



Continuing Obligation Package

To: John Sager, Wisconsin Department of Natural Resources
From: Lynette Carney, Barr Engineering Company
Karl Beaster, Enbridge Energy
Subject: Continuing Obligations Package
Date: July 24, 2019
Project: Enbridge Energy - Superior Terminal Facility Wide - BRRTs 16-16-560657

Site Information: BRRTs Number: 16-16-560657¹
Parcel ID Number: Various (see Attachment D)
Facility Identification Numbers: 816010580 / 816066130 / 816012450
Enbridge Energy Superior Terminal
2800 East 21st Street
Superior, Wisconsin
Douglas County, Wisconsin
Latitude / Longitude: 46.68730 / 92.05958 (Facility Center)
WTM91 Coordinates: X: 363504, Y: 692465 (Facility Center)

Responsible Party: Enbridge Energy, LLC
Attn: Karl Beaster, Environmental Advisor
26 East Superior Street, Suite 309
Duluth, MN 55802
Phone: (218) 464-5623
Email: karl.beaster@enbridge.com

Environmental Consultant: Barr Engineering Co
Attn: Lynette Carney, Project Manager
325 South Lake Avenue, Suite 700
Duluth, MN 55802
Phone: (218) 529-7141
Email: lcarney@barr.com

¹ The BRRTS number for this site was changed from 02-16-560657 to 16-16-560657 when WDNR established a new "16" prefix for negotiate agreement sites. Previous documents related to this site reference the old number which starts with the "02" prefix.

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General Site Information and History

The Enbridge Energy Superior Terminal is located at 2800 East 21st Street, Superior, Wisconsin in Douglas County (Terminal). The Terminal property includes portions of Sections 30 and 31, Township 49 North and Range 13 West and Section 36, Township 49 North and Range 14 West (Figure 1). The property owned by Enbridge occupies approximately 560 acres (Figure B.1.a) and is comprised of more than 135 individual parcels (Attachment F.1). Enbridge (formerly known as Lakehead Pipeline) expanded an oil pipeline system from Canada to their existing Superior Terminal property in 1950. The Lakehead Pipeline name changed to Enbridge in or around 1998. Improvements and expansions of Terminal infrastructure has occurred over the years.

Based on the City of Superior Zoning Map, the Terminal property and surrounding land north and west is zoned Manufacturing-2 (M2). Property located to the east and south of the Terminal is zoned Suburban (SUB) and One Family Residential (R1B). Adjacent properties include the Superior Refining Company to the northwest across East 21st Street and the Dome Petroleum natural gas facility to the north. The Nemadji River is located immediately to the south and east of the Terminal. One railroad yard is located approximately one mile south of the Terminal and a second rail yard is located approximately 0.75 miles to the west. An airport is present approximately 1.5 miles to the west. Open and closed WDNR Remediation and Redevelopment Sites located within ½ mile of the Terminal are shown on Figure B.1.c.

The Terminal has been the site of multiple petroleum (predominantly crude oil) releases in its nearly 70 year history. The Wisconsin Department of Natural Resources (WDNR) release and spill reporting requirements were not well established until the Wisconsin Spill Law was enacted in May of 1978. Spills which occurred prior to this time were documented and addressed in accordance with the existing regulatory guidelines of the time. Previous historical release sites have been and may continue to be encountered during future construction and maintenance activities at the Terminal.

Following the establishment of regulatory reporting requirements in 1978, new spills and releases were reported to the WDNR in accordance with Wisconsin Statutes Chapter 292.11 the Wisconsin Spill Law. Since then, Enbridge has reported and documented numerous petroleum release sites at the Terminal. Open and closed release sites located within the Terminal property boundary are shown on Figure C.4 and listed in Tables A.7.1 and A.7.2. Based on nearly 70 years of petroleum storage and transport history at the Terminal, even with best management practices in place, encounters with historical petroleum impacts and the need to respond to new releases will be inevitable. For this reason, Enbridge worked with the WDNR to develop a streamlined approach for addressing new and historical petroleum related release sites and to establish a facility-wide groundwater performance standard. To initiate this process, Enbridge worked closely with the WDNR to develop a facility-wide *Site Investigation and Response Action Plan (SI/RAP)* for the Terminal. This *SI/RAP* document was submitted to the WDNR on July 17, 2014 with an Addendum published on August 15, 2017.

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The WDNR approved a facility-wide response action in their letter dated February 21, 2018. Following which, the WDNR and Enbridge entered into a *Negotiated Agreement* on October 2, 2018, which outlines the facility-wide process and pathway to closure framework that streamlines the process for completing assessment and remediation of new and historical release sites while adhering to the provisions of NR 700. This continuing obligations package has been established for tracking of the facility-wide site activities and will be updated periodically as future release sites are addressed and transferred to this facility-wide site.

Site transfers will be limited to petroleum spills from pipeline facility related releases. Third party releases or releases associated with other non-petroleum compounds stored at the facility are not covered under this facility-wide approach and will not be included as part of the continuing obligations for this site.

General Site Conditions

The topography of the site and the general area around the site is relatively flat. The Nemadji River is present on the south and southeast side of the Terminal in a broad incised valley (Figures B.1.a). On the south side of the Terminal, a small tributary stream and ephemeral gullies are present that discharge to the Nemadji River. The Nemadji River flows toward the east/northeast in the vicinity of the site, and discharges to Superior Bay of the St. Louis River within the Superior Harbor. The St. Louis River discharges to Lake Superior.

Soil/Geology

The geologic information provided below was summarized from the Enbridge Superior Terminal *SI/RAP* (Barr, 2014). The regional bedrock geology consists of sandstone of the Precambrian-age Bayfield Formation, which is overlain by unconsolidated glacial deposits that are over 150 feet thick (Figure B.3.a.1 through B.3.a.3). The uppermost soil type is glacial-lacustrine red-brown clay. Based on information published in the *Pleistocene Geology of the Superior Region* (WGNHS IC Number 46, Clayton in 1984), the glacial-lacustrine clay deposits are Pleistocene in age and were deposited in a water-logged state during high stages of Glacial Lake Duluth with subsequent isolated erosion and proglacial stream deposition associated with what is now the adjacent Nemadji River channel. Sandstone Bedrock was encountered during Terminal geotechnical investigation activities at depths ranging from 200 to 250 feet below ground surface (bgs) (Figure B.3.a.1 and B.3.a.2).

The National Resource Conservation Service (NRCS) has mapped the majority of the surficial soils in the vicinity of the site as the Amnicon-Cuttre Complex and the Bergland-Cuttre Complex. Both soils are described as clay. There are several wetland areas associated with the site and the surrounding vicinity. The most dominant wetland types are identified as Scrub/Shrub and Forested Wetlands. The site is located on the edge of the Nemadji River flood plain, and the majority of the surface water flow in the vicinity of the site is toward the river. The adjacent Nemadji River valley is topographically 35 to 50 feet lower than the average elevation of the site.

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Based on soil observations during numerous maintenance excavations and the installation of soil borings and monitoring wells at the facility, it has been determined that the majority of the shallow soil encountered at the site consists of the glacial-lacustrine, red-brown clay, except where fill material has been imported. Fill soils are typically associated with granular backfill material around piping and other infrastructure. Areas of granular fill material are localized around specific structures and are not laterally extensive across the site. Additionally, granular fill is not present along most piping and is not present beneath all structures. Coarse gravel (river rock) material is found on the ground surface and around some pipeline infrastructure to inhibit flow of oil in the event of a release and for ease of foot/vehicular traffic access. Terminal roads typically consist of gravel roadbed material. Riprap cobbles are used in some erosion control structures and stormwater control ponds.

Groundwater

Twenty-eight (28) monitoring wells currently make up the monitoring well network for the Terminal (Table A.1; Figure B.3.d). The wells were installed between 1999 and 2015 as part of the Terminal groundwater monitoring program. The wells are sampled and water level measurements are recorded at the frequency outlined in the WDNR-approved groundwater monitoring plan for the Terminal. The wells are used to monitor groundwater at the perimeter of the facility in both the shallow and deep aquifers (Table A.1). Depth to groundwater at the terminal varies between approximately 1 and 8 feet bgs as measured in shallow aquifer monitoring wells and 5 to 25 feet bgs in the deeper aquifer monitoring wells (Table A.6). Free-product has never been detected in any of these wells.

Groundwater elevation data has been collected from 1999 to the present (Table A.6). The dominant local flow direction is to the east (Lake Superior) and southeast (Nemadji River), (Figures B.3.c.1 and B.3.c.2). In general, surface topography largely influences groundwater flow at the Terminal as demonstrated by the incised stream located on the southwest portion of the Terminal where groundwater flow is shown to flow toward the southwest before changing back to the southeast as the topography slopes back toward the Nemadji River (Figures B.3.c.1 and B.3.c.2).

The average lateral hydraulic gradient across the Terminal for the shallow aquifer is approximately 0.0035 feet per foot (fpf) and approximately 0.0045 fpf for the deep wells. The difference in vertical head between the nested shallow and deep wells ranges from 3 to 18 feet. The vertical hydraulic gradients ranged from 0.1 to 0.5 fpf. The vertical flow direction was consistently downward at each well nest.

Hydraulic conductivity in the shallow and deep aquifer was calculated based on grain size data, permeability testing and slug tests. The clay soil appears to have a consistent hydraulic conductivity across varying depths. The average hydraulic conductivity ranged from 1.1×10^{-8} to 3.7×10^{-8} cm/sec. Groundwater velocities in the clay soil at the site are very slow. The lateral average linear velocity of groundwater at the site ranges from approximately 5.5×10^{-11} to 3.1×10^{-10} cm/sec (0.00006 to 0.0003 feet

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per year based on the values presented above. The vertical linear velocity of groundwater ranges from approximately 1.8×10^{-9} to 5.6×10^{-8} cm/sec, or 0.002 to 0.06 feet per year.

Three private water supply wells are located within the Terminal property boundary (Figure B.3.d). Additional water supply wells located within approximately ½ mile of the Terminal property boundary are shown on Figure B.3.a.1. The majority of the surrounding water supply wells (including the three private wells located at the facility) are completed in the “hardpan” unit which represents the regional water supply aquifer. Depth to water in the water supply wells in the hardpan and bedrock was reported to range from 40 to 126 feet below ground surface.

Additional site-specific geologic and hydrogeologic information are found in the *SI/RAP* and *Addendum* documents.

Remedial Action Implemented (Performance Standard – Facility Wide)

The characterization of petroleum impacts to groundwater from individual releases is difficult at the Terminal due to the presence of low permeability clay, continued operation of the site, potential comingling of releases, and the presence of historical releases. Instead of performing individual groundwater investigations at each individual release site, a comprehensive facility-wide site investigation was completed and a groundwater monitoring program was developed to establish a facility-wide hydrogeologic performance standard. The Terminal groundwater monitoring program is used to monitor for potential off-site hydrocarbon migration, and evaluate future risk to potential receptors on a facility-wide basis.

Since this facility was constructed in 1950, multiple petroleum releases have been documented. When the WDNR spill reporting system became well established in the 1980s, releases and encounters with historical impacts at the facility were reported to the WDNR and entered into the Bureau of Remediation and Redevelopment tracking system (BRTS). A figure showing the location of WDNR Remediation and Redevelopment (RR) sites at the facility and within a half-mile radius is shown on Figure B.1.c. The closed reported release sites within the facility boundary are summarized on Table A.7.1. The recently established facility-wide approach to new and historical release sites outlines a process that will allow the WDNR and Enbridge to adequately address impacts that are encountered in a streamlined and consistent manner and is protective of human health and the environment. This process also takes into consideration the site conceptual model and existing groundwater monitoring network as it relates to addressing the groundwater pathway on a facility-wide basis. This process is outlined in the *SI/RAP*, *Addendum*, and *Negotiated Agreement* and is summarized in the flow chart provided in Attachment C.3.

The petroleum impacted sites which meet the established criteria and receive WDNR approval will be transferred to the Terminal facility-wide continuing obligations site and this registry. The list of transferred sites is summarized in Table A.7.2 and will be updated as new sites are added in the future. Details associated with the extent of soil impacts, remedial actions, and material disposal at each of the

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individual release sites are provided in the individual updates provided in Attachment C.3. In addition to the site specific soil information included in Attachment C, estimated residual impacts associated with each of the individual remediation and redevelopment sites located within the facility boundary are shown on Figure B.2.b. This figure will be used as a baseline for assumed residual soil impacts associated with this continuing obligations site as well as a reference for historical releases previously closed by the WDNR.

As indicated above, the groundwater pathway for the new and historical releases transferred to this facility wide site will be evaluated under the annual groundwater monitoring program established for the facility. The facility perimeter groundwater monitoring will be completed as part of the continuing obligations and approved hydrogeologic performance standard. The groundwater monitoring network will continue to be sampled at a frequency established in the *Negotiated Agreement* and Enbridge will submit results to the WDNR as requested. The cumulative historical groundwater monitoring results, including the most recent event in 2018, are summarized on Table A.1.

Applicable NR 720 Code

As referenced above, WDNR and Enbridge entered into the *Negotiated Agreement* to establish the framework of continuing obligations for this site on October 2, 2018. The *Negotiated Agreement* represents the process negotiated and agreed to by WDNR and Enbridge to address new petroleum releases or newly-discovered historical releases of petroleum products for which Enbridge is responsible under Wis. Stat. § 292.11(2) & (3) that originate on Enbridge-owned property and are confined to the boundaries of the Terminal.

The Terminal land use is designated as industrial for determining the extent of soil impacts under Wis. Admin. Code § NR 708 and/or § NR 716 based upon the industrial risk standards applicable to the direct contact soil contaminant pathway and to determine the adequacy of remedial actions taken to address the direct contact soil and soil to groundwater contaminant pathways under Wis. Admin. Code §§ NR 700-754.

WDNR approved the use of the existing hydrogeologic site conceptual model for the Terminal as a facility-wide performance standard to guide remedial actions required to address the soil to groundwater pathway for protection of groundwater in accordance with Wis. Admin. Code §§ NR 700-754. Groundwater monitoring of the Terminal monitoring well network will serve to verify the effectiveness of this hydrogeologic performance standard in accordance with Wis. Admin. Code §§ NR 700-754 and to document the extent of releases to groundwater pursuant to Wis. Admin. Code § NR 708 and/or § NR 716.

For individual release sites, the WDNR will determine whether a specific release will be incorporated into the facility-wide site or issued an individual BRTs tracking number. This determination will be made by evaluating the adequacy of actions taken under Wisc. Admin Code §§ NR700-754 and maintaining tracking information of those actions in the BRTS database.

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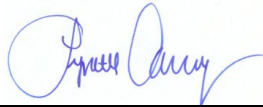
Individual Release Site Details

Remaining residual impacts associated with individual release sites at the Terminal are shown in Attachment C.4. A list of release sites which have been closed using the performance standard and transferred into this facility-wide BRRTS are listed on Table A.7.2. Data for each individual site is summarized in the individual GIS Registry Updates provided in Attachment C.1.

The method by which each individual release site is evaluated and the decision to make the transfer to the facility-wide continuing obligations site is provided on the Regulatory Notification, Classification and Pathways to Closure for Enbridge Superior Terminal Flow Chart in Attachment C.3.

Engineering / Hydrogeologist Certification

"I, Lynette M. Carney, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03(1), Wisconsin Administrative Code, and that to the best of my knowledge, all of the information contained in this document is correct, and the document was prepared in compliance with all applicable requirements in Chapters NR 700 to 726, Wisconsin Administrative Code."



Lynette M. Carney, PG
Senior Geologist

7/24/2019

Date

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Reg. No.

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Attachment A (Data Tables)

Table A.1	Groundwater Quality Data
Table A.6	Groundwater Elevations
Table A.7.1	Historical Closed Terminal Release Sites
Table A.7.2	Sites Transferred to the Facility Wide Continuing Obligation Registry

Attachment B (Figures)

Figure B.1.a	Site Location Map
Figure B.1.c	Remediation and Redevelopment Sites Map
Figure B.3.a.1	Regional Cross Section Locations A-A' and B-B'
Figure B.3.a.2	Regional Cross Section A-A'
Figure B.3.a.3	Regional Cross Section B-B'
Figure B.3.c.1	Shallow Groundwater Elevation Contours
Figure B.3.c.2	Deep Groundwater Elevation Contours
Figure B.3.d	Monitoring Wells

Attachment C (Documentation of Remedial Action)

C.1	Transfer Sites – Assessment and Response Action Summary
C.3	Flow Chart - Regulatory Notification, Classification and Pathways to Closure
C.4	Facility Wide - Estimated Extent of Residual Impacts

Attachment F (Source Legal Documents)

F.1	Parcel Index and Property Deeds
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