RAMBOLL

ENVIRONMENT
& HEALTH

Mr. Christopher Dietrich
Wisconsin Department of Natural Resources
2300 N. Martin Luther King Jr. Dr.
Milwaukee, WI 53212

Low-Profile Betterment and Full-Thickness Betterment Topping Placement Memo
Burnham Canal Superfund Alternative Site
Milwaukee, Milwaukee County, Wisconsin
Miller Compressing Company
WDNR BRRTS #: 02-41-552940
EPA ID: WIN000510222

April 27, 2021

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA

T 414-837-3607
F 414-837-3608
www.ramboll.com

Dear Mr. Dietrich:

Ramboll Americas Integrated Solutions, Inc. (Ramboll [formerly OBG]) has prepared this technical memorandum (memo) for the Wisconsin Department of Natural Resources (WDNR). The purpose of this memo is to request modifications and make clarifications for the procedures and material specifications that were included in the approved October 29, 2020 Remedial Action Work Plan for the Burnham Canal site (Work Plan [OBG, 2020]). Specifically, this memo describes and establishes requirements for Betterment layers to be placed atop the Remedial Subaqueous Aggregate Cap (Cap). Cap completion was documented in Ramboll's WDNR-approved February 11, 2021 Cap Completion Memo (Ramboll, 2021). Ramboll is requesting two modifications from the Work Plan: (1) Use aluminum quality control (QC) catch pans in place of plastic QC catch cylinders; and (2) Provide the option to cut the steel sheet pile wall following completion of Full-Thickness Betterment placement but prior to placement of the Low-Profile Betterment. Both of these modifications are detailed below.

This memo further defines the portions of the Cap and Betterment detailed in Appendix B of the Work Plan (OBG, 2020) and the Cap Completion Memo (Ramboll, 2021) as the following:

Stabilization Layer: Placed over the Canal bottom prior to placing the Cap. Generally consisting of coarse-grained sand (torpedo sand).

Cap: As defined in the Record of Decision (USEPA, 2011), Explanation of Significant Differences (USEPA, 2016), and Work Plan (OBG, 2020), and meeting the definition of a sediment cover per Wisconsin Statutes Chapter 292.01(17m). The Cap consists of a 1-foot layer of aggregates that entirely pass the 1.5-inch sieve.

Full-Thickness Betterment:

- The Canal from approximately STA 4+50 to the steel sheet pile wall at approximately STA 16+85 (eastern project limits).

- 4.5 feet of aggregates that entirely pass the 1.5-inch sieve (same aggregate specification as the Cap aggregates) placed above the Cap.
- Includes Topping, defined below.

Topping: 0.5 feet (six inches) of aggregates meeting the Wisconsin Department of Transportation's (WisDOT's) Select Crushed Material Specification (312).

Low-Profile Betterment:

- Subaqueous conveyance channel lining from approximately STA 2+25 to 4+50. 2 feet of aggregates meeting the WisDOT's Select Crushed Material Specification (312), underlain by nonwoven geotextile.
- Includes riprap from approximately STA 1+50 to STA 2+25. 1.5 to 2 feet of aggregates meeting the WisDOT's Medium Riprap Specification (606), underlain by nonwoven geotextile. This includes the riprap apron to be placed at the combined sewer outfall (CSO) and armor for the western bank of the Canal.

Full-Thickness Betterment Placement

Full-Thickness Betterment placement began on March 16, 2021 and is projected to be completed (excluding topping) on or around April 16, 2021. Section 5.7.3 of the Work Plan (OBG, 2020) states, "The [Broadcast Capping System™] process will be repeated in each sub-unit for each lift until the sum of the thickness of the Betterment lifts in each sub-unit meet the design thickness of the Betterment, which is generally five feet including the top 6 in. of coarser Betterment topping as described in the project's Chapter 30 Permit Application for the Betterment."

The topping is planned to be placed on or around the week of April 19, 2021 with the Broadcast Capping System™ (BCS), in accordance with the Work Plan (OBG, 2020). The following potential limitations and alternative methods to be implemented, if necessary, are presented below:

- QC catch cylinder (as described in Section 5.7.2 of Work Plan [OBG, 2020]) stability: Due to the larger size of aggregates being placed, there is greater potential for QC catch cylinders to be knocked over or damaged. If QC catch cylinder reliability is not maintained during topping placement, aluminum QC catch pans, as pictured below (Figure 1), will be utilized for topping lift thickness measurements. The catch pans are cube-shaped with 1' dimensions (approximately 7.5 gallon capacity), allowing for collection of sample volumes similar to those collected by the QC catch cylinders (approximately 6 gallon capacity). The catch pans will contain graduated markings for thickness measurement and 0.25-inch weep holes for drainage. The aggregate planned to be used for topping is expected to contain < 1% of aggregates smaller than 0.25 inches. As such, aggregate loss through the weep holes is assumed to be negligible for thickness measurements.

- BCS's ability to spread larger aggregates: Due to the larger size of aggregates being placed, there is greater potential for the BCS's metering hopper and/or spreading spinners to have mechanical challenges (*i.e.* jam, break) and for the BCS's conveyor belt to be damaged. If BCS reliability is not maintained during topping placement, direct mechanical placement, as described further below, will be utilized for topping placement.

Figure 1 – Aluminum QC Catch Pan

Low-Profile Betterment (Select Crushed) Placement

Following QC catch cylinder or catch pan thickness and survey confirmation that the Full-Thickness Betterment (including topping) has been placed to design thicknesses, Low-Profile Betterment activities will commence. Initially, nonwoven geotextile will be placed by a dive team in the areas of the Canal to receive Low-Profile Betterment, as described in Section 5.5 of the Work Plan (OBG, 2020). Geotextile installation is planned to occur on or around the week of April 26th, 2021.

Section 5.5 of the Work Plan (OBG, 2020) also states that, "Select areas in the Canal receive stormwater flow discharges from drainage pipes and require scour protections. In these areas, larger rock (riprap) will be installed and integrated with the Betterment." Riprap is described generally as "larger rock" in Section 5.5 and throughout the Work Plan (OBG, 2020). In the Work Plan (OBG, 2020), the term "riprap" includes Select Crushed and Medium Riprap materials that are specifically called out in the Work Plan (OBG, 2020) text and Appendix B (project plans and specifications) of the Work Plan (OBG, 2020) when further clarification/differentiation is required.

As stated in Sections 5.3 and 5.4, of the Work Plan (OBG, 2020), "With the exception of the riprap, all Canal fill materials will be placed using the BCS." Additionally, Section 5.6 of the Work Plan (OBG, 2020) states that "Riprap is to be direct-placed by a marine-based excavator located on a barge." Furthermore, Section 5.7.3 states, "The riprap will be carefully placed with a marine-based excavator."

As discussed above, the Betterment to be placed in the Canal section from approximately STA 2+25 to 4+50 will consist of 2' of Select Crushed (see Section 2.04 of Specification 02300 – Earthwork in Appendix B of the Work Plan [OBG, 2020]) underlain by nonwoven geotextile. Placement of this material is planned to begin on or around April 28th, 2021, by direct-placement by a marine-based excavator located on a barge. Based on the information provided above, this method complies with the Work Plan (OBG, 2020). Per WDNR request, further information detailing this method is provided below:

- After completing all broadcast spreading operations, the BCS will be removed from the barge platform and the barge will be reconfigured for direct placement operations. The configuration of the barge will be similar to the configuration that was used for dredging.

- The Liebherr 954 excavator that was used to feed the spreader hopper will be used for direct placement operations. A 2.5-cubic yard capacity Young clamshell bucket will be installed on the excavator.

- The two material barges used for broadcast spreading support will also be used for direct placement support. Aggregate will be loaded onto the material barges and transported to the direct placement barge.
    - After a material barge is loaded, prior to leaving the material barge loading area, a barge survey will be performed to calculate the volume of material loaded on each barge. These barge surveys will be performed using a real-time kinematic (RTK) global positioning system (GPS) rover pole. A base survey will be performed by logging points on the four corners of the material barge after it is loaded. The material pile will then be surveyed, and a triangular irregular network (TIN) to TIN volume calculation will be made between the material barge stockpile survey and the base survey.

- Prior to direct placement, the computer used by the operator of the direct placement excavator will be loaded with a grid of the placement area. The computer monitor used by the excavator operator will display the grid to guide the operator (Figure 2). This will allow the operator to see each clamshell bucket target location relative to the placement machine's clamshell bucket, prior to the actual placement. This system has been used effectively on previous projects performed by J.F. Brennan (Brennan), the Burnham Canal project's Marine Contractor.
    - The direct placement excavator will utilize the Dredgepack® software developed by Hypack®.
    - The placement machine will be equipped with GPS, inclinometers, and an onboard computer to track, record, and display the placement of the Low-Profile Betterment material.
    - During previous similar projects, Brennan determined that a clamshell bucket pattern for the proposed equipment with matrix cell dimensions of 5.25 by 5.75 feet leads to well-distributed placement. This pattern will be used for direct placement operations for the Burnham Canal project.

- The placement thickness calculation relies on the matrix cell size and the placement bucket volume capacity. The direct placement bucket capacity of 2.5 cubic yards yields an approximate 2.24-foot material thickness in the proposed 5.25- by 5.75-foot grid cell. To target lesser thicknesses, the bucket can be filled to a portion of its capacity in each grid cell. For instance:
    - While targeting a 6-inch placement thickness, the operator will place ¼ of a full bucket in each grid cell.
    - While targeting a 1-foot placement thickness, the operator will place ½ of a full bucket in each grid cell.
    - The operator will load the bucket with the proper amount of aggregate to achieve the target thickness in one bucket grid cell at a time. All material loaded in the clamshell bucket will be placed into a single bucket grid cell. Material will be placed in one grid cell at a time and will not be spread across multiple grid cells.
    - The clamshell bucket pattern can be adjusted, if needed, to perform the placement in the most efficient manner while still achieving the required coverage.

- Estimated grid cell placement volumes based on clamshell bucket capacity and fullness will be summed for each material barge-load and compared against the material barge survey described above to optimize placement volume estimates.

- After the operator has loaded the clamshell bucket, they will center the bucket in the appropriate location based on the Dredgepack® software. Once the clamshell bucket is in the predetermined position based on the matrix cells, the operator will engage the clamshell to open and release the material below the water surface. During the release of the material from the bucket, the operator will trigger a dump switch which will place a "target" or clamshell bucket location on the screen to record and display where the material has been placed. The direct placement barge plant will repeat these operations until all cells in the grid pattern have received Low-Profile Betterment material. When multiple lifts are necessary to achieve the design thickness, subsequent buckets will be offset from the original drop locations to further ensure proper thickness and area coverage.

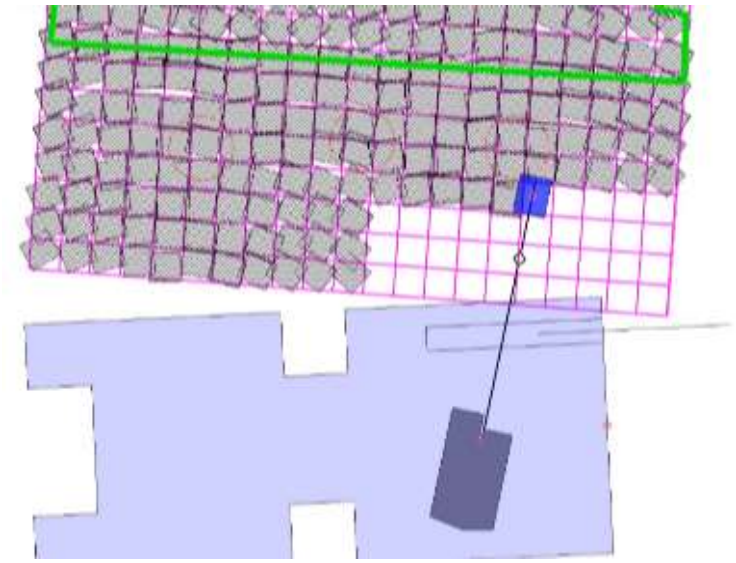

Figure 2 – Example Layout of a Clamshell Bucket Grid Pattern

Low-Profile Betterment (Select Crushed) QC

Section 5.7.3 of the Work Plan (OBG, 2020) states that, in addition to volume calculations, placement of Low-Profile Betterment material will be verified by using sediment poling rods (minimum diameter of 1-1/2 inches) to "feel" for the presence of riprap (larger rock). To attempt to maintain consistency with the methods used for measuring lift thicknesses of the Cap and Full-Thickness Betterment layers, aluminum QC catch pans, as described above, will be placed in each Approval Subunit (previously established in the Work Plan [OBG, 2020]) that will receive Select Crushed for the Low-Profile Betterment layer. Due to the catch pan's maximum 1-foot height, the 2-foot-thick Select Crushed Low-Profile Betterment layer will be placed in two 1-foot lifts. Placement thickness is planned to be verified by summing the aggregate thickness in the catch pan samples in each Approval Subunit.

If catch pans are knocked over or damaged during the direct placement process, placement verification will be performed using a combination of hydrographic surveys and volumetric data to calculate the thickness of material placed, as well as poling. As stated in Appendix B of the Work Plan (OBG, 2020), acceptable verification surveys must demonstrate at least 90% of the work area has achieved the design thickness within a tolerance of 0.25 feet (3 inches).

Low-Profile Betterment (Riprap) Placement

As discussed above, the Betterment to be placed in the Canal section from approximately STA 1+50 to 2+25 will consist of 1.5 to 2 feet of Medium Riprap (see Section 2.05 of Specification 02300 – Earthwork in appendix B of the Work Plan [OBG, 2020]) underlain by nonwoven geotextile. This includes the riprap apron to be placed at the CSO and armor for the western bank of the Canal.

Following confirmation that the Select Crushed portion of the Low-Profile Betterment has been placed to design thicknesses, Medium Riprap will be direct-placed by a marine-based excavator located on a barge. The same methods described above for Select Crushed direct placement will be used for Medium Riprap placement. Medium Riprap may be placed in a single lift or multiple lifts to achieve design thicknesses. Placement verification will be performed using a combination of hydrographic surveys, volumetric data, and poling as described above and in Section 5.7.3 of the Work Plan (OBG, 2020).

11th St. Remediation Boundary Wall Modification

As described in section 6.2 of the Work Plan (OBG, 2020), the steel sheet pile wall installed at the eastern limits of the project area during site preparation will be cut below the water surface at the approximate elevation of the top of the Full-Thickness Betterment (approximately elevation -9 City of Milwaukee Datum [CMD]). As described in Section 2.3.6 of the Work Plan (OBG, 2020), the wall was included in the project's design to achieve a stable eastern terminus of Betterment fill material at the 11th Street Bridge, while still allowing the full Betterment fill thickness to be placed up to the eastern terminus. The wall was also included as a component of turbidity management and control to minimize suspended solids migration.

To date, there have been no exceedances of the project's turbidity Advisory or Action Levels at the compliance point. Additionally, following completion of Full-Thickness Betterment placement, including topping, the remaining project work includes placement of Select Crushed and Riprap a minimum distance of approximately 1,200 feet west of the eastern project limits. These materials contain approximately 0% fines (aggregates passing the No. 200 sieve) whereas the Stabilization Layer, Cap, and Full-Thickness Betterment (excluding topping) contained up to approximately 15% fines. As such, if significant turbidity is not observed within the project area during placement of the topping, the steel sheet pile wall may be cut below the water surface to its finished elevation when the dive team is on site to place the nonwoven geotextile fabric on the west end of the Canal. The existing silt curtains would remain in place and turbidity would continue to be monitored, and Advisory and Action Levels complied with, until all aggregate materials have been placed in the Canal. If the wall is not cut while the dive team is on site to install the nonwoven geotextile fabric, the dive team will return to complete wall modifications following completion of placement of all Betterment layers. Ramboll will provide email notification to WDNR project managers from the Remediation and Redevelopment Program and Water Quality Program no less than 3 business days prior to cutting the steel sheet pile wall.

Please feel free to contact Mark Walter with comments or questions.

Sincerely,

David A. Smith
Project Manager

Mark D. Walter, PE
Project Engineer

References

O'Brien & Gere, Inc. of North America, part of Ramboll (OBG). October 29, 2020. *Remedial Action Work Plan. Burnham Canal Superfund Alternative Site, Milwaukee, Milwaukee County, Wisconsin.*

Ramboll Americas Integrated Solutions, Inc. (Ramboll). February 11, 2021. *Cap Completion Memo. Burnham Canal Superfund Alternative Site, Milwaukee, Milwaukee County, Wisconsin.*

United States Environmental Protection Agency. September 2011. *Record of Decision. Burnham Canal Superfund Alternative Site, Milwaukee Count, Wisconsin.*

Unites States Environmental Protection Agency. February 2016. *Explanation of Significant Differences. Burnham Canal Superfund Alternative Site, Milwaukee County, Wisconsin.*