From: Marcus D Byker <Marcus.Byker@ramboll.com>
Sent: Wednesday, March 31, 2021 3:46 PM
To: Gielniewski, Margaret
Cc: Krueger, Sarah E - DNR; Fitzpatrick, William - DNR; Dombrowski, Frank J; Abigail Small
Subject: Marinette - PDI/RD Status Update
Attachments: Marinette - Treatability Study Work Plan - 210331.pdf

Margaret,

On behalf of Frank Dombrowski of WPSC, attached is the Treatability Study (TS) Work Plan – Revision 0 for the WPSC Marinette MGP. This TS Work Plan describes the sample collection and testing that is needed to inform the design of a potential *in situ* solidification and stabilization remedy. WSPC's goal is to collect the samples required for this TS as part of upcoming delineation efforts on the Fincantieri Marinette Marine property.

Please feel free to contact Frank Dombrowski with any questions or concerns with the contents of this document.

Kind Regards,

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RAMBOLL

ENVIRONMENT
& HEALTH

MEMO

To: Frank Dombrowski

From: Abby Small and Marcus Byker - Ramboll

cc:

Re: Treatability Study Work Plan – Revision 0
Marinette Former Manufactured Gas Plant Site, Marinette, Wisconsin
Wisconsin Public Service Corporation
CERCLA Docket No. V-W-06-C-847; Site Spill ID – B5BT; CERCLIS ID – WIN000509952

March 31, 2021

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INTRODUCTION

This *Treatability Study (TS) Work Plan* provides pertinent information and a scope of work for an *in situ* solidification and stabilization (ISS) treatability study (TS) to be performed for Wisconsin Public Service Corporation's (WPSC) Former Marinette Manufactured Gas Plant (MGP) site (Site) located in Marinette, Wisconsin. WPSC is a subsidiary of WEC Energy Group, and WEC Business Services, LLC (WBS) currently manages the Site on behalf of WPSC.

A Preliminary Design Investigation Work Plan (PDI Work Plan) – Revision 2, (PDI Work Plan) was submitted on March 13, 2020 and approved by the United States Environmental Protection Agency (USEPA) on April 16, 2020. Initial preliminary design (PDI) fieldwork was conducted between April and May 2020. Additional investigation is warranted on the Fincantieri Marinette Marine property to complete delineation of source material as described in the June 24, 2020 Preliminary Design Investigation (PDI) Work Plan Addendum. The additional investigation is planned for spring 2021.

During the April/May 2020 PDI, site-specific constraints were identified making the proposed remedy (excavation) unsafe and impractical. As discussed in the PDI Work Plan, if site-specific constraints were identified, alternative remedies were to be considered including ISS. Given the site constraints and the second mobilization for delineation on the Fincantieri Marinette Marine property, additional soil is proposed to be collected for bench scale testing of ISS during the spring 2021 mobilization.

PURPOSE

This TS Work Plan is an addendum to the PDI Work Plan – Revision 2, dated March 13, 2020. A project description is provided in the PDI Work Plan. The purpose of the study is to determine an appropriate mix design for implementation of ISS as a remedial technology for the Site. This TS Work Plan outlines the procedures and requirements for the study in accordance with EPA's *Guide for Conducting Treatability Studies under CERCLA, Final* (October 1992), as supplemented for remedial design by the *Remedial Design/Remedial Action*

Handbook, EPA 540/R-95/059 (June 1995). Note that the TS outlined herein is general accordance with the USEPA-approved TS conducted at the Former WPSC Manitowoc, WI MGP Site.

TREATMENT TECHNOLOGY DESCRIPTION

ISS is a technology based on the use of augers or other equipment to mix a slurry of pozzolanic additives into soils to solidify them *in situ*. As the augers are advanced into the soils, a reagent is injected, resulting in a mixed subsurface column. ISS reagent addition is used to physically bind (solidify) and/or chemically react with (stabilize) compounds in soil, resulting in a solidified or stabilized mass with reduced constituent mobility and leachability. ISS isolates constituents of concern (COC) and source material from human contact and from groundwater by entombing them in a low-permeability monolith. Active reagents used in ISS can include pozzolanic compounds such as cement or blast furnace slag. Other additives such as bentonite may be included to help decrease permeability, especially in higher permeability formations such as those present at the Site. Reagents are typically mixed with water to create a flowable and pumpable slurry that is then mixed with the affected soil.

Performance standards typically include a maximum hydraulic conductivity and a minimum unconfined compressive strength. Performing ISS results in expansion of the treated media. Depending on the soil type, the expansion can range from 10% (sandy materials) to 25% or more (clayey materials) of the original treatment volume. Testing during this ISS TS will provide an estimate of ISS swell expected for this application.

TEST OBJECTIVES

The primary goal of the TS is to determine an appropriate mix design for implementing ISS as a remedial technology at the Site. Specific objectives for the TS include:

- Develop a mix design capable of solidifying/stabilizing targeted materials to immobilize and encapsulate source material
- Develop an economical mix design for implementation of ISS at the site using readily-available reagents
- Assess the physical and chemical properties of the solidified/stabilized monolithic materials
- Assess volumetric expansion associated with an ISS operation at the site

Based on these objectives, the following performance criteria have been developed for the final mix design and full-scale ISS application.

Parameter	Design Criteria	Methodology
Unconfined Compressive Strength (UCS)	Average of ≥ 50 pounds per square inch (psi) with no sample < 40 psi	ASTM D2166
Hydraulic Conductivity	Average of ≤ 1 x 10^{-6} centimeters per second (cm/sec) with no sample > 1 x 10^{-5} cm/sec	ASTM D5084

In addition to the criteria listed above, testing will be performed to evaluate the overall effectiveness of the trial mix designs and to compare additional performance metrics to select an optimal mix that meets the primary ISS treatability and implementation goals. Details on the additional testing are provided below. Based on Ramboll's experience with other ISS treatability studies at similar sites, Ramboll will evaluate mix designs to achieve the identified performance goals. Ramboll will test mix designs using the following reagents:

- Type I/II Portland cement (PC)
- Combination of PC and ground granulated blast furnace slag (GGBFS) at a ratio of 50% PC to 50% GGBFS and 75% PC to 25% GGBFS
- Bentonite

Initial mix design testing will generally include reagent addition rates between 7% and 15% of total reagent based on the in-place density of the untreated soil. Up to 12 initial mix designs will be tested in this phase of the study. Ramboll will coordinate delivery of the cement (Type I/II) and ground granulated blast-furnace slag (GGBFS) from a local supplier to the treatability testing laboratory. Bentonite will be supplied by the testing laboratory.

EXPERIMENTAL DESIGN AND PROCEDURES

ISS

A minimum of six 5-gallon buckets of soil will be shipped to the selected treatability testing laboratory. This will include two buckets of soil collected from the Wastewater Treatment Plant (WWTP) Zone, two buckets of soil collected from the Boom Landing Zone, and two buckets of soil collected from the Fincantieri Marinette Marine property.

Testing will consist of the following phases.

Phase 1: Initial Characterization of Site Soil

- Upon arrival to the lab, the soil types in each bucket will be visually classified to verify relative consistency of soil type.
- Soil from the two buckets from each sample area will be composited and homogenized by hand.
- Samples will be collected from two soil composites for the initial characterization of both physical and chemical parameters as follows:

Parameter	Test Method	Quantity
Material pH	EPA Method 9045	3
Moisture Content	ASTM D2216	3
Unit Weight	ASTM D7263	3
Particle Size	ASTM 422	3
Atterberg Limits	ASTM D4317	3
Total Volatiles (VOC)	EPA Method 8260	3
Totals Semi Volatiles (SVOC)	EPA Method 8270	3
SPLP VOC	EPA Method1312/ 8260B	3
SPLP SVOC	EPA Method 1312/8270D	3

The result of Phase 1 testing will be reviewed to assess the characteristics of the three sampled areas. If the results indicated similarity between areas, they may be combined and homogenized for subsequent testing. The following tables depicting sample numbers assume that soil from the three areas are similar in physical characteristics and are combined and homogenized for subsequent testing. If the three areas are not combined, up to three times as many mix designs (a set for each soil type) may be analyzed in the subsequent steps. If the samples results indicate materially different characteristics that may indicate

differing reagent addition rates to meet project objectives, they will be tested separately in subsequent phases.

Phase 2: Initial Mix Design Testing

Initial mix testing will be performed to establish a range of potential mix designs to meet the proposed ISS performance objectives listed above. Up to 9 preliminary mix designs will be tested on the homogenized sample or individual test samples based on the results of Phase 1. Mix designs will generally be based on the following:

Identification No.	Mix Formulation	Water to Total Reagent Ratio (by weight)	% Addition (by wet weight of untreated soil)
1	PC + 0.5% bentonite	1.35 – 1.5:1	7 to 15
2	50/50 Mix of GGBS/PC	1 to 1 – 1.25:1	7 to 15
3	25/75 Mix of GGBS/PC	1 to 1 – 1.25:1	7 to 15

Actual mix designs and addition rates will be determined after Task 1 based on collaboration between WPSC, Ramboll, and the treatability testing laboratory. Test procedures during this phase include:

- Extraction of approximately 1,000 to 1,500 grams of base material into a table-top bowl. Weight will be measured to prepare a reagent mix.
- Mix reagent with water in separate container. Water will first be added to the regents and mixed in a high-speed mixer to form a flowable slurry. Initial mixes will be developed using the lowest (i.e., 1.35:1 for PC & bentonine mix and 1:1 for GGBS/PC mix) water to reagent ratio, unless Phase 1 testing conditions indicate a change in mix design is needed.
- The slurry will then be mixed with aliquots of composited soil. Mixing of the reagent slurry and soil will occur in a pulsed fashion with a mechanical paddle mixer (Hobart mixer, or equivalent) or by hand to approximate mixing energy anticipated during application of full-scale ISS. Mixing will occur until the reagent is mixed homogeneously, no unmixed soil or clumps are visible, and only as long as it takes to fully incorporate the reagent slurry.
- Mixed material will be placed in cylindrical molds to cure for UCS (2-inch diameter) and hydraulic conductivity (3-inch diameter) testing.
- Specimen observations of penetration resistance will be recorded using a pocket penetrometer at 1-, 3-, and 5-day intervals to monitor curing progress.
- After curing (as noted below), the mixes will be tested for UCS and hydraulic conductivity as follows:

Parameter	Test Method	Quantity
UCS at 14 and 28 days of curing	ASTM D2166	18
Hydraulic Conductivity at 28 days	ASTM D5084	9

- Volume expansion will be calculated mathematically based on mold specimen weight and baseline material bulk density.

Phase 3: Optimization/Repeatability Testing

Following reporting to WPSC and Ramboll, additional testing may be performed to demonstrate repeatability of the most favorable mix designs or to optimize design mixes. Up to four additional mixes will be developed using the procedures utilized in Phase 2.

After curing (as noted below), the mixes will be tested for UCS and hydraulic conductivity as follows:

Parameter	Test Method	Quantity
UCS at 14 and 28 days	ASTM D2166	8
Hydraulic Conductivity at 28 days	ASTM D5084	4

Based on the testing results, Ramboll, in consultation with WPSC and the testing laboratory, will select up to three mix designs for further testing as follows:

Parameter	Test Method	Quantity
Leachability Testing	LEAF – EPA1315 (9 Intervals with VOCs and Polycyclic Aromatic Hydrocarbons (PAHs) on leachate)	1

Results from the leachability testing will not be compared to numerical performance criteria or goals. Due to the duration of testing, these analyses will not be used for full-scale ISS performance testing. Results from this TS may be used to correlate leaching performance with UCS and hydraulic conductivity for use in the full-scale ISS construction quality assurance (CQA) program. Because ISS will be only be applied deeper than 4 feet below ground surface (bgs), it will not be subject to freeze-thaw cycles. Therefore, durability testing will not be performed.

EQUIPMENT AND MATERIALS

No special equipment or materials will be required to perform the treatability testing. Readily-available drilling and sampling equipment will be utilized for sample collection and laboratory testing will be performed at specialized treatability testing laboratories equipped with all sample handling, mixing, curing and testing steps identified in this work plan.

ISS reagents to be utilized in mix design tests will consist of Type1/2 PC and GGBFS from local vendors. Arrangements will be made for one 5-gallon bucket of each ISS reagent to be sent to the testing lab from a local supplier. Powdered bentonite will be Wyoming Bentonite supplied by Wyo-Ben, Inc. of Billings, Montana.

SAMPLING AND ANALYSIS

Up to two soil borings will be advanced in the WWTP Zone, the Boom Landing Zone, and the Fincantieri Marinette Marine property to collect representative subsurface soil samples for treatability testing.

Soil borings are expected to be advanced using sonic, methods. When the terminal depth of the borehole is reached, the boreholes will be abandoned consistent with methods outlined in the PDI Work Plan, Revision 2. Drilling will be overseen by a qualified Ramboll representative who will complete a boring log to document encountered subsurface strata and other pertinent observations at each boring location, including location by hand-held GPS having submeter accuracy.

The entire core depth will be collected and retained for TS sample selection. The Ramboll representative will visually inspect the core for source material. Each core will also be screened using a photoionization detector

(PID) to evaluate the presence of volatile organic compounds (VOC). Subsampling of the entire core will be completed, in consultation with the Treatability Study Manager, and focus on the most-highly affected intervals.

Selected soil material collected from the sampler from each soil boring will be placed into sealable plastic buckets. Samples will be collected to fill two 5-gallon buckets from each of the three sample areas. All soil sample material will be sealed and shipped by courier to the testing laboratory under chain-of-custody.

DATA MANAGEMENT

Data generated during the TS is anticipated to include photographs, field logs, boring logs, surveys, sample control logs, chains of custody, analytical laboratory reports, and bench test laboratory reports. TS data will be managed in accordance with the Multi-Site QAPP.

DATA ANALYSIS AND INTERPRETATION

Data from the TS will be analyzed and interpreted to support development of the full-scale ISS designs. This will include using ISS bench testing data to support ISS mix design.

HEALTH AND SAFETY

The USEPA-approved *Multi-Site Health and Safety Plan - Revision 2* (Multi-Site HASP; IBS, 2007a) will be used as a draft HASP for the purposes of the PDI Work Plan. This plan will be modified based on additional site-specific information as the PDI, TS, and RD process progresses.

HANDLING OF TREATABILITY STUDY-DERIVED WASTES

The following sections describe how the different investigation-derived wastes (IDW) will be handled.

Field-Derived Waste Management

TS borings will be installed during the same mobilization as supplemental PDI borings to complete delineation on the Fincantieri Marinette Marine facility in accordance with the USEPA-approved June 24, 2020 PDI Work Plan – Addendum 1. All IDW generated will be collected in properly labeled, 55-gallon drums or bulk containers (*e.g.,* roll-off container lined with polyethylene sheeting for solids, fractionation tanks for liquids). IDW includes soil cuttings, decontamination pad and plastic sheeting, personal protective equipment, decontamination water, well-development water, and pumped groundwater.

Laboratory-Derived Waste Management

The testing laboratory will dispose of the tested and unused soil/fill material through standard laboratory disposal processes. The testing laboratory will manage all materials remaining in their possession and dispose of them properly. No laboratory-derived waste will be returned to the site.

REPORTS

Upon completion of the TS, the testing laboratories will provide a draft technical report on the procedures and results of the work to Ramboll. Deviations from this TS Work Plan will be identified and discussed in these reports. Associated calculations, summary tables and graphs, and raw laboratory reports will be included. The laboratory's interpretation of the data will be included in this report. Ramboll will compile TS data into the Remedial Design. The report will include:

- Summary of the sample collection activities performed

- Summary of the TS activities performed
- Description of deviations from this work plan
- Summary of analytical results
- Executed mix formulations for each testing phase
- Discussion of periodic specimen observations during curing
- Physical characterization evaluation of the untreated and post-treated soil/fill material
- Evaluation of leach testing results
- Summary of major findings

Recommendations regarding the preferred ISS mix design will be made. Significant data gaps (if any) that would need to be addressed in further studies will be identified and discussed.

The report appendices will include:

- Sample collection logs and field notes
- Draft technical report by testing lab
- Raw laboratory data
- Backup calculations

SCHEDULE

The TS fieldwork will commence once access is obtained from Fincantieri Marinette Marine. Approximate milestone dates for the ISS TS are as follows:

Milestone	Approximate Time from Approval of PDI Work Plan
Access is obtained from Fincantieri Marinette marine	TBD
ISS Sample Collection	30 Days
ISS Samples to Lab	35 Days
ISS Initial Untreated Characterization Testing Complete	55 Days
ISS Initial Mixes Created	65 Days
ISS First Round of Data Available	105 Days
ISS Optimization/Repeatability Mixes Created	125 Days
ISS Second Round of Data Available	170 Days
ISS Leaching Data Available	285 Days

MANAGEMENT AND STAFFING

This section describes the project management organization and responsibilities for the TS. Lines of communication will be maintained among project personnel and the subject leaders. The key personnel are the Project Manager, Treatability Study Manager, and ISS subject leader. These key personnel are identified below along with a brief description of their responsibilities.

PROJECT MANAGER

The Project Manager, along with the Treatability Study Manager, will be the primary points of contact with the WPSC and the USEPA. The Project Manager will provide overall strategic direction for the TS. Marcus Byker is the Project Manager.

TREATABILITY STUDY MANAGER

The Treatability Study Manager, along with the Project Manager, will be the primary points of contact between WPSC and the USEPA. Abby Small is the Treatability Study Manager, and will direct the technical team in this role.

ISS SUBJECT LEADER

The ISS Subject Leader will be responsible for the technical considerations associated with the application of ISS for the TS. This will include TS considerations, oversight of ISS bench testing, evaluation of the test objectives, and summarizing conclusions of the TS to support the full-scale design. Glenn Luke is the ISS subject leader.