DREDGED MATERIAL DISPOSAL PLAN

FEASIBILITY EVALUATION
CONSTRUCTION DREDGED MATERIALS DISPOSAL AT DELAWARE CONFINED DISPOSAL AREAS

PORT OF WILMINGTON
EDGEMOOR EXPANSION
EDGEMOOR, NEW CASTLE COUNTY, DELAWARE

December 2019
Revised June 2020

Prepared for:

Diamond State Port Corporation
820 North French Street, 4th Floor
Wilmington, Delaware 19801

Prepared by:

Duffield Associates, Inc.
5400 Limestone Road
Wilmington, Delaware 19808

Project No. 11139.LH

TABLE OF CONTENTS

SECTION	DESCRIPTION	PAGE
I.	INTRODUCTION	1
II.	REEDY POINT NORTH AND SOUTH DISPOSAL AREAS	2
	A. STATUS AND SUMMARY	2
	B. CAPACITY ANALYSIS	3
III.	WILMINGTON HARBOR SOUTH DISPOSAL AREA	4
	A. STATUS AND SUMMARY	4
	B. CAPACITY ANALYSIS	5
IV.	WILMINGTON HARBOR NORTH DISPOSAL AREA	8
	A. STATUS AND SUMMARY	8
	B. CAPACITY ANALYSIS	8
V.	FEASIBILITY OF EDGEMOOR DREDGED MATERIAL DISPOSAL	9
VI.	SUMMARY	13

I. INTRODUCTION

Diamond State Port Corporation (DSPC) of Delaware has applied to the United States Army Corps of Engineers (USACE) for a Clean Water Act Section 404 permit, and a Rivers and Harbors Act Section 10 permit for dredging related to the construction of a primary harbor access channel and ship berth development ("proposed project") at the applicant's Edgemoor property ("Edgemoor Site"). The proposed project supports the redevelopment of the Edgemoor Site into a multi-user containerized cargo port.

The proposed project is located adjacent to and north of the Federal navigation channel, in the southern portion of Reach B of the Delaware River, at the intersection of the Cherry Island and Bellevue Ranges and is offshore of the applicant's property located along Hay Road, in Edgemoor, Delaware. The applicant proposes to deepen portions of the Delaware River adjacent to the Federal Navigation Channel to create a primary access channel that will serve the proposed berth construction at the Edgemoor Site.

The primary harbor access channel will provide access to an approximately 2,600 foot long wharf structure. Proposed construction of the berth and access channel calls for excavation to a 45 foot mean lower low water (MLLW) project depth. The 45 foot MLLW project depth matches the maintained depth of the Federal navigation channel of the Delaware River. The area expected to be dredged is approximately 4000 feet in length and a width extending from the boundary of the federal navigation channel to approximately 300 feet offshore of the site at MLLW. The total area is approximately 85 acres, and is estimated to require the dredging of 3,325,000 cubic yards as part of the construction. The harbor layout and berth grading are shown in project permit drawings titled "Port of Wilmington – Edgemoor Expansion, Permit Plans" prepared by Duffield Associates, Inc. (Duffield Associates) dated October, 2019.

Duffield Associates has prepared the following report summarizing the feasibility of the placement of the construction dredged materials for the Edgemoor Project in existing confined disposal areas within in Delaware. These disposal areas included:

- Reedy Point North Disposal Area on the Chesapeake and Delaware Canal
- Reedy Point South Disposal Area on the Chesapeake and Delaware Canal
- Wilmington Harbor South Disposal Area on the Delaware River, and,
- Wilmington Harbor North Disposal Area on the Christina River.

As part of the permitting process, DSPC has prepared an Environmental Assessment Technical Document evaluating several alternatives for the disposal of the initial (construction) dredged material in existing upland confined disposal facilities (CDFs) in Delaware or a new dredge material disposal area on additional open land along the river. Based on these alternatives, the use of an existing CDF was selected as the preferred alternative. The use of the existing CDFs would occur through the use of a Section 217 (b) application for additional capacity at federal site (WRDA 1986 Section 217, as subsequently amended).

The purpose of this evaluation is to consider the feasibility of disposal of the dredged material from the harbor construction at these facilities. It is understood that the Section 217(b) application will set the contractual terms of the use of the facility. The terms of the application are used to ensure that the USACE operations are not adversely impacted by the use of a federal facility by a non-federal party (e.g. DSPC) and can include financial or physical terms related to the use of the facility.

II. REEDY POINT NORTH AND SOUTH DISPOSAL AREAS

A. STATUS AND SUMMARY

The Reedy Point North and South Disposal Areas were constructed as part of the Chesapeake and Delaware Canal expansion project approved in the 1950's and constructed in the 1960's by USACE. The expansion resulted in the construction of 20 confined disposal areas along the canal. The USACE Philadelphia District 2018 Confined Disposal Area Inspection Report indicates that six of these areas are currently monitored and 14 of the sites are considered dormant/inactive. Additionally, only three of the sites have been utilized for disposal of dredged material over the last decade. Reedy Point North and South Disposal Areas are the eastern end of the Chesapeake and Delaware Canal, where the canal meets the Delaware River.

The 2018 USACE inspection report indicates that Reedy Point North, as shown in Figure 1, has not been utilized for dredged material disposal since 1996. The disposal area is reported to have a footprint on the order of 130 acres, with berm at elevations ranging from 21 to 28 feet.

Figure 1: Reedy Point North Disposal Area

Reedy Point South Disposal Area, as shown in Figure 2, is regularly used to support the maintenance dredging of the Chesapeake and Delaware Canal Project, and was last utilized for disposal in 2015. The disposal area is reported to have a footprint on the order of 135 acres, with berm at elevations ranging from 22 to 34 feet. The Reedy Point South Disposal Areas currently maintains the practice of active mining of the material following dredge events to maintain the available capacity without dike raisings. This is primarily feasible due to the granular nature of the fill placed in the disposal site.

Figure 2: Reedy Point South Disposal Area

B. CAPACITY ANALYSIS

Based on the time that has elapsed since the most recent dredge events, publicly available LIDAR topography collected in 2019 was utilized to support this evaluation. Based on the topography, the typical elevation of the top-of-dike around the Reedy Point North Disposal Area is typically elevation 24 feet (NAVD 88); however, the south east corner, a section is lower at elevation 21 feet, and the south west corner is higher, on the order of 30 feet, and the interior surface of the disposal areas varies from approximately 14 to 22 feet. Considering an effective minimum freeboard of 2 feet, the site has an effective capacity of 950,000 cubic yards at the current dike elevation. This effective capacity is in line with the inspection area reported capacity in 2018 of 890,000 cubic yards.

The feasibility evaluation consisted of determining the air “disposal” volume in the existing condition and the construction of a dike raising prior to the dredge event. The dike configuration were assumed to start approximately the current dike footprint, beginning at the inner edge of the top of the existing containment dike. Based on the addition of a 12 foot dike raising, it is estimated that an air volume of 2,925,000 cubic yard could be developed, and would require the movement of approximately 400,000 cubic yards of material for dike construction. The estimated volume is exclusive of the standard 2 foot of freeboard below the dike height elevation, so no additional reduction in these values was utilized in the disposal feasibility calculation.

In general, the use and stability of upland confined disposal areas area typically controlled by the geotechnical stability of the berms. This is commonly a result of the construction of berms over fluvial sediments and previously dredged material, which have limited and variable geotechnical strengths. In some cases, the geotechnical stability of the dikes is highly dependent on the amount of strength gain in the lower (older) dredged materials from the over lying layers of (newer) dredged material. The Reedy Point Disposal Areas are founded over a sandy coastal plain geology, and the dredged material which has been utilized for dike construction is generally granular in nature. As a result, it appears that a 12 foot dike raising could be configured at the Reedy Point North Disposal Area while maintaining a stable slope configuration.

Based on the time between the most recent dredge events, publicly available LIDAR topography collected in 2019 was utilized to support this evaluation. Based on the topography, the typical elevation of the top-of-dike around the Reedy Point South Disposal Area is typically elevation 22 feet (NAVD 88); however the northwest corner is higher, on the order of 34 feet, and the interior surface of the disposal areas varies from approximately 10 to 16 feet. Considering an effective minimum freeboard of 2 feet, the site has an effective capacity of 1,190,000 cubic yards at the current dike elevation. This effective capacity is in line with the inspection area reported capacity in 2018 of 1,100,000 cubic yards. No new dike raisings were considered at this time in this facility.

III. WILMINGTON HARBOR SOUTH DISPOSAL AREA

A. STATUS AND SUMMARY

Wilmington Harbor South Disposal Area is located to the southwest of the confluence of the Christina and Delaware Rivers as shown in Figure 3.
The disposal area was established in 1990, and has been primarily utilized for the disposal of dredged material from the maintenance of the Wilmington Harbor project. While there have been modifications to the footprint of the disposal area over time, there is currently approximately 185 acres of diked disposal.

Figure 3: Wilmington Harbor South Disposal Area

At the time of this evaluation, the disposal area is in active dike management by CENAP, with ditching and dewatering efforts anticipated through 2019 and spring 2020. A dike raising is proposed to occur in the summer or fall of 2020. The area is assumed to be available for use as a disposal area in Summer 2021 at the conclusion of the dredging exclusion zone related to the fish spawning in the river (which extends through July 1, 2020.

B. CAPACITY ANALYSIS

To support this evaluation, DSPC coordinated the performance of a topographic survey of the Wilmington Harbor South Disposal Area. The topographic survey was flown on December 23, 2018 and the survey plan was prepared by VanDemark & Lynch. Based on December 2018 topography, the typical elevation of the top-of-dike around the site is 31 feet (NAVD 88) and the interior surface of the disposal areas varies from approximately 25 to 28 feet. The current ditching and dewatering activities are apparent in the survey data. In general, the grade of the disposal area is higher in the west triangular portion of the site where the dredge pipes discharge, and is the lower in the vicinity of the sluice in the north east corner. Considering an effective minimum freeboard of 2 feet (corresponding to an elevation of 29 feet) the site has effectively minimal capacity at the current dike elevation.

The feasibility evaluation consisted of determining the air “disposal” volume in the existing condition and three configurations of varying height and steepens of the dike slopes as follows:

- Existing Conditions – The existing condition based on the survey results.
- Dike Configuration A – A standard 10 foot dike raise with 4 Horizontal to 1 Vertical slopes.
- Dike Configuration B – An extended 12 foot dike raise with 4 Horizontal to 1 Vertical slopes.
- Dike Configuration C - An extended 12 foot dike raise with 6 Horizontal to 1 Vertical slopes.

These dike configurations were generally considered the range of potential dike heights and slopes based on our experience with similar sites. The dike configurations were assumed to start approximately 60 feet from the outer edge of the top of the existing containment dike. For each dike configuration, the proposed air volume created (based on maintaining 2 feet of freeboard below the top of dike elevation) and approximate volume of soil required for berm construction was determined. Table 1 provides the parameter for the four dike configurations as well as the estimated conceptual air volume capacity.

Table 1: Dike Configuration Parameters and Conceptual Capacity

Dike Config.	Ext. Slope (H:V)	Int. Slope (H:V)	Dike Elev. (ft)	Dike Const. (cubic yds)	Total Est. Volume (cubic yards)
Existing	--	--	31	--	1.606 M
A	4:1	4:1	41	0.325 M	4.364 M
B	4:1	4:1	43	0.420 M	4.407 M
C	6:1	6:1	43	0.540 M	4.188 M

As noted, the Total Estimated Volume is exclusive of the standard 2 foot of freeboard below the dike height elevation, so no additional reduction in these values was utilized in the disposal feasibility calculation. It is further noted that due to the potential for significant settlement of theses berms over the two year dredging period, some capacity loss due to differential settlement along the dike could occur. Our evaluation has assumed that minor dike maintenance would be performed during the dredging period to maintain the 10 foot or 12 foot nominal dike heights.

In general, the use and stability of upland confined disposal areas area typically controlled by the geotechnical stability of the berms. This is commonly a result of the construction of berms over fluvial sediments and previously dredged material, which have limited and variable geotechnical strengths. In some cases, the geotechnical stability of the dikes is highly dependent on the amount of strength gain in the lower (older) dredged materials from the overlying layers of (newer) dredged material.

At the Wilmington Harbor South Disposal Area, it is understood that the berm along the Delaware River has been shown to be the critical portion of the site from a geotechnical slope stability perspective. A conceptual level slope stability analysis was performed in this portion of the site. The analysis was based on the dike configurations and subsurface soil strength and unit weight parameters developed as part of previous USACE engineering studies at the site including Standard Penetration Test (SPT) borings and geotechnical laboratory testing performed by Duffield in 2005 and Klienfelder in 2010. It is understood that USACE is in the process of performing a geotechnical study to support the current dike raising, which would evaluate the strength gain in the critical soil stratigraphy layers.

The slope stability analysis was performed utilizing ReSSA+ (Version 1.1) software developed by ADAMA Engineering, and considered a total stress analysis as an "end of construction" condition. The USACE Engineering manual for geotechnical slope stability (EM 1110-2-1902) recommends a minimum factor of safety of 1.3 relative to embankment failure of dredged material containment levees under the end of construction condition. This minimum factor of safety could be increased to 1.5 where failure could have a significant consequence of failure (e.g. close proximity of human safety or vital infrastructure). Long-term effective stress analysis is generally considered less critical than the end of construction for these types of dikes and was not performed as part of this conceptual analysis.

The slope stability analysis indicated a conceptual end-of- construction factor of safety for Dike Configuration A (10 foot height with 4 horizontal to 1 vertical slopes) on the order of 1.3 to 1.4 could be achieved depending on the soil variably along the dike. The analysis of dike configuration B (12 foot height with 4 horizontal to 1 vertical slopes) indicates that a factor of safety on the order of 1.25 to 1.3 may be possible, depending on the soil strength gain; however, our analysis indicates that the shallower 12 foot high berm with 6 horizontal to 1 vertical side slopes of dike configuration C would also result in factors of safety on the order of 1.3 to 1.4 which consistent with a stable dike configuration.

The analysis did not consider the use of geotextile reinforcement at the base of the berm elevation, which can be included in the design section to increase the slope stability of the section. The use of structural geotextiles has been used in areas of soft subgrade soils, but is not common practice in disposal areas on the Delaware River; however the controlling stability configuration was generally observed to be related to the global stability of the entire dike configuration (e.g. critical surfaces extend though the subgrade at the toe of the original berm along the Delaware River), opposed to a critical slope though the upper dikes. Geotextiles are generally more effective in increasing the stability of a single dike raising opposed to the entire system.

As a result, it appears that a 10 to 12 foot dike raising could be configured at the Wilmington Harbor South Disposal Area while maintaining a stable slope configuration. It is understood that the final design of the slopes are being performed by USACE Philadelphia District engineering.

IV. WILMINGTON HARBOR NORTH DISPOSAL AREA

A. STATUS AND SUMMARY

Wilmington Harbor North Disposal Area is located to the northwest of the confluence of the Christina and Delaware Rivers as shown in Figure 4. The disposal area was established in the 1940's as part of an open placement area that formerly extended under the adjacent Cherry Island Landfill. This area was subsequently transitioned into a diked upland disposal area in the late 1950's. It has been primarily utilized for the disposal of dredged material from the maintenance of the Wilmington Harbor project until it was recently taken out of service following an early 2017 dredge event. There is currently approximately 93 acres of diked disposal, with no future planned expansion or dike raising.

Figure 4: Wilmington Harbor North Disposal Area

At the time of this evaluation, the disposal area is inactive, and it is understood that it was last utilized for disposal in 2017, with no future planned disposal events.

B. CAPACITY ANALYSIS

Based on the timing of the final dredge event, a publically available 2019 LIDAR survey with 2 foot contours that postdates the final dredge event was utilized to support our evaluation. The typical elevation of the top-of-dike around the site is

53 feet (NAVD 88), with some minor settlement around the sluice box outfall structure to around elevation 51 feet. The current elevation of the dredged material within the disposal area ranges from 46 to 48 feet. No ditching and dewatering activities are currently being performed.

It is understood that USACE considered this site to have reached its terminal dike elevation, and that no further dike raisings are planned. It is further understood that during the final dredge event, apparent damage to the outfall structure was noted which may limit the further use of the structure.

The feasibility evaluation consisted of determining the air "disposal" volume in the existing condition, assuming that minor regrading of the dike is performed to re-establish the berm at elevation 53 feet (corresponding to an allowable dredge elevation of 51 feet). Additional remediation, consisting of the replacement of the sluice box outfall piles through the berm would also be needed prior to dredging activities. Based on the existing site topography, it was determined that these minor maintenance activities would result in an estimated conceptual air volume capacity of 600,000 cubic yards.

As noted, the estimated volume is exclusive of the standard 2 foot of freeboard below the dike height elevation, so no additional reduction in these values was utilized in the disposal feasibility calculation. This capacity could be increased by pre-removing additional materials from the site; however, expansion through additional dike raisings do not appear practical at this time.

V. FEASIBILITY OF EDGEMOOR DREDGED MATERIAL DISPOSAL

Based on the 2018 bathymetric survey performed as part of the 204(f) Application supporting studies and the currently proposed harbor grading to a depth corresponding to a -45 foot MLLW harbor (-48 feet NAVD 88), the initial dredge volume quantity for the Edgemoor berthing area and side slopes is estimated to be 3,325,000 cubic yards. Initial geotechnical sampling summarized in a report titled "Geotechnical Data Report, Port of Wilmington, Edgemoor Expansion, Edgemoor, New Castle County, Delaware," dated October 2019 indicates that this material would consist of:

- Fluvial Mud – approximately 915,000 cy
- Alluvial Sands – approximately 925,000 cy
- Potomac Clay and Clayey Sands – approximately 1,485,000 cy

For the purposes of these conceptual analyses, it has been assumed that the dredging will occur over three separate events, spaced over a two-year period.

The Bulking factor and shrinkage factor are terms that represent expected volume change experienced during hydraulic dredging. The Bulking Factor is the excess water which is utilized during mixing, dredging and placement for a given soil type. For example, a Bulking Factor of 2.0 would correspond to the deposition of 2 cubic yards of soil/water

slurry mixture placed in the disposal area for every cubic yard of soil hydraulically dredged from the river bottom. The Shrinkage Factor is the corresponding volume of the same material after flocculation and sedimentation occurs in the disposal area and active dewatering has been performed to dry the soil/water slurry into a soil crust. Due to underlying consolidation of the hydraulic soils and the densification from dewatering activities, the volume of the material in the disposal area is generally slightly less than the volume of the material in water prior to dredging. Table 2 includes the bulking factor and shrinkage factor assumed for each dredging event.

Table 2: Assumed Bulking and Shrinkage Factors

Dredge Materials	Bulking Factor (during dredging)	Shrinkage Factor (at 6 months)	Shrinkage Factor (at 24 months)
Fluvial Mud	1.8	1.0	0.8
Alluvial Sands	1.4	1.0	1.0
Clay and Clayey Sand	2.2	1.3	1.0

It is noted that for the purpose of our feasibility analysis, a short term shrinkage factor of 1.0 or greater was used assuming that the benefits of long term dewatering, which is considered in the extended disposal area planning (e.g. the DALP Runs), is not likely to be experienced during the 2 year initial dredged period. In addition, the increased bulking factor for the Potomac Clays was utilized to account for the slower production of the dredging activities, which have been reported for this material when encountered in the Main Channel Deepening Project.

Based on these bulking factors and the disposal volumes calculated for each of the configurations, the disposal plans are summarized in Tables 3, 4, 5, and 6.

Table 3: Dredging and Disposal for Reedy Point North/South Disposal Areas

Dredging Cycle	Dredging Volume (cubic yards)	Dredge Material	Bulking Factor	Bulked Volume (cubic yards)	Short Term Shrinkage Factor	Short Term Disposal Volume (cubic yards)
Pre-Dredge 1 (December 2020)						Reedy North 2,925,000 Reedy South 1,190,000
Dredge 1	915,000	Mud	1.8	1,647,000	1.0	Reedy North 100% Reedy South 0%
	925,000	Sand	1.4	1,295,000	1.0	Reedy North 50% Reedy South 50%
Post-Dredge 1 (January 2021)						Reedy North 630,000 Reedy South 542,500
Pre-Dredge 2 (July 2021)						Reedy North 1,547,500 Reedy South 727,500
Dredge 2	1,100,000	Clay	2.2	2,420,000	1.3	Reedy North 70% Reedy South 30%
Post-Dredge 2 (September 2021)						Reedy North 7,500 Reedy South 67,500
Pre-Dredge 3 (December 2021)						Reedy North 637,500 Reedy South 337,500
Dredge 3	425,000	Clay	2.2	935,000	1.3	Reedy North 65% Reedy South 35%
Post-Dredge 3 (January 2022)						Reedy North 32,500 Reedy South 7,500
Dredge Remaining Following Dredge Cycle 3				Fluvial Mud – 0 cy Alluvial Sands – 0 cy Potomac Clay and Clayey Sands – 60,000 cy		

Table 4: Dredging and Disposal for Wilmington Harbor South Dike Configuration A, 10 ft. Dike Height

Dredging Cycle	Dredging Volume (cubic yards)	Dredge Material	Bulking Factor	Bulked Volume (cubic yards)	Short Term Shrinkage Factor	Short Term Disposal Volume (cubic yards)
Pre-Dredge 1 (December 2020)						4,364,000
Dredge 1	915,000	Mud	1.8	1,647,000	1.0	
	925,000	Sand	1.4	1,295,000	1.0	
Post-Dredge 3 (January 2021)						1,432,000
Pre-Dredge 2 (July 2021)						2,524,000
Dredge 2						
	1,100,000	Clay	2.2	2,420,000	1.3	
Post-Dredge 2 (September 2021)						104,000
Pre-Dredge 3 (December 2021)						1,094,000
Dredge 3	386,000	Clay	2.2	849,200	1.3	
Post-Dredge 3 (January 2022)						244,800
Dredge Remaining Following Dredge Cycle 3				Fluvial Mud – 0 cy Alluvial Sands – 0 cy Potomac Clay and Clayey Sands – 0 cy		

Table 5: Dredging and Disposal for Wilmington Harbor South Dike Configuration B, 12 ft. Dike Height

Dredging Cycle	Dredging Volume (cubic yards)	Dredge Material	Bulking Factor	Bulked Volume (cubic yards)	Short Term Shrinkage Factor	Short Term Disposal Volume (cubic yards)
Pre-Dredge 1 (December 2020)						4,407,000
Dredge 1	915,000	Mud	1.8	1,647,000	1.0	
	925,000	Sand	1.4	1,295,000	1.0	
Post-Dredge1 (January 2021)						1,465,000
Pre-Dredge 2 (July 2021)						2,567,000
Dredge 2	1,100,000	Clay	2.2	2,420,000	1.3	
Post-Dredge 2 (September 2021)						147,000
Pre-Dredge 3 (December 2021)						1,137,000
Dredge 3	386,000	Clay	2.2	849,200	1.3	
Post-Dredge 3 (January 2022)						287,800
Dredge Remaining Following Dredge Cycle 3				Fluvial Mud – 0 cy Alluvial Sands – 0 cy Potomac Clay and Clayey Sands – 0 cy		

Table 6: Dredging and Disposal for Wilmington Harbor South Dike Configuration C, 12 foot Freeboard, Shallow Berm

Dredging Cycle	Dredging Volume (cubic yards)	Dredge Material	Bulking Factor	Bulked Volume (cubic yards)	Short Term Shrinkage Factor	Short Term Disposal Volume (cubic yards)
Pre-Dredge 1 (December 2020)						4,118,000
Dredge 1	915,000	Mud	1.8	1,647,000	1.0	
	925,000	Sand	1.4	1,295,000	1.0	
Post-Dredge 1 (January 2021)						1,176,000
Pre-Dredge 2 (July 2021)						2,278,000
Dredge 2	1,100,000	Clay	2.2	2,420,000	1.3	
Post-Dredge 2 (September 2021)						142,000
Pre-Dredge 3 (December 2021)						848,000
Dredge 3	350,000	Clay	2.2	770,000	1.3	
Post-Dredge 3 (January 2022)						78,000
Dredge Remaining Following Dredge Cycle 3				Fluvial Mud – 0 cy Alluvial Sands – 0 cy Potomac Clay and Clayey Sands – 36,000 cy		

VI. SUMMARY

The feasibility evaluation determines that the volume of material excavated as part of the Edgemoor construction dredging can be placed in the Reedy Point North and South Disposal Areas or the Wilmington Harbor South Disposal Area. For each of the approaches, the construction would require three dredged cycles with active dewatering maintenance between cycles. The three cycles could be placed in the Reedy Point facility, if Wilmington Harbor North Disposal area is used to facilitate staging of up to 200,000 cubic yards of material during the final dredge event. While three cycles could feasibly be disposed of in the Wilmington Harbor South Disposal Area with a 10 foot dike raising, the staging of the cycles and the amount of active maintenance would be reduced with additional dike height. Our analysis indicates that there is a potential for higher dike; however it his highly dependent on the geotechnical strength testing and analysis currently being performed by USACE.

Due to the high potential for settlement of the berms due to consolidation of the underlying soil, it is likely that some intermediate dike raising or maintenance grading will be required to maintain the design elevation and the available capacity between dredge events. This is more likely to occur in the Wilmington Harbor North and South Disposal Areas, but could also be experienced to some extent in the Reedy Point facility. Due to the time and available materials, this may need to consist of an imported fill from onsite or offsite sources or underutilized areas of the disposal area. .

Additionally, it should be anticipated that the use of these facilities for the Edgemoor Construction dredging would effectively “fill” the existing capacity or the capacity created as part of the current dike construction during each dredge event. Nominal dewatering efforts following the final dredge event may allow for additional smaller volume dredge events (e.g. a few cycles of maintenance dredging) prior to subsequent dike risings and future dredged material disposal.

The actual volume of dredging that can be placed during each dredge event is a function of the bulking factors experienced during dredging and the volume of dredge effluent that can be dewatered during the dredge event, which is a function of the environmental controls on the outfall assigned during environmental permitting. The feasibility evaluation assumed that no material would exit the disposal area during dredging, which is considered conservative.

This evaluation has conservatively not considered the potential beneficial reuse of dredged material on the Edgemoor site, which could consist of up to 10 percent of the total dredge volume. If performed, this would offset material proposed to be excavated during the initial dredge event, and would be performed concurrent to that event. The beneficial use would reduce the potential to require full use of the two main disposal alternatives, and would reduce the potential need to engage the contingency capacity in the Wilmington Harbor North Disposal Area, which would require a the replacement of the outfall structure and dike regrading to develop a relatively small effective disposal capacity.

This report has been prepared according to generally accepted soil engineering standards and are based on the conditions assumed in this report. It is noted that, although conditions have been inferred, conditions may vary. As a result, this report may require modifications based on the conditions observed and exposed during future evaluation and construction activities. In the event that changes are proposed, Duffield Associates, Inc. will not consider this report valid unless the changes have been reviewed and the recommendations of this report modified and re-approved in writing.

BJD:acj
11139LH.0620-EDGEMOOR.WHS FEASIBILITY.RPT-REV