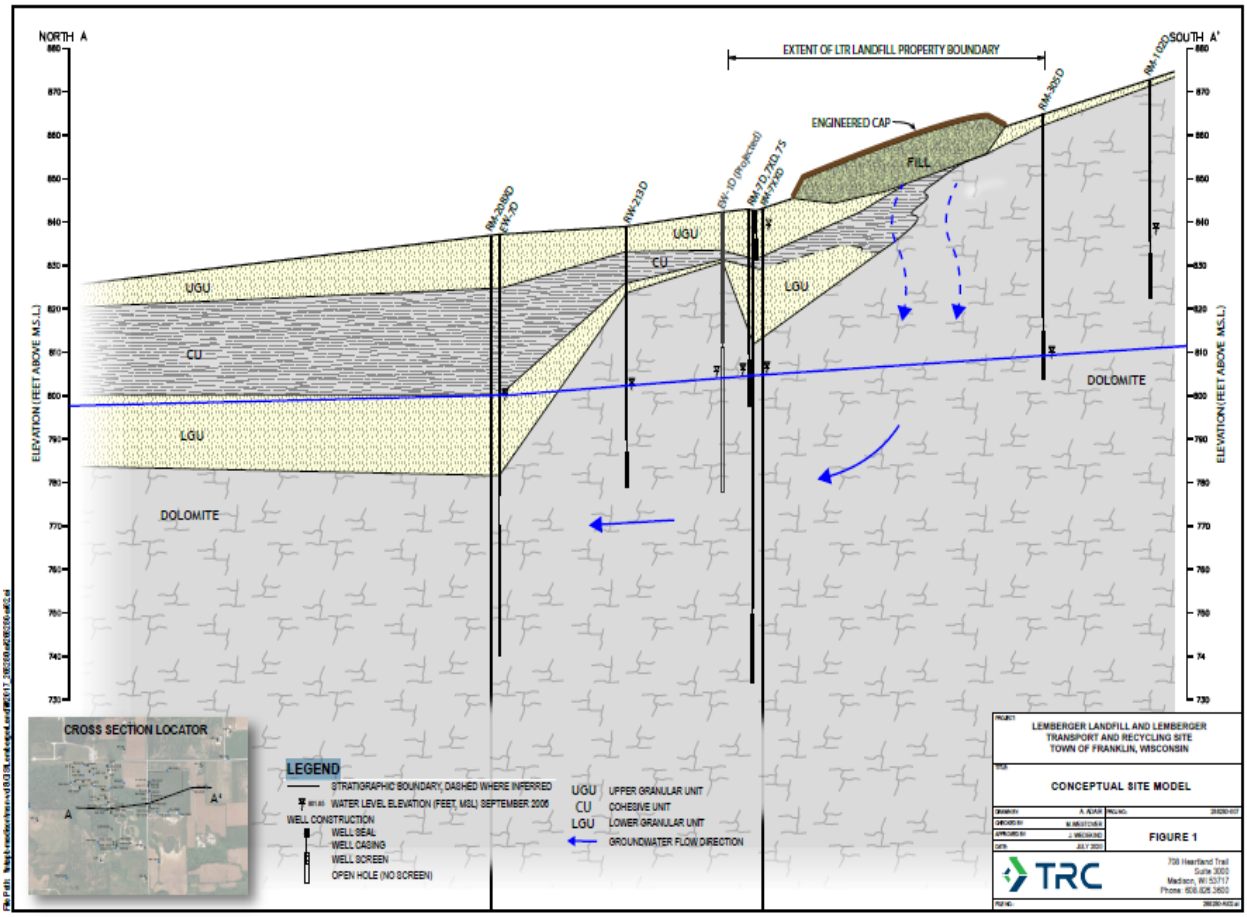
Using data from the RI, EPA determined there were unacceptable human health risks from exposure to contaminated soil and groundwater at the Lemberger Sites. However, because data gaps were identified regarding contaminant sources at the LTR, EPA decided to first proceed with a ROD in 1991 addressing the LL source area and the groundwater contamination from both Sites. Further investigation was then performed at the LTR source area to address identified data gaps. Additional sampling for the LTR was performed in 1992 and primarily included samples from 13 test pits and 18 soil borings. The test pits were located based on magnetic anomalies. The samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. It was observed that fill soils were intermixed with solid wastes and drums. At some locations, a black tar-like material with a burnt-wood charcoal odor was observed. The LTR investigation delineated hot spots containing buried drums, concentrated wastes, and high levels of contamination.

Site Characteristics

The terrain of the general area is rolling to hilly, sloping to the west and northwest, with numerous wetlands in the area. The Branch River, which drains into Lake Michigan, is located about 3,000 feet west of LL and 3,500 feet northwest of LTR, as shown on Figure 1.

The Lemberger Sites are geologically located within an interlobate glacial geomorphology characterized by alternating and random sequences and deposits of sand, gravel, and clay soils. Near the Lemberger Sites, there are two distinct sand and gravel deposits, referred to as the Upper Granular Unit (UGU) and Lower Granular Unit (LGU), which are generally separated by a clay unit called the Upper Clay Unit (UCU). (Note: the UCU is shown on some Site figures as "Cohesive Unit" (CU)). Below the LGU lies the Niagara Formation dolomitic limestone bedrock, described as grayish-white massive to thinly-bedded sedimentary rock with highly-weathered surfaces. The Niagara dolomite aquifer serves as the primary drinking water source in the area. All residences in the vicinity of the Lemberger Sites rely on groundwater for drinking and other residential uses. At the time of the RI, approximately 2,700 people used this aquifer for drinking within a three-mile radius of the Lemberger Sites. Figure 2 illustrates the UGU, CU, LGU, and underlying dolomite bedrock.

Figure 2 - Geohydrology of Lemberger Sites



There are two groundwater aquifer systems of concern at the Lemberger Sites. One is the UGS, which is a localized perched aquifer in the UGU lying atop the UCU, and the second is the LGS, which consists of the water-saturated portions of the dolomite bedrock and, where it exists, the overlying sand and gravel of the LGU.

The UGS may be a single interconnected aquifer or may comprise several discontinuous perched zones, depending on location. The UGS is in direct contact with the bedrock, without the intervening UCU, at the southeastern corner of the LL and along the northern and eastern sides of the LTR. Mapping of groundwater heads in the UGS in the vicinity of the Lemberger Sites indicates that flows are to the west with some convergence toward the southwestern corner of the LL.

The LTR Site is located on the flank of a bedrock ridge, which reaches the ground surface a few hundred feet south and east of the LTR and slopes downward to the northwest. There is no perched aquifer system at the LTR and the LGU is missing at essentially all of the LTR. As a result, the permeability of the LGS is relatively low at and near the LTR Site. In most soil

borings, fractured and massive bedrock zones were found to be interlayered. The upper part of the bedrock is more weathered and fractured, and the fracture frequency decreases with depth. However, horizontal and vertical fractures are present and provide significant migration pathways through which contaminated groundwater migrates from the LTR.

The water table lies about 10 to 40 feet below the top of the dolomite at the LTR and dips to the north to northwest. The top of the bedrock dips downward at a faster rate than the water table, and the sand and gravel LGU is consistently present to the north. Therefore, as the groundwater in the LGS migrates to the north and northwest from the LTR Site, groundwater flows in both the bedrock and the relatively permeable LGU that together comprise the LGS.

Remedy Selection and Implementation

Due to the complex conditions at the Lemberger Sites, EPA divided the work into OUs. OU1 addressed the groundwater contamination resulting from both Sites as well as the source contamination (i.e., the waste) at the LL Site. OU2 addressed the source contamination (i.e., the waste) at the LTR Site. A summary of the OUs for the Lemberger Sites is provided in Table 1.

Table 1 – OU Summary for Lemberger Sites

Media	**LL Site**	**LTR Site**
Groundwater	OU1	OU1
Source contamination/waste	OU1	OU2

OU1

The ROD for OU1, which EPA issued in 1991, included the following remedy components:

- installation of extraction wells and an on-site groundwater treatment system to restore groundwater in the upper and lower aquifers at the Sites;
- construction of a Subtitle D landfill cap for the LL Site per State of Wisconsin landfill closure regulations;
- construction of a slurry wall around the perimeter of the LL;
- installation of leachate withdrawal wells in the interior of the LL and a leachate storage system with transport of leachate to a publicly-owned treatment plant;
- construction of an outfall pipe from the on-site groundwater treatment plant with final discharge to the Branch River;
- construction of a six-foot security fence around the LL and the groundwater treatment facility;
- a contingency plan to provide an alternative water supply to any residential well owners whose water supply is disrupted by the pumping;
- deed restrictions;
- monitoring; and

- wetlands investigation measures designed to prevent damage to wetlands, and mitigation, if necessary.

In October 1992, the potentially responsible parties (PRPs) entered into a consent decree with EPA and WDNR to implement EPA's Selected Remedy for OU1.

The remedial design for the OU1 remedy was completed in March 1995. The groundwater extraction and treatment system design included six extraction wells in the LGS, four screened in bedrock, and two in the LGU. These six wells were intended to capture all contaminated groundwater in the LGS from the Lemberger Sites. An air-stripping system was constructed to treat the extracted groundwater. The remedial action construction work for OU1 was conducted from summer 1995 to fall 1996.

EPA issued a Preliminary Close Out Report (PCOR) for the LL Site in September 1996, stating that all construction activities were complete and consistent with the ROD and remedial design plans and specifications. The remedial action construction work for OU1 (which addressed the LL source as well as groundwater contamination from both Sites) included the following:

- installation of groundwater extraction wells;
- construction of a groundwater treatment system;
- construction of a solid waste cap over the LL;
- installation of a slurry wall surrounding the LL waste;
- installation of eight leachate wells through the LL Site cover to remove groundwater contained within the slurry wall and cap; and
- construction of various sumps to remove groundwater from the LL.

Following operation of the groundwater extraction and treatment system for nearly 10 years, EPA issued an ESD in September 2006. The ESD modified the 1991 ROD for OU1 of the Lemberger Sites by allowing temporary shutdown of the groundwater extraction and treatment system for a pilot study to evaluate the effectiveness of MNA to address the remaining groundwater contamination at the Sites.

<u>OU2</u>

As noted earlier, a source control action for the LTR Site was not included in the 1991 ROD for LTR OU2 because further characterization was required before selecting a remedy for the LTR wastes. After further remedial investigations at the LTR, which found that the LTR Site contained buried drums as well as landfill hotspots, EPA and WDNR determined that conditions at the LTR Site warranted emergency removal activities to abate conditions that may have presented an imminent and substantial endangerment to the public. In July 1993, EPA and the PRPs entered into an Administrative Order on Consent (AOC) to perform these removal activities at LTR. The AOC required the PRPs to conduct the following removal activities:

- construct a Site fence around the perimeter of the LTR;

- perform a land survey to better define the LTR boundaries;
- conduct a geophysical survey to delineate areas that could contain buried drums;
- excavate and dispose of drums;
- use soil vapor extraction to treat contaminated soils adjacent to the drums and in identified landfill hotspots; and
- submit a work plan to install a vapor extraction system for further source removal and, at a minimum, a Subtitle D landfill cap at the LTR per State of Wisconsin landfill closure regulations.

In September 1994, EPA issued a ROD for OU2, the LTR source contamination. The ROD selected "No Further Action" for OU2 because it was determined that, once all removal activities required by the AOC were complete, there would be no further unacceptable risks at the LTR. Even though the Selected Remedy for OU2 was No Further Action, the ROD stated that five-year reviews would be required because hazardous substances would remain at the LTR Site. The ROD for OU2 did not require ICs for the LTR landfill source materials.

In November 1993, field activities associated with the excavation and removal of drums started at the LTR Site, with completion of this phase of the removal work in April 1994. A total of 1,380 drums, 180 lab jars, and 226 gas cylinders were excavated from the LTR and disposed of off-Site. As part of the work required by the AOC for OU2, the PRPs submitted a work plan for the design and construction of a soil vapor extraction system and landfill cap, as described above. However, prior to constructing the landfill cap, it was determined that the soil vapor extraction system would not be effective in removing VOCs from the source. EPA then required a composite cover system to be constructed to provide for a greater reduction of infiltration through the source. All of the construction work required by the OU2 removal AOC was completed by fall 1996.

EPA issued a PCOR for the LTR Site in October 1996, stating that all construction activities were complete and consistent with the ROD, the removal AOC, and remedial design plans and specifications. In addition to the OU1 remedy components (described above) that address groundwater contamination from both Sites, the removal construction activities at the LTR Site associated with OU2 included the following:

- excavation and off-Site disposal of drums, lab jars, and gas cylinders;
- construction of a six-foot chain-link fence around the landfill; and
- construction of the landfill cap.

III. BASIS FOR THE DOCUMENT

Evaluation of MNA for OU1 Groundwater

After eleven years of active groundwater remediation across the Sites under the extraction and treatment remedy implemented in accordance with the 1991 ROD for OU1, groundwater

extraction was suspended in 2006 to perform an MNA study of groundwater at the Sites. The purpose of the MNA study was to evaluate the existing conditions at both Sites and confirm that the plume of VOCs would not expand and exceed the groundwater cleanup levels established in the 1991 ROD with MNA alone, in the absence of active groundwater extraction and treatment. The results and conclusions obtained during the MNA study are summarized as follows:

- The overall size of the VOC groundwater plume has diminished significantly since the remediation activities commenced, as well as since the MNA study began in 2006, and concentrations of VOCs within the impacted area continue to decrease.
- VOCs in the groundwater near the identified LTR source have degraded through anaerobic microbial reductive dechlorination to form primary breakdown products such as cis-1,2-DCE and 1,1-DCA. Aerobic conditions downgradient of the LTR inhibited production of alternate degradation compounds (e.g., vinyl chloride and 1,1-DCE). VOCs continue to be degraded via abiotic processes.
- Statistical analysis of the historical groundwater data indicates that the concentrations of most VOC parameters that exceed the Wisconsin enforcement standard (ES) at most locations in the groundwater contaminant plume will reach the ES in approximately 50 years.
- Geochemical conditions in the aquifer suggest that limited biotic activity continues at the LTR source area. BIOCHLOR model results are consistent with the occurrence of a higher rate of decay near the source area than in the downgradient plume.
- WDNR finalized a memo to EPA in 2010 stating that, given the measured concentrations of contaminants of concern (COCs) dissolved in groundwater, any potential groundwater discharges to the Branch River would not be of concern for aquatic life.
- ICs are in place and encompass areas where groundwater exceedances exist and serve as additional protection to restrict the potential for exposure risks to COCs.
- The maximum vertical extent of the impacted groundwater (190 feet bgs) is significantly shallower than the WDNR Special Casing Area depth requirement (minimum depth of 250 feet bgs for newly constructed wells). The Special Casing Area was first established in 1988 and expanded in 2010.
- An IC Plan for the Sites has been in place since 2009, and EPA made a Site-Wide Ready for Anticipated Use determination for both Lemberger Sites in 2015.

The Lemberger Sites' MNA study followed EPA's 1999 MNA guidance, "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action and Underground Storage Tank Sites," and followed the three-tiered approach to evaluate MNA as a remedy option. Generalizing, the three lines of evidence are 1) data that show decreasing trends of contamination, 2) geologic and hydrogeologic data to demonstrate that indirect natural attenuation processes will reduce contaminants, and 3) data from field studies which directly demonstrate natural attenuation processes are occurring. EPA evaluated all three lines of evidence and determined that all three lines of evidence are met and show that MNA effectively works at the Sites. More information regarding the three lines of evidence is provided below.

<u>First Line of Evidence</u> – Historical groundwater and/or soil chemistry data that demonstrate a clear and meaningful trend of decreasing contaminant mass and/or concentration over time at appropriate monitoring or sampling points.

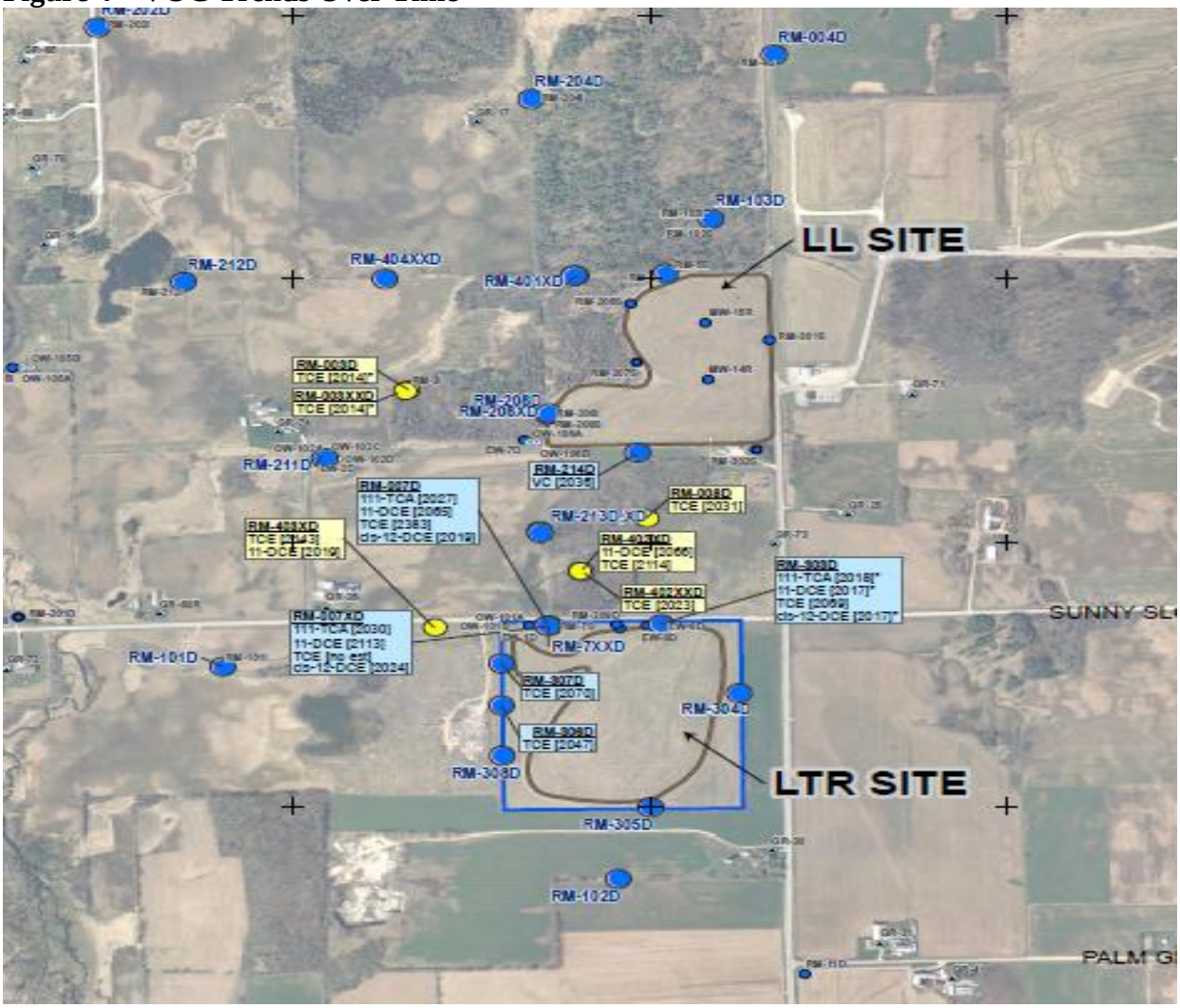
Figure 3 shows the spatial distribution of total VOCS at various times over a 20-year period. These "snapshots" reflect the addition of monitoring wells over the years. Note that the three latest snapshots summarize the plume after the 2006 start of the MNA study, when all extraction wells stopped operating. This overview shows that the footprint of the VOC plume is stable or decreasing in area, and that the amount of contaminant mass in the LTR source area has decreased over time.

Figure 3 - Spatial Distribution of Total VOC Concentrations as Snapshots over Time

The behavior of individual VOCs was also examined. Concentration vs. time graphs of the VOC data were evaluated at all monitoring wells to determine if the overall plume concentrations are increasing, stable, or decreasing. Statistical analyses, using Sen's method and linear regression, were performed for each of the wells and VOCs with current ES exceedances to determine if the trends in concentrations are increasing or decreasing with a specified level of statistical significance, and to estimate time-to-cleanup. The statistical analysis showed that concentrations of parent compounds have decreased or remained stable at these wells and that trichloroethene (TCE), which is a degradation product of PCE, has substantially decreased at downgradient wells that at one time all exceeded the ES. As a way to summarize the trend analyses, Figure 4 shows various wells' trends over time. Wells that are shown as blue dots represent no ES exceedance

and a downward trend, while yellow dots represent ES exceedance and a stable or downward trend.

Figure 4 – VOC Trends Over Time



Contaminant trends at the LTR source area show groundwater extraction had very little impact on the concentration of VOCs leaving the source area. More importantly, VOC concentrations at the source area have decreased at most (10 of 11) monitoring wells at the same rate regardless of whether or not the extraction wells were operating. Decreasing concentrations of VOCs at the source area in the absence of active extraction and treatment is clear evidence that the plume will continue to diminish over time.

Concentrations of VOCs at 35 of 37 downgradient monitoring wells exhibit decreasing trends when viewed over the full monitoring history. The two exceptions are at wells with concentrations significantly below regulatory standards. One of these wells, RM-401XD, continues to be monitored for compliance and the other, RM-003I, is collocated with other wells

that exhibit higher concentrations and will continue to be monitored. VOC concentration trends at the wells within the source area and the downgradient plume are generally downward both before and after the groundwater extraction system was shut down.

Summarizing analyses contained in the 2019 MNA Report [TRC, 2019], Table 2 focuses on the estimated year to reach the ES (also known as "time to ES") only for those monitored wells that exceeded the ES for one or more VOCs of concern anytime during the period 2015-2018. Wells that did not exceed the ES during this period are not included in the table. It should be noted that wells RM-003D and RM-003XXD do meet the ES during almost all of the monitoring period between 2015-2018, but are right along the edge of the ES plume exceedance line for TCE. In one or more sampling event these wells have exceeded the TCE ES slightly, that is why the estimated year to reach ES below for these wells is 2014.

Table 2 - Estimated Time to ES at Wells Exceeding ES (2015-2018)

Well ID	Compound	Estimated Year to Reach ES	Notes
Wells at Source Area			
RM-007D	TCE	2383	[1]
RM-007D	cis-1,2-DCE	2019	
RM-007D	1,1,1-TCA	2027	
RM-007D	1,1-DCE	2065	
RM-007XD	TCE	N/A	[2]
RM-007XD	cis-1,2-DCE	2024	
RM-007XD	1,1,1-TCA	2030	
RM-007XD	1,1-DCE	2113	[1]
RM-214D	vinyl chloride	2036	
RM-303D	TCE	2069	
RM-303D	cis-1,2-DCE	2017	
RM-303D	1,1,1-TCA	2018	
RM-303D	1,1-DCE	2017	
RM-306D	TCE	2047	
RM-307D	TCE	2070	
Wells within Potential Expanded DMZ			
RM-402XD	TCE	2114	[3]
RM-402XD	1,1-DCE	2066	[3]
RM-402XXD	TCE	2023	[3]
RM-403XD	TCE	2143	[3][4]
RM-403XD	1,1-DCE	2019	[3]
Plume Wells			
RM-003D	TCE	2014	
RM-003XXD	TCE	2014	[3]
RM-008D	TCE	2031	

NOTES:
Information in this table summarized from Table 2 of MNA Report [TRC, 2019].
N/A No estimate available.
[1] Estimate improves with more data, based on evaluations of three (3) data subsets.
[2] Asymptoting to RM-007D concentration, then anticipate it will echo RM-007D decay behavior.
[3] Shorter data record at this location.
[4] Anticipate that estimate will contract with more years of data collection, as observed in records of numerous other wells.

Concentration decreases to the ES can be estimated for all but one of these recent ES exceedances (TCE at RM-007XD). A small number of these estimates extend to the next century or beyond, but review of Site data at other wells suggests that these estimated times will shorten as future data are collected and updated estimates are developed. No time-to-ES estimate is available for TCE at RM-007XD because concentrations at this LTR-boundary well are approaching, but have not yet attained, decreasing conditions. Concentrations at this well are asymptoting toward the concentration in its collocated sibling well RM-007D and, once that is achieved, its behavior is expected to echo the declining concentration behavior seen at RM-007D.

Secondary Line of Evidence – Hydrogeologic and geochemical data that can be used to demonstrate indirectly the type(s) of natural attenuation processes active at the site, and the rate at which such processes will reduce contaminant concentrations to required levels.

Natural attenuation of the VOC plume can be documented through analysis of the physical, biological, and chemical processes that act on it. Degradation of the chlorinated compounds of concern (1,1,1-TCA, TCE, and their respective breakdown compounds) can occur via the following mechanisms:

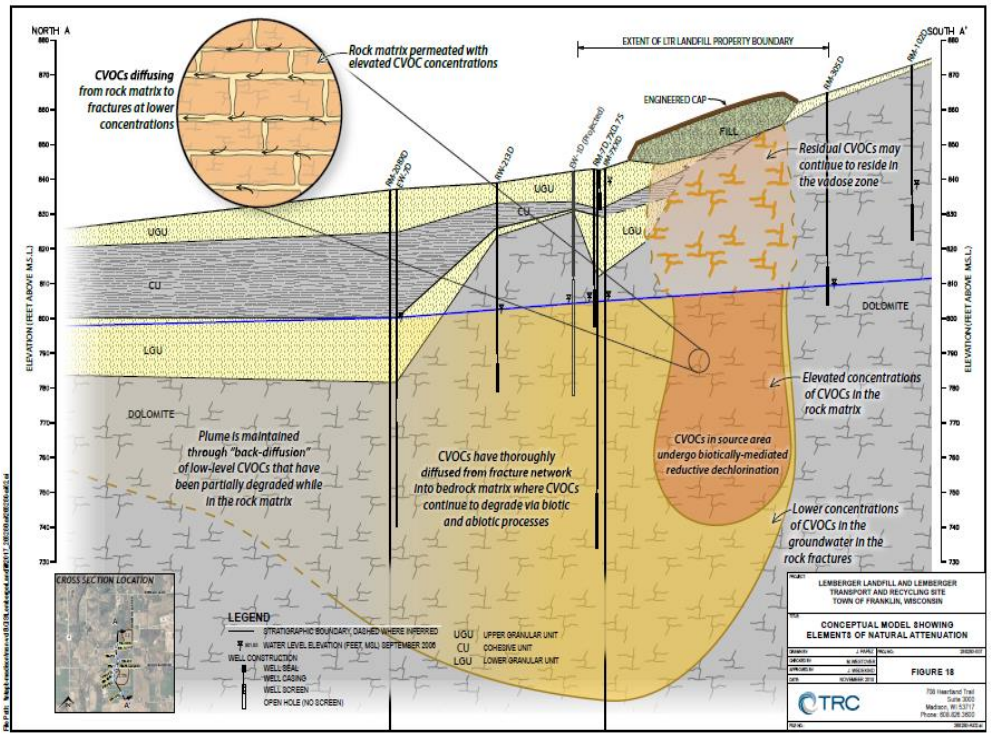
- Biotically-mediated reductive dechlorination;
- Biotically-mediated aerobic oxidation and aerobic co-metabolism; and
- Abiotic hydrolysis and elimination.

Indirect evidence of biotic and abiotic attenuation mechanisms may be obtained by evaluation of the temporal and spatial distribution of VOCs and indicator parameters in the groundwater. Indicator parameters currently in the monitoring program include alkalinity, chloride, sulfate, nitrogen (as nitrate + nitrite), total iron, total manganese, total organic carbon, and field measurements of pH, temperature, specific conductance, dissolved oxygen, and oxidation-reduction potential. All indicator parameters measured at the Sites are consistent with the general requirements of MNA.

Two different methods were used to evaluate whether MNA is occurring and to calculate decay rates at the Lemberger Sites: the Buscheck-Alcantar Method and the BIOCHLOR model. Both methods showed that decay rates are much higher in the source area than in the downgradient plume. This is consistent with the updated conceptual site model (CSM), discussed below, which includes biotic decay in the source area and abiotic decay in the rest of the plume. This also indicates that MNA is occurring across the entirety of both Sites.

The updated CSM presented in Figure 5, which uses the LTR Site as an example, demonstrates that VOCs released from the LTR from past waste disposal practices entered the fractured rock aquifer and moved rapidly to the north, following the local hydrologic gradient toward the Branch River. A residual mass of VOCs diffused into the rock matrix below the LTR and at lower concentrations along the length of the plume. VOCs will continue to be slowly released from the rock matrix to the groundwater through the process of back diffusion until the mass has equilibrated to match the groundwater concentrations in the fractures or the mass degrades. Groundwater at the Sites is largely aerobic and lacking in organic carbon. This environment limits continued biotic degradation of TCE. Therefore, abiotic processes of dispersion, hydrolysis, and sorption plus aerobic degradation serve to further decrease the constituent mass.

Figure 5 – Conceptual Site Model



Figures 6 and 7 below illustrate degradation of VOCs at the LTR and LL Sites.

Figure 6 – Degradation of Chlorinated Ethenes

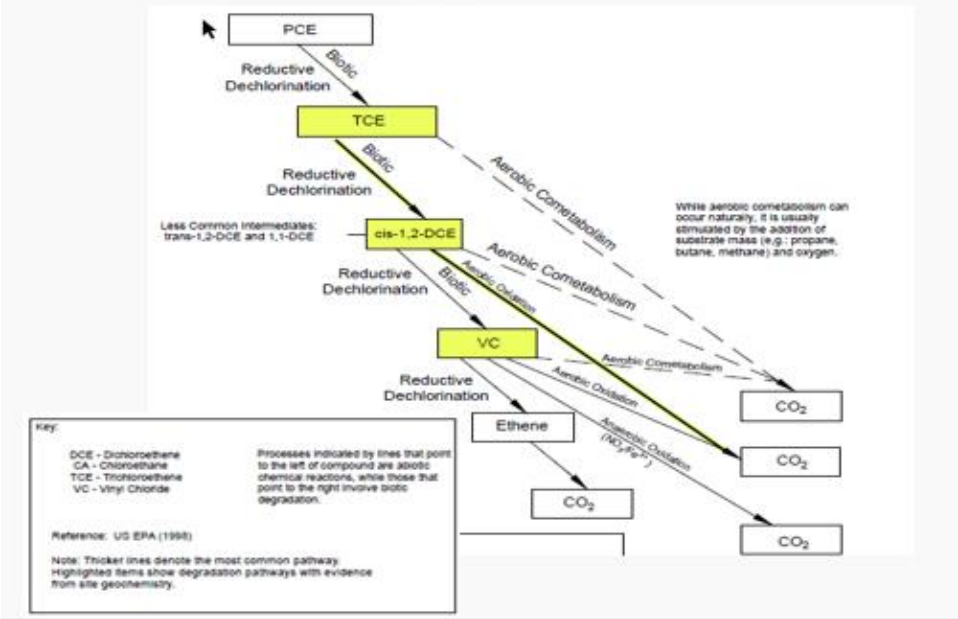


Figure 7 – Degradation of Chlorinated Ethanes

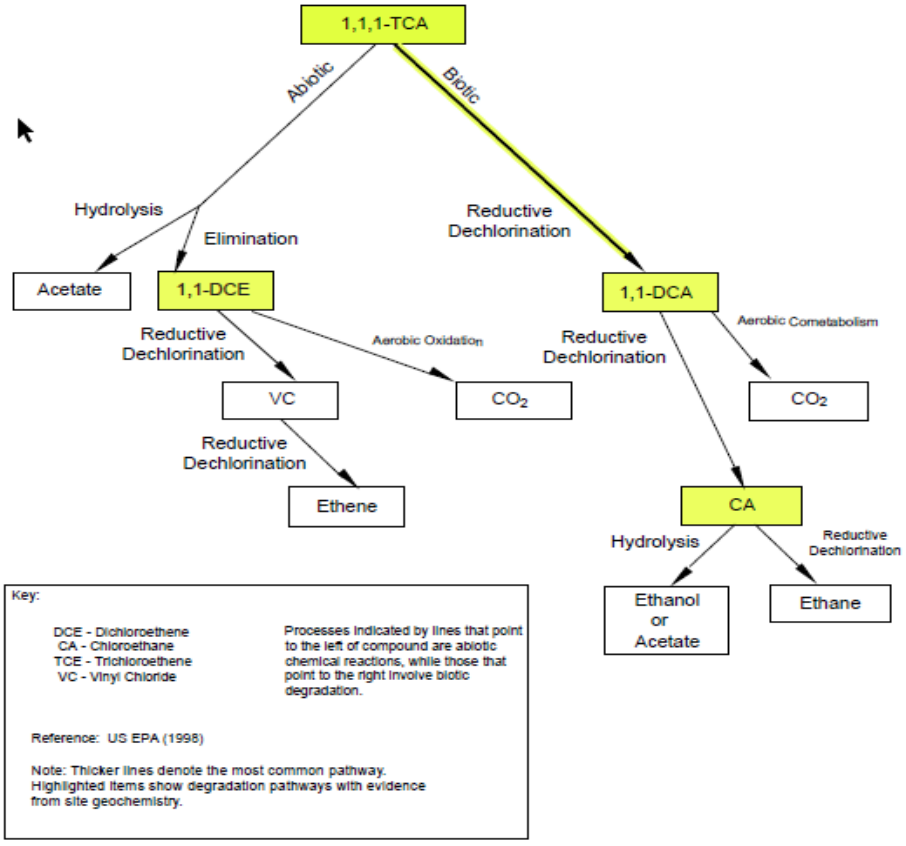


Figure 6 shows how chlorinated ethenes are biotically degraded at the Sites. The thicker and yellow-highlighted lines show how PCE degrades across the Sites. Figure 7 shows how chlorinated ethanes are both biotically and abiotically derived from 1,1,1-TCA across the Sites. The conclusions presented in Figures 6 and 7 are supported by geochemical evidence gathered from sampling across the Sites. Notable exceptions include TCE at RM-007D, which is stable over the full range of data and reflects remaining parent material near the source area, and 1,1-DCE at RM-007XD, which reflects an ongoing equilibration process with RM-007D, similarly seen in TCE and cis-1,2-DCE data for that pair of wells.

Tertiary Line of Evidence – Data from field or microcosm studies (conducted in or with actual contaminated site media) which directly demonstrate the occurrence of a particular natural attenuation process at the site and its ability to degrade the contaminants of concern.

Deoxyribonucleic acid (DNA) testing was performed to support the conclusion that MNA is occurring at the Sites. The following were noted:

- DNA testing revealed that the genera of bacteria associated with 1,1,1-TCA degradation were detected at two wells that were studied around the LTR.
- The bacteria will continue to degrade 1,1,1-TCA where the population is viable, but is limiting to growth in other areas.
- However, other indicators such as the presence of biotically-produced 1,1,1-DCA and cis-1,2-DCE in the plume indicates that reductive dechlorination is occurring.

Changes to Groundwater Cleanup Levels for OU1 Groundwater

Under current implementation of Wisconsin Administrative Code NR 140, Groundwater Quality, cases involving contaminated groundwater are routinely closed by the WDNR Remediation and Redevelopment Program using the ES as the basis for closure. The ES is an applicable groundwater compliance standard for substances of health or welfare concern in the groundwater beyond the boundaries of the waste. Section NR 140.22 specifies compliance with more-stringent preventive action limits (PALs) only to the extent that this compliance is technically and economically feasible. WDNR has concluded since the mid-1990s that groundwater quality compliance with PALs at contaminant discharge sites in the state is, in many cases, not technically or economically feasible. The range of responses when an ES is exceeded includes the collection and evaluation of data to determine whether natural attenuation can be effective to restore groundwater quality within a reasonable period of time, as demonstrated by a stable or receding groundwater plume.

Although ESs were considered when the cleanup levels for Sitewide groundwater were established in the 1991 ROD, the selected groundwater cleanup levels for any COCs with an established PAL were based on the PAL. Since most of the Sites' COCs had PALs, the cleanup levels for groundwater (which were provided in Table 5 of the 1991 ROD) were primarily based on the PALs in effect at that time. Cleanup levels for COCs without an established PAL were based on either the federal maximum contaminant level (MCL) in effect at that time or a calculated risk-based value.

In order to bring the selected cleanup levels for the Sites in line with how WDNR and EPA interpret and implement the state's promulgated groundwater quality standards, EPA has decided to change the groundwater cleanup levels originally selected in the 1991 ROD. The revised groundwater cleanup levels for the Sites will reflect either current MCLs, current ESs, or – for those COCs without an MCL or ES – calculated risk-based values. Since 1991, some COCs that did not have an MCL and/or ES now have one or both. In some instances, the MCL and/or ES values have changed since 1991. For many COCs with both an MCL and an ES, the ES is identical to the MCL. In accordance with the NCP, only those state standards that are more stringent than federal standards should be identified as the applicable or relevant and appropriate requirement (ARAR). Therefore, for COCs that have identical MCLs and ESs, the MCLs will be selected. For COCs that have ESs but no MCLs, or ESs that are more stringent than the MCLs, the ESs will be selected. The cleanup levels for any COCs without MCLs or ESs will continue to be based on calculated risk-based values.

Requiring ICs for LTR OU2 Soils

EPA has decided that the "No Further Action" remedy selected in the 1994 ROD for LTR OU2 does not ensure long-term protectiveness, since waste remains in place at the LTR Site above levels that allow for UU/UE. Although appropriate ICs for the LTR waste materials have already been implemented, EPA has decided that ICs need to be documented in an EPA decision document as a required remedy component for LTR OU2.

IV. DESCRIPTION OF NEW ALTERNATIVES

OU1 Groundwater

EPA and WDNR evaluated one new groundwater alternative against the existing groundwater remedy selected in the 1991 ROD. These two options are described as follows: either (1) leave the existing groundwater extraction and treatment system component of the 1991 ROD remedy in place (i.e., do not change the groundwater remedy) or (2) change the groundwater remedy (as described below) to address the remaining groundwater contamination at the Sites. The components associated with a potential change to the groundwater remedy were developed based on new groundwater monitoring data and analyses that were outgrowths of the remedial design and remedial actions conducted from 2002 to the present under the 1991 ROD. The conclusions of the Sites' MNA study and the rationale for changing the selected cleanup levels for groundwater are described above in Section III, *Basis for the Document*.

Groundwater Alternatives

The two remedial action alternatives for groundwater are further described below.

- Option 1: Leave Original Remedy in Place, Restart the Groundwater Extraction and Treatment System
    - The original remedy (per the 1991 ROD) included extracting and treating the VOC-contaminated groundwater plume and was fully described in the 1991 ROD.

This remedy was constructed and implemented, as described in the *Remedy Selection and Implementation* discussion in Section II, above. Extraction of groundwater was suspended in 2006 to allow for an evaluation of MNA, and the extraction and treatment system has remained in shutdown-mode since that time. Under this option, the groundwater extraction and treatment system would be restarted and would continue to operate until selected cleanup levels were achieved.

- The costs associated with active groundwater extraction and treatment under the original remedy while the system was in operation exceeded $500,000 per year (including all required groundwater sampling and analysis costs). The costs of Option 1 are anticipated to be similar to those prior costs.

Option 2: Amended Remedy – Monitored Natural Attenuation of VOCs in Groundwater

- This option would rely on natural processes to reduce the residual VOCs in groundwater over time and would include an updated long-term groundwater monitoring program.
- The major costs associated with Option 2 are for groundwater sampling and analyses (i.e., for the monitoring associated with MNA) and are estimated at approximately $100,000 annually.

Groundwater Cleanup Levels

Additionally, under either of the above options, EPA would change the groundwater cleanup levels that were selected in the 1991 ROD, in accordance with the rationale presented in the *Changes to Groundwater Cleanup Levels for OU1 Groundwater* discussion in Section III, above.

OU2, LTR Soils

EPA and WDNR evaluated one new alternative for OU2 against the existing "No Further Action" remedy selected in the 1994 ROD. These two options are described as follows: either (1) leave the existing "No Further Action" remedy in place (i.e., do not change the OU2 remedy) or (2) change the OU2 remedy (as described below) to include the requirement for ICs for the contaminated soils and waste materials at the LTR Site.

The two remedial action alternatives for LTR soils are further described below.

- Option 1: Leave Original "No Further Action" Remedy in Place
  - Under this option, ICs would not be a required element of the remedy for LTR soils, despite the fact that waste remains in place at the Site above levels that allow for unlimited use and unrestricted exposure.
  - There would be no costs associated with this option.
- Option 2: Amended Remedy – ICs for LTR soils

- Under this option, ICs would be a required element of the remedy for LTR soils. ICs in the form of environmental restrictive covenants, use-restriction agreements with landowners, and/or local governmental controls would prevent exposures to and disturbance of wastes and contaminated soils at the LTR Site and prevent disturbance of the landfill cap that was constructed during the emergency removal action at the Site.
- Since all ICs required by this option have already been implemented, there would be no additional costs associated with this option.

Remedial Action Objectives

Remedial action objectives (RAOs) are goals for protecting human health and the environment and are designed to address the risks posed by current or future exposures to site-related contamination. RAOs were developed for the Lemberger Sites based on the contaminant levels and exposure pathways identified during the RI and in the baseline risk assessment.

OU1 Groundwater

The RAO for groundwater at both Sites as identified in the 1991 ROD for OU1 remains unchanged and is listed below.

- The objective of the groundwater remedial action is to achieve federal drinking-water standards under the Safe Drinking Water Act and the State of Wisconsin groundwater Rule, Chapter NR 140.

The 1991 ROD also stated, when describing the Selected Remedy, that "The goal of this remedial action is to restore all portions of the aquifer to the waste management boundary, so that it may serve as a drinking water resource."

OU1, LL Soils

Although this ROD Amendment does not change the selected remedy for the LL source area soils, the RAOs are presented here for completeness.

RAOs for the LL source area soils were not explicitly identified in the 1991 ROD for OU1 (which addressed the LL source area in addition to groundwater contamination at both Sites). However, the 1991 ROD included the following statement: "The purpose of this remedy is to … reduce the risks associated with exposure to the hazardous substances." The 1991 ROD also indicated that the purpose of the source control remedy at the LL Site was to mitigate contaminant migration from the soil and wastes into the groundwater, and that without such source control/containment measures, the contaminated soil, leachate, and wastes may continue to contaminate the groundwater and increase the time required to clean up the groundwater. Based on the above information, the RAOs for the LL source area soils can be inferred to be as follows (as stated in the 2006 ESD):

- Prevent direct contact, ingestion and inhalation of Site-related contaminants.
- Provide source control of landfill contaminants to prevent further contamination of groundwater.

OU2, LTR Soils

Because the source control actions at the LTR Site were implemented through an emergency removal action and the Selected Remedy for OU2 was "No Further Action," no RAOs were identified in the 1994 ROD for OU2. However, since waste remains in place at the LTR Site at levels that do not allow for UU/UE, EPA has established the following RAO for LTR source area soils (i.e., OU2):

- Prevent human exposure to contaminated soils and wastes at the LTR Site.

V. EVALUATION OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, Section 300.430(e)(9)(iii) of the NCP (40 C.F.R. § 300.430(e)(9)(iii)) sets forth nine evaluation criteria to be used in assessing the individual remedial alternatives. The purpose of this evaluation is to promote consistent identification of the relative advantages and disadvantages of each alternative, thereby guiding selection of remedies offering the most effective and efficient means of achieving site cleanup goals. While all nine criteria are important, they are weighed differently in the decision-making process depending on whether they evaluate protection of human health and the environment or compliance with federal and state ARARs (threshold criteria), consider technical or economic merits (primary balancing criteria), or involve the evaluation of non-EPA reviewers that may influence an EPA decision (modifying criteria). A remedial alternative is first judged in terms of the two threshold criteria. If a proposed remedy meets the threshold criteria, the remedial alternative is then evaluated under the balancing and modifying criteria.

This section describes the nine evaluation criteria and summarizes the relative performance of the remedial alternatives against the nine criteria.

EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES	
Threshold Criteria	**Overall Protection of Human Health and the Environment** considers whether an alternative adequately protects human health and the environment.
	Compliance with ARARs considers whether an alternative meets applicable federal and state environmental statutes, regulations, and other requirements.
Primary Balancing Criteria	**Long-term Effectiveness and Permanence** considers the ability of an alternative to maintain protection of human health and the environment over time.
	Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment considers an alternative's use of treatment to reduce the harmful effects of principal contaminants, the ability of contamination to move in the environment, and the amount of contamination present.
	Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
	Implementability considers the technical and administrative feasibility of implementing an alternative.
	Cost considers the total present cost of an alternative over time, including capital and annual operation and maintenance costs.
Modifying Criteria	**State/Support Agency Acceptance** considers whether the State agrees with EPA's analyses and recommendations.
	Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative.

Threshold Criteria

*1. **Overall Protection of Human Health and the Environment**: Protectiveness is the primary requirement that remedial actions must meet under CERCLA. A remedy is protective if it adequately eliminates, reduces, or controls current and potential risks posed by the site through each exposure pathway. The assessment with respect to this criterion describes how the alternative achieves and maintains protection of human health and the environment.*

For OU1 groundwater, both options would be protective of human health and the environment, considering the compilation and analysis of groundwater monitoring data documented in groundwater monitoring reports, and including the data collected subsequent to the MNA study. No adverse effects to the water supply are anticipated under either option, and ICs that encompass the contaminated groundwater plume are in place as additional protection to prevent exposure risks to COCs in groundwater at the Sites.

For OU2, LTR soils, Option 1 would not be protective of human health and the environment because ICs would not be required to prevent exposure to the contaminated soils and wastes that remain at the Site and to prevent disturbance of the landfill cap that was constructed as part of the LTR emergency removal action. Option 2, which requires such ICs, would be protective of human health and the environment. Because Option 1 would not be protective, it is not eligible to be selected and is not discussed further.

2. ***Compliance with ARARs****: Section 121(d) of CERCLA and Section 300.430(f)(1)(ii)(B) of the NCP require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA section 121(d)(4). Applicable requirements are those requirements that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Relevant and appropriate requirements are those requirements that, while not applicable, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.*

For OU1 groundwater, both options would comply with ARARs. Under either option, EPA recommends changing the selected groundwater cleanup levels to ensure compliance with NR 140 (using WDNR ESs, as opposed to WDNR PALs, for those COCs which do not have an MCL at least as stringent as the ES). Both options would include long-term monitoring to detect changes in Site groundwater quality. Under either alternative, NR 140 would require additional action if results of the long-term monitoring demonstrated further NR 140 ES exceedances and/or worsening of the groundwater contaminant concentrations outside the waste boundaries.

For OU2, LTR soils, Option 2 would comply with ARARs.

Primary Balancing Criteria

3. ***Long-term Effectiveness and Permanence****: This criterion reflects CERCLA's emphasis on implementing remedies that will ensure protection of human health and the environment in the long term. The assessment of alternatives with respect to this criterion evaluates the residual risks at a site after completing a remedial action or enacting a no-action alternative and includes evaluation of the adequacy and reliability of controls.*

For OU1 groundwater, both options would provide long-term effectiveness and permanence and would achieve the groundwater RAOs. Option 1, the original remedy, does this by extracting and treating the VOC-contaminated groundwater at the Sites. The Option 2 MNA evaluation for the Lemberger Sites showed that MNA processes have been at work at the Sites, even under the original remedy. MNA processes are expected to achieve groundwater cleanup goals at *most* locations within the groundwater plume within 50 years.

For OU2, LTR soils, Option 2 would ensure long-term protection through the implementation of ICs to prevent exposure to contamination and to prevent disturbance of the landfill cap.

4. ***Reduction of Toxicity, Mobility, or Volume (TMV) of Contaminants through Treatment****: This criterion addresses the statutory preference for remedies that employ treatment as a principal element. The assessment with respect to this criterion evaluates the anticipated performance of the specific treatment technologies an alternative may employ and is specific to evaluating how treatment reduces TMV.*

For OU1 groundwater, long-term groundwater monitoring data have shown that a significant reduction in TMV through treatment has already been achieved via operation of the groundwater extraction and treatment system under the original remedy. Option 1 includes treatment of extracted groundwater. However, given the relatively low concentrations of contaminants remaining in the groundwater, reactivating the extraction and treatment system would likely not remove any significant amount of contamination from the aquifer. Additional reductions of VOCs via natural attenuation processes have been observed since shutdown of the system and are expected to continue under either option.

For OU2, LTR soils, Option 2 does not include treatment as an element of the remedy.

*5. **Short-term Effectiveness**: This criterion addresses short-term impacts of the alternatives. The assessment with respect to this criterion examines the effectiveness of alternatives in protecting human health and the environment during the construction and implementation of a remedy until the response objectives have been met.*

For OU1 groundwater, leaving the original remedy in place and restarting the groundwater extraction and treatment system under Option 1 would pose some minimal short-term risk to workers during implementation. The system has not been in operation since 2006 and a significant amount of equipment and facility maintenance work would be necessary to resume operation of the system. Option 2, MNA, would pose very little short-term risks to workers as required monitoring would be conducted.

For OU2, LTR soil, Option 2 would pose no short-term risks to workers, nearby residents, or the environment. Option 2 includes no remedy implementation work, and all ICs that would be required under this option have already been implemented.

*6. **Implementability**: The assessment with respect to this criterion evaluates the technical and administrative feasibility of the alternative and the availability of the goods and services needed to implement it.*

For OU1 groundwater, both options are technically and administratively feasible to implement. Option 2, MNA, would be easier to implement because the groundwater extraction and treatment system, which has been idle since 2006, would not need to be restarted.

For OU2, LTR soil, Option 2 poses no implementability issues. All ICs that would be required under this option have already been implemented.

*7. **Cost**: Cost encompasses all engineering, construction, and operation and maintenance costs incurred over the life of the project.*

For OU1 groundwater, the costs of active groundwater extraction and treatment under Option 1 are expected to be similar to when the original remedy was in operation, which was at least $500,000 per year. The major costs associated with Option 2 are for groundwater sampling and

analyses and are estimated at approximately $100,000 annually.

For OU2, LTR soils, there are no costs associated with Option 2 because all ICs required by this option have already been implemented.

Modifying Criteria

*8. **State/Support Agency Acceptance**: This criterion evaluates whether a support agency, based on comments submitted after its review of the Proposed Plan, concurs, opposes, or has no comment on the preferred alternative.*

For OU1 groundwater, WDNR does not consider Option 1 to be a cost-effective alternative and supports the selection of MNA, Option 2, to address the remaining groundwater contamination at the Sites.

For OU2, LTR soils, WDNR supports Option 2.

*9. **Community Acceptance**: This criterion refers to the assessment of public comments received on the Proposed Plan.*

EPA received comments from one entity during the Proposed Plan public comment period. The comments raised questions about the class of emerging contaminants known as per- and polyfluoroalkyl substances (PFAS), which have not yet been sampled for in groundwater at the Sites, and concerns that MNA may not be effective for PFAS, if present at the Sites. EPA's response to the public comments is provided in the Responsiveness Summary in Appendix 2.

VI. SELECTED AMENDED REMEDY

EPA is hereby amending the 1991 ROD for OU1 of the Lemberger Sites and the 1994 ROD for LTR OU2 by making the following changes to the Selected Remedies for the Sites:

- a fundamental change to the OU1 groundwater remedy for both Sites, comprised of switching from extraction and treatment of contaminated groundwater to **Option 2, Monitored Natural Attenuation of VOCs in Groundwater**;
- a change to the OU1 groundwater cleanup levels for some of the Lemberger Sites' COCs, particularly those that were based on Wisconsin PALs; and
- a fundamental change to the remedy for OU2, LTR soils, from "No Further Action" to **Option 2, ICs for LTR soils**.

More detailed information regarding these changes is provided below.

Selected Remedy for OU1 Groundwater

Based on EPA's evaluation of the two remedy options for OU1 groundwater against the nine

evaluation criteria (see discussion in Section V, above), EPA has concluded that **Option 2, Monitored Natural Attenuation of VOCs in Groundwater**, is the most appropriate remedy for addressing the remaining VOC groundwater contamination at the Lemberger Sites. While both remedial options – restarting the groundwater extraction and treatment system (Option 1) and using MNA to continue reducing the concentration of VOCs in groundwater (Option 2) – are protective of human health and the environment and comply with ARARs, EPA has determined that Option 2, the MNA remedy, provides the best balance of trade-offs in terms of the five balancing criteria. The groundwater extraction and treatment system components of the original remedy selected in the 1991 ROD for OU1 operated for 11 years until suspended in 2006 to evaluate MNA. Groundwater data shows that MNA is effectively reducing the concentration of VOCs in groundwater, with or without operation of the groundwater extraction and treatment system. The MNA remedy will continue to degrade VOCs in groundwater over time through natural processes in a cost-effective manner. This amended remedy for OU1 groundwater requires an updated long-term groundwater monitoring program. The major costs for the MNA remedy are for the groundwater sampling and analyses associated with MNA and are estimated at approximately $100,000 per year.

Revised Cleanup Levels for OU1 Groundwater

In accordance with the rationale discussed above in Section III of this ROD Amendment, EPA is revising the groundwater cleanup levels to reflect either current MCLs, current ESs, or risk-based values. The groundwater cleanup levels are no longer based on PALs. For COCs that have identical MCLs and ESs, the MCLs will be selected. For COCs that have ESs but no MCLs, or ESs that are more stringent than the MCLs, the ESs will be selected. The cleanup levels for any COCs without MCLs or ESs will continue to be based on risk-based values. The selected groundwater cleanup levels, as revised by this ROD Amendment, are presented in Table 3.

Selected Remedy for OU2, LTR Soils

Based on EPA's evaluation of the two remedy options for OU2, LTR soils, against the nine evaluation criteria (see discussion in Section V, above), EPA has concluded that **Option 2, ICs for LTR Soils**, is the only appropriate remedy for OU2. Since waste remains in place at the LTR Site above levels that allow for UU/UE, ICs are required to prevent human exposure to the contamination and disturbance of the landfill cap that was constructed during the emergency removal action at the LTR Site. Appropriate ICs for the LTR waste materials and contaminated soil have already been implemented but need to be documented in an EPA decision document as a required remedy component to ensure long-term protectiveness. This ROD Amendment therefore changes the LTR OU2 remedy from "No Further Action" to a remedy that requires ICs. ICs in the form of environmental restrictive covenants, use-restriction agreements with landowners, and/or local governmental controls are required to prevent exposures to and disturbance of wastes and contaminated soils at the LTR Site and prevent disturbance of the landfill cap. Since all required ICs have already been implemented, there are no additional costs associated with the amended remedy for LTR OU2.

LL and LTR Remedy Components Not Changing

The changes to the OU1 and OU2 remedies described above do not affect other components of the selected remedial and/or removal actions implemented at the LL and LTR Sites, including the following:

- The fences around the perimeters of the LL and LTR Sites;
- The completed consolidation and containment of contaminated soil and wastes within the LL and LTR Sites beneath landfill caps;
- The slurry wall around the perimeter of the LL waste;
- Environmental monitoring to assure protectiveness and effectiveness of the remedy, consisting of three main components: long-term groundwater monitoring, slurry wall monitoring, and landfill cap monitoring; and
- ICs for the LL waste and for groundwater from both Sites, as required by the 1991 ROD for OU1.

Table 3 – Selected Groundwater Cleanup Levels

COC	Original Cleanup Level in 1991 ROD (µg/L)	Current MCL (µg/L)	Current NR 140 ES (µg/L)	Site-specific Risk-based Value (µg/L)
1,1,1-Trichloroethane	40*	**200**	200	900
1,1-Dichloroethane	85*	--	**850**	0.4
1,1-Dichloroethene	0.024*	**7**	7	0.06
1,2-Dichloroethene	10*	**5**	5	200
2-Butanone	500	--	**4000**	500
4-Methyl-2-pentanone	100	--	**500**	100
Acetone	1000	--	**9000**	1000
Bis(2-ethylhexyl)phthalate	2	**6**	6	2
Carbon tetrachloride	0.5*	**5**	5	0.3
Chloroform	0.6*	--	**6**	1.1
Methylene chloride	15*	**5**	5	5
Tetrachloroethene	0.1*	**5**	5	0.7
Toluene	68.6*	1000	**800**	3000
Trichloroethene	0.18*	**5**	5	3
Vinyl chloride	0.0015*	2	**0.2**	0.017
Xylene, total	124*	10000	**2000**	1000
4,4'-DDT	0.1	--	--	**0.1**
Aldrin	0.002	--	--	**0.002**
Aroclor-1248	0.5	0.5	**0.03**	0.005
Aroclor-1254	0.5	0.5	**0.03**	0.005
Dieldrin	0.002	--	--	**0.002**
Heptachlor	0.4	**0.4**	0.4	0.008
Arsenic	5*	**10**	10	0.001
Barium	200*	**2000**	2000	0.9
Beryllium	1	**4**	4	0.01
Cadmium	1*	**5**	5	0.01
Chromium	5*	**100**	100	0.002
Lead	5*	--	**15**	6
Manganese	0.025*	--	**300**	2
Mercury	0.2*	**2**	2	3
Selenium	1*	**50**	50	30
Silver	10*	--	**50**	30
Zinc	2500*	**5000**	--	2000

*Original cleanup level based on 1991 Wisconsin PAL.
2021 ROD Amendment Selected Cleanup Level denoted by bold font and bold cell outline.

VII. SUPPORT AGENCY COMMENTS

In a letter dated December 18, 2020, the WDNR formally concurred with the revisions to the Selected Remedy described in this ROD Amendment. The state's concurrence letter is provided in Appendix 3.

VIII. STATUTORY DETERMINATIONS

Under CERCLA §121 and the NCP, the lead agency must select remedies that 1) protect human health and the environment, 2) comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), 3) are cost-effective, and 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The information below discusses how the Selected Amended Remedy meets these statutory requirements, and also discusses the requirement for five-year reviews to be conducted at the Sites.

Protection of Human Health and the Environment

The Selected Amended Remedy will be protective of human health and the environment. The MNA remedy for OU1 groundwater will protect human health and the environment by continuing to reduce the concentrations of VOCs in groundwater through natural attenuation processes until groundwater cleanup levels are achieved. Appropriate ICs that encompass the contaminated groundwater plume are in place as additional protection to prevent exposure risks to COCs in groundwater at the Sites. The revised remedy for LTR OU2, which now includes ICs as a required remedy component, will ensure that the response actions conducted at LTR OU2 will remain protective in the long term.

Compliance with Applicable or Relevant and Appropriate Requirements

The Selected Amended Remedy will comply with all federal and state ARARs. Most importantly, the amended remedy for OU1 groundwater will comply with the federal MCLs under the Safe Drinking Water Act and the state's promulgated standards under Wisconsin Administrative Code NR 140, Groundwater Quality. The cleanup levels for groundwater, as revised by this ROD Amendment, are provided in Table 3. Other than the revisions to the numerical cleanup levels for groundwater reflected in Table 3, this ROD Amendment makes no changes to the ARARs identified in prior decision documents for the Sites.

Cost-Effectiveness

EPA has concluded that the Selected Amended Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, EPA used the following definition from the NCP: "A remedy shall be cost-effective if its costs are proportional

to its overall effectiveness." (40 C.F.R. § 300.430(f)(1)(ii)(D)). EPA made this determination by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence, reduction of TMV through treatment, and short-term effectiveness). Overall effectiveness was then compared to cost to determine cost-effectiveness. The relationship of the overall effectiveness of the selected remedial alternatives was determined to be proportional to their costs, and therefore the selected alternatives represent a reasonable value for the money to be spent.

Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

EPA has determined that the Selected Amended Remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a practicable manner at the Lemberger Sites. For OU1 groundwater, active groundwater extraction and treatment occurred for 11 years under the original remedy selected in the 1991 ROD, until operation of the system was suspended in 2006 for an evaluation of MNA. Groundwater data shows that MNA is effectively reducing the concentration of VOCs in groundwater, with or without operation of the groundwater extraction and treatment system. For LTR OU2, neither the original "No Further Action" remedy nor the Selected Amended Remedy (which requires ICs for OU2) includes a treatment component, as all other appropriate response actions for OU2 were conducted previously through an emergency removal action.

EPA has determined that the Selected Amended Remedy for the Lemberger Sites provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and state and community acceptance.

Preference for Treatment as a Principal Element

CERCLA includes a preference for remedies that employ treatment to address the principal threats posed by a site, wherever practicable. The principal threat concept is applied to the characterization of "source material," which is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contaminants to groundwater, surface water, or air or that act as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. Contaminated groundwater is not source material, so is not a principal threat waste.

The original remedy for OU1 groundwater included active treatment of extracted groundwater. The Selected Amended Remedy for OU1 groundwater, MNA, will continue to reduce the concentration of groundwater contaminant through natural processes. The prior emergency

removal action at the LTR Site addressed principal threat waste materials at that site, including buried drums. There are no principal threat wastes remaining at the Lemberger Sites.

Five-Year Review Requirements

Because the Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining at the Sites above levels that allow for UU/UE, statutory reviews are required to ensure that the remedy is, or will be, protective of human health and the environment. Five-year reviews for the Lemberger Sites were conducted in 2000, 2005, 2010, 2015 and 2020. The next five-year review is scheduled to be completed in 2025.

IX. PUBLIC PARTICIPATION COMPLIANCE

EPA has met the public participation requirements set out in Section 300.435(c)(2)(ii) of the NCP. EPA published a notice of availability of the Proposed Plan in the Harold Times Reporter on October 10, 2020. A 30-day public comment period was held from October 12 through November 11, 2020, to give members of the public time to review the Proposed Plan and other documents contained in the Administrative Record for the Sites. EPA posted the Proposed Plan for this ROD Amendment on EPA's webpage for the Lemberger Sites and placed copies of the Proposed Plan in the Administrative Record file, which was and is available at the EPA Region 5 Records Center and the information repository maintained at the Manitowoc Public Library in Manitowoc, Wisconsin. EPA's response to the comments received during the public comment period is provided in the Responsiveness Summary in Appendix 2. Based upon a review of the written comments submitted during the public comment period, EPA determined that no significant changes to the amended remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

X. AUTHORIZING SIGNATURE

This ROD Amendment was developed by EPA, with the assistance and concurrence of WDNR. The Director of the EPA Region 5 Superfund & Emergency Management Division has been delegated the authority to approve this decision document. WDNR's concurrence letter is included as Appendix 3.

1/14/2021

X 

Douglas Ballotti, Director
Superfund & Emergency Management Division
Signed by: DOUGLAS BALLOTTI

APPENDICES

APPENDIX 1

Administrative Record Index

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR THE
LEMBERGER LANDFILL AND LEMBERGER TRANSPORT SITES
FRANKLIN, MANITOWOC COUNTY, WISCONSIN

UPDATE 10
JANUARY, 2021
SEMS ID:

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	927561	7/14/10	U.S. EPA	Public	(Redacted) Third Five Year Review Report (Signed)	249
2	485627	7/13/15	U.S. EPA	Public	Fourth Five Year Review Report (Signed)	324
3	961433	4/19/19	TRC Environmental	U.S. EPA	Report Re: Final Monitored Natural Attenuation	422
4	959079	7/20/20	U.S. EPA	Public	Fifth Five Year Review Report (Signed)	46
5	961434	10/1/20	U.S. EPA	Public	Letter re: Concurrence on Draft ROD Amendment	28
6	956307	12/18/20	WDNR	U.S. EPA	Letter re: Concurrence on Draft ROD Amendment	2

APPENDIX 2

Responsiveness Summary

EPA published a notice of availability of the Proposed Plan for the Lemberger Sites in the Harold Times Reporter on October 10, 2020 and held a 30-day public comment period from October 12 through November 11, 2020. EPA posted the Proposed Plan on EPA's webpage for the Lemberger Sites and placed copies of the Proposed Plan in the Administrative Record file, which was and is available at the EPA Region 5 Records Center and the information repository maintained at the Manitowoc Public Library in Manitowoc, Wisconsin.

EPA received comments from one entity during the Proposed Plan public comment period. The comments EPA received are provided in their entirety below (in italics), followed by EPA's response.

Public Comment:

Midwest Environmental Advocates (MEA) submits these comments regarding the proposed plan for amending the selected remedy for the Lemberger Landfill and Lemberger Transport & Recycling Superfund Sites in the Town of Franklin, Wisconsin (the Plan). Several citizens have reached out to MEA with concerns regarding the Plan, particularly when it comes to the failure to consider the potential presence of per- and polyfluoroalkyl substances (PFAS).

The Plan is proposed based on the Monitored Natural Attenuation Report submitted to the EPA in April 2019. That report states that the nature and extent of groundwater impacts from the historical operation of the Lemberger Landfill and the Lemberger Transport and Recycling site "are well characterized and understood." Further, EPA's website announcing the Plan states that it will "comply with state and federal regulations."

As EPA is well aware, PFAS have been used since the 1940s to manufacture a wide variety of consumer products and have been widely used in industrial applications because they are uniquely resistant to heat, oil, and water.

When those consumer products are no longer useful, they were thrown away and eventually made it to landfills like the Lemberger Landfill. Industrial waste potentially containing PFAS was also discarded at facilities like the Lemberger Transport and Recycling site. Once in the environment, PFAS accumulate because they do not easily breakdown through natural attenuation processes, leading PFAS to be dubbed "forever chemicals." PFAS can also be highly toxic to humans in extremely low concentrations and exposure has been linked to all sorts of terrible adverse health impacts, making it absolutely vital that potential exposure pathways are identified and eliminated.

To our knowledge, no testing for PFAS has ever been undertaken at the Lemberger Landfill and the Lemberger Transport and Recycling site. This is despite the fact that when these sites were active in the late 1960s to the mid-1970s there was no impermeable liner preventing leachate, which likely included PFAS, from contaminating the underlying aquifers. The nature and extent

of groundwater impacts from the historical operation of these facilities has therefore not been completely investigated and by extension cannot be well understood.

In addition, although Wisconsin is still in the process of promulgating numerical standards for PFAS in groundwater, those compounds still qualify under the definition of "hazardous substance" under Wisconsin's Spills Law, Wis. Stat. § 289.01(11), and must be remediated accordingly. The Wisconsin PFAS Action Council has also recently released a Draft Plan to address PFAS contamination in the state, which includes recommendations to address PFAS-contaminated landfill leachate. In December 2019, the EPA itself released interim recommendations for addressing groundwater contaminated with two of the most well studied PFAS, PFOA and PFOS. Those recommendations included screening levels to determine whether the presence of those chemicals at a Superfund site warrant further attention. MEA therefore questions the conclusion that the Plan will comply with state and federal regulations when no PFAS testing has occurred and all signs point to a high likelihood that these hazardous substances are present on site.

The Monitored Natural Attenuation Report is limited to considering the efficacy of natural attenuation for CVOCs, but does not consider the efficacy of natural attenuation for PFAS that may be on site. Again, PFAS are extremely durable and do not easily breakdown through natural attenuation. This suggests that the groundwater treatment system should remain in operation, not be discontinued, and even be upgraded to effectively treat for PFAS if present.

MEA requests that the EPA consult with the Wisconsin Department of Natural Resources and investigate the potential presence of PFAS at the Lemberger Landfill and the Lemberger Transport and Recycling Site, as well as in the Branch River where treated leachate has been discharged for years, before approving the Plan. If PFAS are detected, the Plan should be revised in order to ensure that PFAS are not allowed to migrate off-site any more than they may already have and instead are appropriately remediated.

Thank you for the opportunity to comment.
Mailing address: 612 W Main St, Suite 302, Madison, WI 53703

EPA Response:

EPA's most recent five-year review for the Lemberger Sites, completed on July 20, 2020, recognized that PFAS sampling has not yet been conducted at the Sites and that PFAS may potentially be present based on the types of wastes that were disposed at the LL and LTR Sites. EPA determined that the potential presence of PFAS in groundwater does not impact *current* protectiveness at the Sites, since there are no current, complete groundwater exposure pathways. However, the potential presence of PFAS does impact *future* protectiveness. As a result, EPA included, as an issue and recommendation of the five-year review, the potential presence of PFAS in groundwater (the issue) and the need to collect groundwater samples for PFAS analysis during the next groundwater sampling event (the recommendation). The 2020 five-year review report can be found online at: semspub.epa.gov/work/05/959079.pdf. EPA and WDNR will work

with the PRPs at the Lemberger Sites to ensure this sampling is completed. If PFAS is found in groundwater above screening levels, additional sampling and investigation work would likely need to be conducted to determine the nature and extent of the PFAS contamination, and appropriate next steps under Superfund evaluated.

Despite the fact that PFAS sampling has not yet been conducted, EPA believes it is appropriate to move forward with revising the groundwater remedy selected in the 1991 ROD for OU1. The MNA study showed that the remaining residual VOCs in groundwater can be effectively addressed via MNA natural processes. Neither the original groundwater remedy nor the revised remedy selected in this ROD Amendment addresses PFAS, which may or may not be present in groundwater at levels of concern. If PFAS is found to be present at levels that pose an unacceptable risk to human health or the environment, EPA would need to evaluate appropriate future response actions to address those unacceptable risks.

APPENDIX 3

State Concurrence Letter

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
101 S. Webster Street
Box 7921
Madison WI 53707-7921

Tony Evers, Governor
Preston D. Cole, Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463
TTY Access via relay - 711

December 18, 2020

Douglas Ballotti, Director
Superfund Division
U.S. EPA - Region 5
77 West Jackson Street
Chicago IL 60604

Subject: Concurrence on Draft ROD Amendment for Lemberger Transport and Recycling and Lemberger Landfill Superfund Sites, Town of Franklin, Wisconsin

Dear Mr. Ballotti:

This letter is provided by the Wisconsin Department of Natural Resources (WDNR) to document the State's concurrence with the Record of Decision (ROD) Amendment to the 1991 ROD for operable unit 1 (OU1) for Lemberger Landfill (LL) and site-wide groundwater and to the 1994 ROD for OU2 for Lemberger Transport and Recycling (LTR) in the Town of Franklin, Wisconsin, as previously modified by a 2006 Explanation of Significant Differences (ESD). We believe the modifications to the remedy described in the draft November 2020 ROD Amendment are consistent with the requirements of Wisconsin statutes and administrative rules.

The purpose of the ROD Amendment is to document fundamental changes to the remedy for both Lemberger sites. This includes a change in the groundwater remedy, comprised of switching from extraction and treatment of contaminated groundwater to monitored natural attenuation (MNA) of the remaining groundwater contamination. The 2006 ESD allowed for the temporary shutdown of the groundwater extraction in order to evaluate plume stability and assess natural attenuation processes. EPA coordinated with WDNR during their evaluation of the groundwater data collected during the shutdown, and WDNR concurs with EPA's assessment that MNA will ensure continued protectiveness and progress toward attainment of the remedial action objectives for groundwater. The ROD Amendment also adds the requirement of institutional controls (ICs) to the remedy for the LTR site, and all the ICs that are required at the sites have already been implemented.

In addition to the above fundamental changes to the remedy, the ROD Amendment also documents changes to groundwater cleanup standards for some of the Lemberger Sites' contaminants of concern (COCs), particularly those based on Wisconsin's Preventive Action Limits (PALs). EPA recommends changing the groundwater cleanup levels based on PALs to Enforcement Standards (ESs). This change is based on how the PALs and ESs are applied under Wis. Admin. Code Ch. NR 140, which is an Applicable or Relevant and Appropriate Requirement (ARAR) under the ROD. This proposed change is consistent with WDNR's approach that uses compliance with ESs to determine eligibility for site closure under Wis. Admin. Code NR 726 on a State-wide basis. Section NR 140.28(2) specifies that a PAL exemption may be granted if it is found that compliance with PALs is not technically or economically feasible. Therefore, achievement of levels below the ESs is accepted as the appropriate groundwater cleanup level under Ch. NR 140 for the site.

The Department concurs with the modifications to the selected remedy at the Lemberger Superfund sites, as described above and in the draft November ROD Amendment.

Thank you for your support and coordination in addressing contamination at the Lemberger Superfund sites. Should you have any questions regarding this matter please contact Judy Fassbender at (414) 507-5571.

Sincerely,

Christine Haag, Director
Remediation and Redevelopment Program

Cc: Roxanne Chronert, WDNR
Demaree Collier, RPM, EPA Region 5