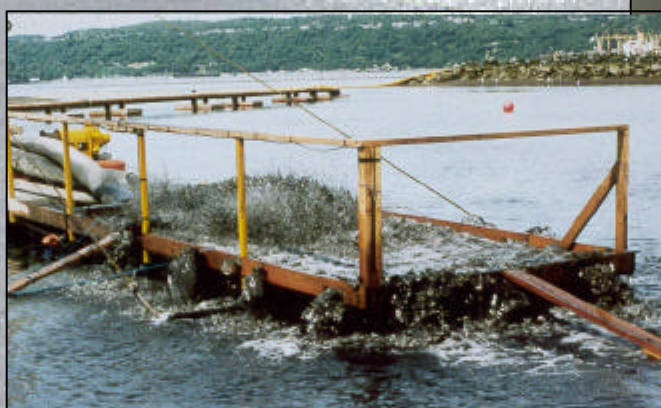
St. Louis River/Interlake/Duluth Tar Site
Duluth, Minnesota

FEASIBILITY STUDY
REVISED ADDENDUM 1

MARCH 29, 2004



SERVICE
ENGINEERING
GROUP

FEASIBILITY STUDY
ADDENDUM NO. 1
ST. LOUIS RIVER/INTERLAKE/DULUTH TAR SITE
SEDIMENT OPERABLE UNIT

Prepared for:
XIK Corp.
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Prepared by:

SERVICE ENGINEERING GROUP

March 29, 2004

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1.0 INTRODUCTION

1.1 Addendum Purpose

This Addendum to the Approved Feasibility Study[1] (FS) for the Sediment Operable Unit (SedOU) was prepared by SERVICE Engineering Group (SERVICE) as a result of and to report the following changes from the FS:

1. An increase in the estimated volume of sediment to be dredged;
2. A decrease in the estimated capacity of the Slip 7 CAD;
3. New information about the difficulty of maintaining deep draft shipping in Slip 6;
4. The availability of Slip 6 for use as a CAD.

Each of these changes is described in more detail in Section 2.

The Minnesota Pollution Control Agency (MPCA) has requested this Addendum prior to the issuance of its Proposed Plan for the SedOU.

These changes primarily affect Alternative 3—Dredge/Cap Hybrid. The combination of more dredged material, less than expected storage capacity, and the availability of Slip 6 for storage has led to a decision to relocate the CAD for this alternative from Slip 7 to Slip 6.

The effects of the change in dredging volumes on Alternative 4—Dredge/Off-Site Disposal are also addressed in this report. Alternative 1—No Action, and Alternative 2—*In Situ* Cap are not affected and will not be addressed.

1.2 Report Organization

This document should be read along with the Approved FS. Section 2 presents the results of more detailed calculations on dredge volumes and on-site disposal facilities. Section 3 describes how Alternatives 3 and 4 are physically affected. Section 4 summarizes impacts in terms of the evaluation criteria and comparative analysis, including costs.

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[1] The Final Feasibility Study consists of the Draft Feasibility Study submitted by SERVICE Engineering Group on December 30, 2003 and the MPCA's Approval Letter with Modifications, dated January 14, 2004. Combined, these documents constitute the Final FS.

2.0 CHANGES IN DREDGE VOLUME, ON-SITE DISPOSAL CAPACITY AND CAD LOCATION

2.1 Changes in Dredge Volume

In Table 1-1 of the FS, dredge volume estimates were presented. As a result of additional analysis done during preliminary design work, no additional contamination has been identified, but several changes to dredge volume estimates are necessary.

1. Changes in the dredge prisms[2] such as more dredging on side slopes, which are to be capped, to assure slope stability (Alternatives 3 and 4).
2. Dredging of the Minnesota part of the Minnesota Channel has now been included in Alternative 3. In the approved FS, it was included in Alternative 4.
3. A subcut of soft sediment from beneath the CAD dike may be necessary to assure its stability and rapid constructability (Alternative 3).

In addition to these changes, other factors not yet fully determined may also cause volume increases. These include the:

1. Amount of overdredging,[3]
2. Uncertainty about horizontal dredge limits around the mouth of Stryker Bay,
3. Amount of sediment removal necessary below the CAD dike.

Each change is described in more detail below and the estimated *in situ* volume changes are shown in **Table 2-1**. In summary, these changes result in a net volume change for Alternatives 3 and 4 as follows:

In situ volume in Cubic Yards	**Dredge/Cap Hybrid Alternative 3**		**Dredge/Off-Site Disposal Alternative 4**	
	Minimum	Maximum	Minimum	Maximum
FS Volume	178,000		495,000	
New Volume	166,000	225,000	501,000	609,000
Net Change	(12,000)	47,000	6,000	114,000

Dredge Prism. Dredge prisms are developed to define the neat line.[4] The neat line must be constructible because it is used to instruct the dredging contractor what to dredge. When

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[2] A dredge prism is a series of three-dimensional geometric sediment volumes that can be removed with mechanized dredges and verified with a survey.

[3] Clean sediment dredged to allow for vertical variability while attempting to remove the entire layer of contamination.

factoring in the limitations and capabilities of dredging equipment, dredge prisms can be two to more than 100 percent less efficient than more complex geometries that are based only on the depth of contamination at sampling points, as was done in the FS, depending on the complexity, slopes and size of the dredge prism. For the FS, the Dredge/Off-Site Disposal Alternative had a full dredge prism developed. The Dredge/Cap Hybrid Alternative was based on a portion of the full dredging prism, but an alternative-specific dredge prism was not created. The Dredge/Cap Hybrid includes dredging in a small but deep area of the Minnesota Channel at the south end of the Site adjacent to relatively steep slopes that would be capped. In order to maintain stable slopes with a deeper cut at the bottom, some of the slopes must be cut back, adding to dredge volumes from areas that would be capped.

When Hallett relocates as described in Section 2.4, dredging is no longer necessary in the berth area of Slip 6 for Alternative 3. This simplifies the dredge prism by removing the dredging to be done in this area. South of the CAD, sediment in Minnesota would be capped, while a small amount of sediment in Wisconsin would be dredged to the limits of contamination.

With the Dredge/Off-Site Disposal Alternative, there would be no capping, so the adjacent slope cuts were included in its dredging volumes of the FS.

The Minnesota Channel. The volumes in Table 1-1 of the FS assumed the Minnesota portion of the Minnesota Channel would be capped in the Dredge/Cap Hybrid Alternative. The FS also states that a decision to allow or disallow such capping in or near the Minnesota Channel had not been made by the US Army Corps of Engineers (COE). Since submitting the FS, SERVICE has inquired about this issue to the COE. The COE indicated that any contamination within the Minnesota Channel above a depth of 28 feet must be removed. Contamination beneath 28 feet is not part of the Minnesota Channel and would be subject to jurisdiction by others. Consequently, this Addendum assumes the Minnesota Channel material would need to be dredged. Much of the contamination in this area is deep and is located at the base of a steep slope that would need to be cut back to a flatter slope in order to remain stable if armored as described in the Data Gap Report Appendix GT5 Erosion Analysis. Because of these side slope cuts, the impact of assuming that dredging is likely in this area involves more volume than the Minnesota Channel

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[4] The surface within the sediment above which lies the targeted contaminated sediment.

itself. In the approved FS, dredging of this area was assumed for the Dredge/Off-Site Disposal Alternative, so no change in volumes would occur for Alternative 4.

Subcutting for Slip 6 CAD Dike. Geotechnical analysis of borings completed in the vicinity of the Slip 6 CAD dike (Alternative 3), indicates that subcutting (removal) of soft surface sediments from beneath the footprint of the dike prior to dike construction may be necessary to increase the stability of the dike and allow its construction without delays associated with staged construction. In the FS, this subcut was not included.

When added to the previous dredge volume estimate in the Approved FS, the changes described above result in the minimum revised estimate of dredge volume. The volumes described below represent the potential additions to the minimum volume that lead to the estimated maximum dredge volumes.

Increased overdredging. The FS assumed an average of six inches of overdredging beneath the neat line. Such dredging precision is said to be achievable with some state-of-the-art equipment. Other equipment might need additional overdredge to be sure to get all of the targeted contamination. A six-inch average overdredge is most achievable in simple, flat dredge prisms as is planned for portions of Stryker Bay. It is more difficult in complex dredge prisms with frequently changing depths like in the Minnesota Channel and the entrance to Stryker Bay. The frequent change in water level caused by seiches may also contribute to potentially larger overdredging. Since dredging will be conducted over a large area, the impact of the extra volume of dredged material would be substantial. The design team recommends planning disposal capacity for a potential overdredge increase from six to twelve inches. The volume impact is shown on **Table 2-1** for Alternatives 3 and 4.

Other uncertainties. At this point, some details are yet unknown. Additional subcutting may be necessary beneath the CAD dike. Horizontal dredge limits have not yet been confirmed. Slope cuts may need to be flatter in certain areas once geotechnical design is complete. Some of the surcharged cap may need to be sacrificed when dredging adjacent to the cap. Unexpected surprises can continue to arise even during remediation. A general safety factor is often applied to increase the likelihood the disposal cell is large enough for as-yet-unknown volume impacts. The estimated safety factor volume (10 percent of the minimum estimated dredge volume) is shown in **Table 2-1**. Although there is no dredging planned for Alternative 3 in Slip 6 (except for the small area to the south), an additional volume of 15,000 *in situ* cubic yards has been included in the Safety Factor column in case dike design requires additional subcutting for a stable dike base.

At this time, SERVICE recommends planning for a potential maximum dredge volume of about 225,000 *in situ* cubic yards for the Dredge/Cap Hybrid.

2.2 Changes in On-Site Disposal Capacity

On-site disposal capacity in the deep portion of Slip 7 was approximated in Dredge/Cap Hybrid Alternative in the FS using a technique that was flexible enough to vary the quantities of various options. More detailed analysis indicates those calculations overestimated the available storage in the slip, necessitating a larger on-site disposal capacity—even to hold the previously estimated volume. The approximation assumed a minimally-sized disposal cell at the north end of the slip (located 1,500 feet north of the south end of the dock at Station 15+00), and then estimated how much additional volume was gained for each foot the centerline of the containment dike moved south. This estimate was based on the premises that: (1) the cross section of the deep area was fairly constant, and (2) that the cross section that was used to move north and south to subtract or gain volume was representative. As illustrated in **Figure 2-1** both assumptions were incorrect. The cross section is neither constant nor represented accurately with the "original average section." These errors resulted in an overestimate of the actual volume of available storage, especially in a CAD whose area is limited to the shallower north end as shown in the FS. The erroneous estimated volume from the FS when filling the CAD areas north of Station 8+00 to elevation 601 is shown on **Figure 2-3** with a diamond shape.

The new storage volumes were calculated as follows. Containment was designed using a dike with a 2:1 slope in Slip 7 and 2.5:1 slope for Slip 6 at the south end of each CAD, and using vertical slopes along the dock wall. The inside shape of the CAD was contoured using measured bathymetry and the geometry of the designed containment. The area of each 1-foot contour within the CAD was measured using AutoCad® software. An example of this approach is shown in **Figure 2-2** showing the end dike and the contours used to calculate the volume. Then, the average-end-area method was used to estimate volume. With this method, the average of each set of adjacent contours is multiplied by the thickness between those contours (one foot) and a volume is calculated for that interval. These volumes can be converted to yards of *in situ* sediment by dividing the actual space by the assumed bulking factor[5] of 1.2 (a value recommended by the Peer Review Team). The volumes of each layer are added and plotted as a function of the depth as shown in **Figure 2-3**. With this method, the dike location is fixed and the volume of sediment (as *in situ* cubic yards) is as accurate as the bathymetry and the bulking factor.

The results are shown in **Figure 2-3**. While the erroneous volume estimate in the FS showed a capacity within the target volume range developed for this Addendum, the actual volume is about 72,000 *in situ* cubic yards less. Comparing the actual available storage capacity of a Slip 7 CAD at Station 8+00 to the minimum and maximum range of projected dredge volumes, a substantial shortfall is evident, ranging from a minimum of 66,000 *in situ* cubic yards, to a maximum of 125,000 *in situ* cubic yards. To store those additional yards in the same CAD footprint would raise the sediment to elevations ranging from 609 to 617 feet, compared to a water level averaging 601.8 feet. Dikes would be four to six feet higher. The large internal head of water that such a facility would create would substantially change the operating conditions and possibly the safety of the operation. After completion, it would remain an upland mound. Similarly, because of structural limitations in the adjacent dock wall, slope stability issues on the western side and the presence of a thick layer of contamination within the footprint, overexcavating clean material from the base of the CAD is infeasible.

As noted, measurements of Slip 6 and calculations based on those measurements indicate that Slip 6 has more than sufficient volume to serve as a CAD for all the materials that are likely to result from the proposed dredging. If, however, during the remedial design or the performance of the proposed remedy, it appears that the amount of dredged material would exceed the capacity of Slip 6 as a CAD, alternatives to dredging consistent with criteria utilized in the FS process should be evaluated to limit the dredge volume to the slip's capacity.

[5] When sediment is dredged and placed in a CAD, it is initially fluffed up by the disturbance and then slowly consolidates over time. A CAD must be able to contain the dredged sediment in its fluffed up volume. This bulked volume controls the minimum size of the CAD.   The bulking factor is the estimated ratio between the fluffed up sediment and the *in situ* sediment volume. For the FS and this Addendum, it is estimated to be 1.2, reflecting a 20 % increase over the same sediment as it currently sits *in situ*.

2.3 Difficulties in Maintaining Deep Draft Shipping in Slip 6

Foundations of Dock 6 terminate at 22 feet, and dredging to 28 feet is necessary to remove contamination. Exposing these footings and removing the lateral support the footings rely upon would be a hazard that would necessitate installing additional support for the dock foundation before dredging could safely proceed.

Ships use increasingly powerful bow thrusters to maneuver within the slips. Propeller wash from bow thrusters is focused on the adjacent slopes and is a larger erosive force than was estimated in the FS for tug-assisted barges. Armoring against the propeller wash is estimated to require rocks that are one meter in diameter or a continuous concrete mat over the cap. These types of armoring are more costly and have limited habitat value.

Finally, at least a portion of Slip 6 would be needed to store sediment dredged from the site, since a CAD filling Slip 7 all the way to its southern limit is not large enough to hold the dredgings.

2.4 Availability of Slip 6 as a CAD

Hallett conducts bulk material handling operations at Dock 6 that require deep draft shipping. Hallett's estimates of the costs of relocating from Dock 6 were of a magnitude that previously precluded consideration of Slip 6 for use as a CAD. In light of the new information about necessary CAD space and the difficulty of maintaining shipping in Dock 6, the costs of relocation became relatively more economic. As a result, a relocation agreement has been reached in principle between Hallett Dock Company and XIK Corp. Hallett will continue to operate at Dock 6 through 2004 and then relocate those operations elsewhere. Slip 6 will thus be available for use as a CAD in 2005 and beyond.

In Slip 6, the end dike for containment was located to:

- Provide the necessary capacity,
- Avoid the need to seal the cribbing of the dock wall against leakage of dredged material by locating the dike south of the dock structure,
- Avoid impacting Wisconsin waters with any of the dike fill,
- Take advantage of the firmer sandy foundation at the south end of the slip.

The centerline of the dike is estimated to be located about 165 feet south of the south end of the dock wall Station 0+00. The available storage north of that dike is shown in Figure 2-3. The Elevation/Volume Curve indicates that the Slip 6 CAD is deeper and larger than the previous Slip 7 CAD, and can store the expected volumes when filled to an elevation ranging from 596 to 600. During design, dredge volumes and CAD design details would continue to be evaluated.

3.0 HOW THE CHANGES AFFECT ALTERNATIVES 3 AND 4

3.1 Dredge/Cap Hybrid Alternative Changes

Each of the changes described above affect the Dredge/Cap Hybrid Alternative. As shown in **Figure 3-1**, the following changes have been made since the Approved FS:

1. The smaller CAD in Slip 7 would be enlarged to hold the dredged sediment and relocated to Slip 6.
2. The areas to be armored and the purpose of armoring also changed somewhat with deep draft shipping moved off-site. Armoring would be used to armor against currents and waves. The areas to be armored are on the exposed slopes of Slip 7 and the Minnesota Channel.
3. Areas to be remediated in the on-shore wetlands of Slip 7 have been updated to reflect the results of additional sampling since the FS.
4. Finally, since the water adjacent to the dock wall in Slip 7 will remain open water with an *in situ* cap instead of the CAD cap shown in the FS, there is little potential for habitat improvement along the dock wall, so the shoreline buffer zone has been removed from that area, matching the buffer zone plan for the Dredge/Off-Site Disposal Alternative in this regard.

3.2 Dredge/Off-Site Disposal Alternative Changes

The expected dredge volume has increased from 495,000 up to 501,000 to 609,000 *in situ* cubic yards (1 to 23 percent). Areas to be remediated in the on-shore wetlands of Slip 7 have been updated to reflect the results of additional sampling since the FS. Otherwise, the physical dimensions of the alternative are unchanged as shown in **Figure 3-2**.

4.0 HOW THE CHANGES AFFECT EVALUATION CRITERIA AND ALTERNATIVES COMPARISON

Since most of the scope of Alternatives 3 and 4 remain unchanged, there were no changes in the following evaluation criteria as summarized in **Table 4-1**:

- Cleanup standards based on Property Use,[6]
- Permanence,[7]
- Protection of Human Health and the Environment by achieving Preliminary Remedial Goals (PRGs),
- Long-Term Effectiveness, and
- Reduction of Toxicity, Mobility, or Volume, through Treatment.

Those criteria with changes or updates are discussed below.

4.1 Compliance with Permits and ARARs

The DNR has indicated the new configuration for the Dredge/Cap Hybrid Alternative would be permittable,[8] and is preferred over the previous version as it had previously indicated because Slip 7 has the greater resource value and potential. Mr. John Linc Stine indicated that compared to the previous version of the Hybrid alternative, mitigation requirements would likely be lower.

The DNR declined to change its estimate of the amount of mitigation and compensation that it would require as part of its permit, for the change in on-site disposal facilities for the Dredge/Cap Hybrid, indicating the estimated cost range is wide and the mitigation costs would likely remain within the range. They indicated that Slip 6, if finished as a CAD would likely be self-mitigating and the mitigation requirements for Slip 7 would likely be less because of the greater amount of deep water habitat available in the capped slip. In any case, these estimates are preliminary. Actual mitigation and compensation requirements for the DNR's permit will be

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6 MERLA (Minn. Stat. 115B.17, Subd. 2a) requires that in determining the appropriate cleanup standards to be achieved by a response action, the MPCA must consider the planned use of the property.

7 The RFRA for this Site indicates that to be permanent a remedy must provide absolute long-term effectiveness. The MPCA considers a remedy permanent when it allows for unrestricted use of all land and natural resources impacted by the contaminants and, except for the purpose of treatment, does not involve removal of the contaminants to another site and minimizes exchange of the contaminants to other environmental media.

8 Meeting between DNR, MPCA, XIK, Hallett Dock Company and SERVICE, March 8, 2004.

determined after evaluation of function and values before and after the remedy. The DNR, the City of Duluth and the COE will evaluate these requirements during the permitting processes that are yet to come should this alternative be selected.

There would be no changes for Alternative 4.

4.2 Implementability

The larger CAD in Slip 6 would likely be large enough to allow hydraulic dredging for the Dredge/Cap Hybrid using a 10- or 12-inch dredge. In the FS, the CAD was too small to provide the minimum area necessary to settle solids from the discharge of reasonably-sized hydraulic dredges. Mechanical dredging with hydraulic conveyance remains viable as well. With the containment dike located south of the dock wall, isolation of the contaminants would be simpler and therefore more implementable than sealing the cribbing beneath the dock wall.

There would be no changes for Alternative 4.

4.3 Short-Term Risks

The changed dredge volumes would subtract from or add to the following durations of the dredging schedule for Alternatives 3 and 4. (There are 152 working days in a 5-day-per-week, 7-month construction season.)

Working Days of Dredging	**Dredge/Cap Hybrid Alternative 3**		**Dredge/Off-Site Disposal Alternative 4**	
	Minimum	Maximum	Minimum	Maximum
FS	141		408	
New Duration	138	187	418	508
Net Change	(3)	47	10	100

In the case of the new configuration of the Dredge/Cap Hybrid Alternative compared to the FS's version, elimination of dredging from Slip 6 would decrease some dredging in areas of high naphthalene concentrations (shown as black dots on **Figure 3-1**), somewhat off-setting emissions from the larger CAD that is nearer potential receptors. As shown in Appendix C of the FS, except when dredging areas of high naphthalene concentrations, emissions from the CAD are expected to meet ambient air quality requirements. The contingency measures of covering the CAD or adding powdered activated carbon remain viable techniques to minimize short-term impacts.

4.4 Total Cost

Cost estimates reflecting the changes discussed above are summarized in **Table 4-1** and detailed in **Table 4-2**. The costs of the Dredge/Cap Hybrid Alternative have increased from $31.9 to $33.5 million range in the FS to $43.8 to $48.2 million. The increased costs are due to larger dredged sediment volumes (maximum volumes), additional capping material, and $10 million of increased relocation costs. The Dredge/Off-Site Disposal Alternative stayed the same or increased from its $93.9 million estimate in the FS to $94.9 to $110.7 million due to the changes in dredge volume.

4.5 Property (Land and Water) Uses

For the Dredge/Cap Hybrid, the CAD in Slip 6 would preclude the use of Dock 6 for maritime use because of its conversion to a range of wetlands types. The current owner (Hallett Dock Company) and XIK have agreed to the acceptability of this property use change. The zoning of the land portion of the site would remain industrial. Dock 7 would be potentially usable for shallow draft shipping with the use of necessary measures to protect the cap.

There would be no changes for Alternative 4.

Table 2-1
Revised Dredge Volume Comparison
SLRIDT Site, Duluth, MN

SERVICE ENGINEERING GROUP

Alternative 3-Dredge/Cap Hybrid

Location/Modification	**Draft FS**	Minimum Volumes: Changes Due to Dredge Prism and New Side Slopes	Minimum Volumes: Dredging Minnesota Part of Federal Channel	Minimum Volumes: Subcut of Soft Sediment Beneath 6 CAD Dike	Minimum Volumes: Total Minimum Changes	Minimum Volumes: **Minimum New Dredge Total**	Maximum Volumes: Increase in Overdredge from 6 to 12 Inches	Maximum Volumes: Additional Safety Factor* Volume	Maximum Volumes: Total Maximum Changes	Maximum Volumes: **Maximum New Dredge Total**
Stryker Bay, *In Situ* CuYds	**133,224**	2,676	0	0	2,676	**135,900**	26,500	13,590	42,766	**175,990**
Slip 6, *In Situ* CuYds	**42,053**	(42,053)	0	6,146	(35,907)	**6,146**	-	15,000	(20,907)	**21,146**
Slip 7, *In Situ* CuYds	**3,084**	6,816	12,900	-	19,716	**22,800**	1,200	2,280	23,196	**26,280**
TOTAL, *In Situ* CuYds	**178,361**	(32,561)	12,900	6,146	(13,515)	**164,846**	27,700	30,870	45,055	**223,416**

Alternative 4-Dredge/Off-Site Disposal

Location/Modification	**Draft FS**	Minimum Volumes: Changes Due to Dredge Prism and New Side Slopes	Minimum Volumes: Dredging Minnesota Part of Federal Channel	Minimum Volumes: Subcut of Soft Sediment Beneath 6 CAD Dike	Minimum Volumes: Total Minimum Changes	Minimum Volumes: **Minimum New Dredge Total**	Maximum Volumes: Increase in Overdredge from 6 to 12 Inches	Maximum Volumes: Additional Safety Factor* Volume	Maximum Volumes: Total Maximum Changes	Maximum Volumes: **Maximum New Dredge Total**
Stryker Bay, *In Situ* CuYds	**204,058**	0	0	0	0	**204,058**	30,920	20,406	51,326	**255,384**
Slip 6, *In Situ* CuYds	**100,000**	0	0	0	0	**100,000**	10,000	10,000	20,000	**120,000**
Slip 7, *In Situ* CuYds	**190,500**	6,000	0	0	6,000	**196,500**	17,500	19,650	43,150	**233,650**
TOTAL, *In Situ* CuYds	**494,558**	6,000	0	0	6,000	**500,558**	58,420	50,056	114,476	**609,034**

* Additional safety factor volume is a reserve for unknowns.
Safety Factor is estimated to be 10% of the Minimum New Dredge Total + (for the Hybrid only) 15,000 for unknown subcut volume at main dike.

Table 4-1
Evaluation Criteria by Alternative for Alternatives Affected by Changes
SLRIDT Site

SERVICE ENGINEERING GROUP

The following changes to Table 5-1 of the Final FS have occurred due to the changes presented in this Addendum. Please review in conjunction with Table 5-1 of the Final FS.

	3. Dredge/Cap Hybrid	4. Dredge/Off-Site Disposal
Threshold Criteria		
Property Use[i]	No Change	
Permanence[ii]	No Change	
Protect Human Health and the Environment by achieving Preliminary Remedial Goal (PRGs)	No Change	No Change
Comply with Permits and ARARs	The revised on-site disposal plan is permittable. DNR considers the changes to be an improvement over the previous Hybrid configuration (in the FS) by disposing of contaminants in the slip with the lesser habitat value and improving the potential for Slip 7.	No Change
Balancing Criteria		
Long-term Effectiveness	No Change	No Change
Reduction of toxicity, mobility, or volume, through treatment.	No Change	No Change
Implementability	Because of the larger CAD in Slip 6, hydraulic dredging is feasible and implementable. Mechanical dredging also remains implementable.	No Change
Short-term Risks	Short-term risks from dredging would last 0-10 weeks longer than reported in the FS (for a total of 1.2 to 1.26 construction seasons) due to the changed dredge volume in this Addendum. Air emissions are expected to meet requirements for ambient air since areas with high naphthalene concentrations will not be dredged.	Short-term risks would last 2-20 weeks longer than reported in the FS (for a total of 2.8 to 3.3 construction seasons) with a single dredge due to the larger dredge volume in this Addendum.
Total Cost	$43.8-48.2 million (Formerly $31.9-33.5)	$94.9-110.7 million (Formerly $93.9 Million)
Other Considerations		
Property (Land and Water) Uses	Maritime use of Slip 6 would be precluded by converting it to a wetland. Capping in Slip 7 would eliminate the potential use of Slip 7 for ships, but would allow barges or a marina. Present and future owners of the slip have indicated such use changes would be acceptable. Contact with the Port Authority also indicated preliminary acceptance of this approach.	No Change

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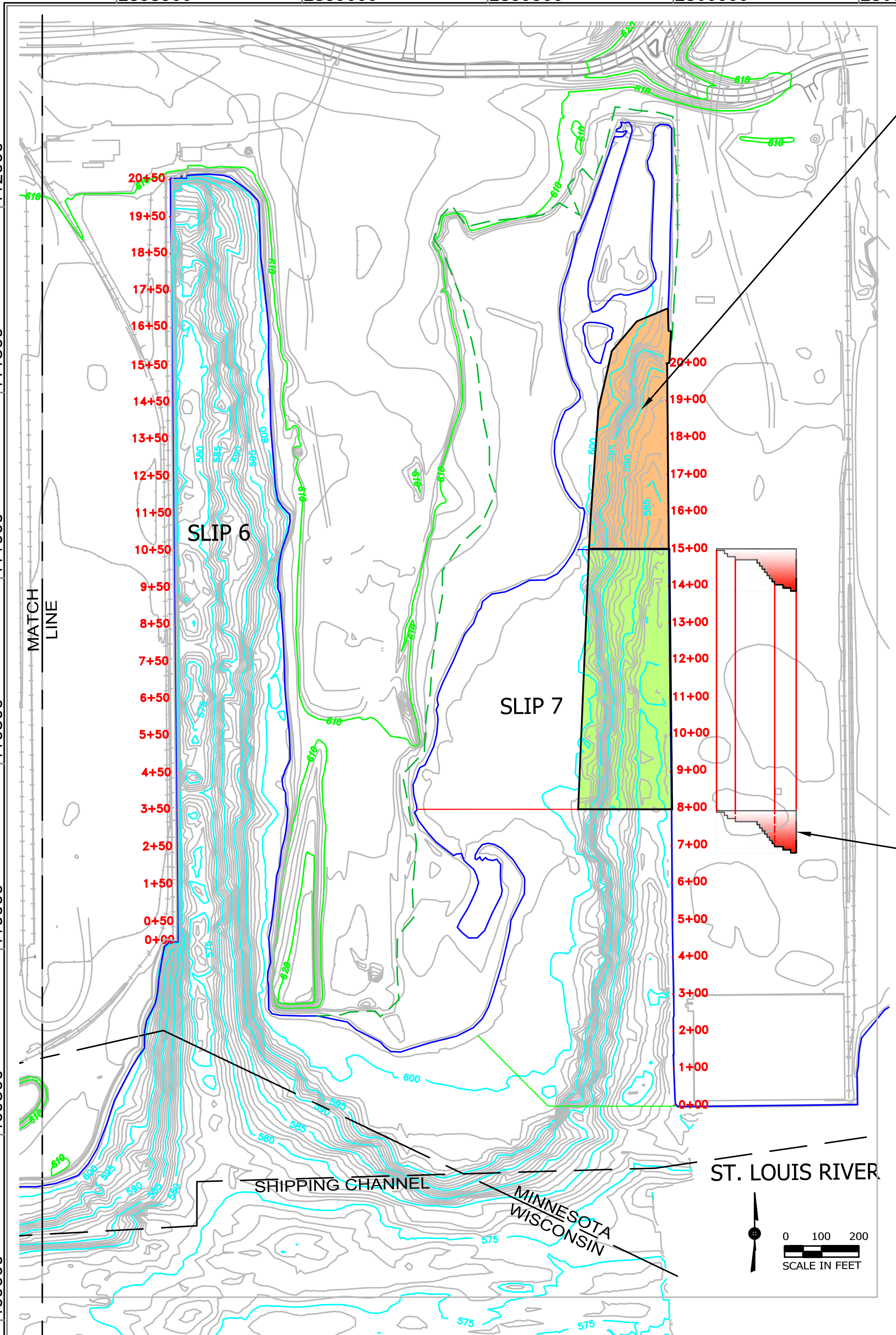
i MERLA (Minn. Stat. 115B.17, Subd. 2a) requires that in determining the appropriate cleanup standards to be achieved by a response action, the MPCA must consider the planned use of the property.

ii The RFRA for this Site indicates that to be permanent a remedy must provide absolute long-term effectiveness. The MPCA considers a remedy permanent when it allows for unrestricted use of all land and natural resources impacted by the contaminants and, except for the purpose of treatment, does not involve removal of the contaminants to another site and minimizes exchange of the contaminants to other environmental media.

Table 4-2
Cost Summary for Alternatives Affected by Changes

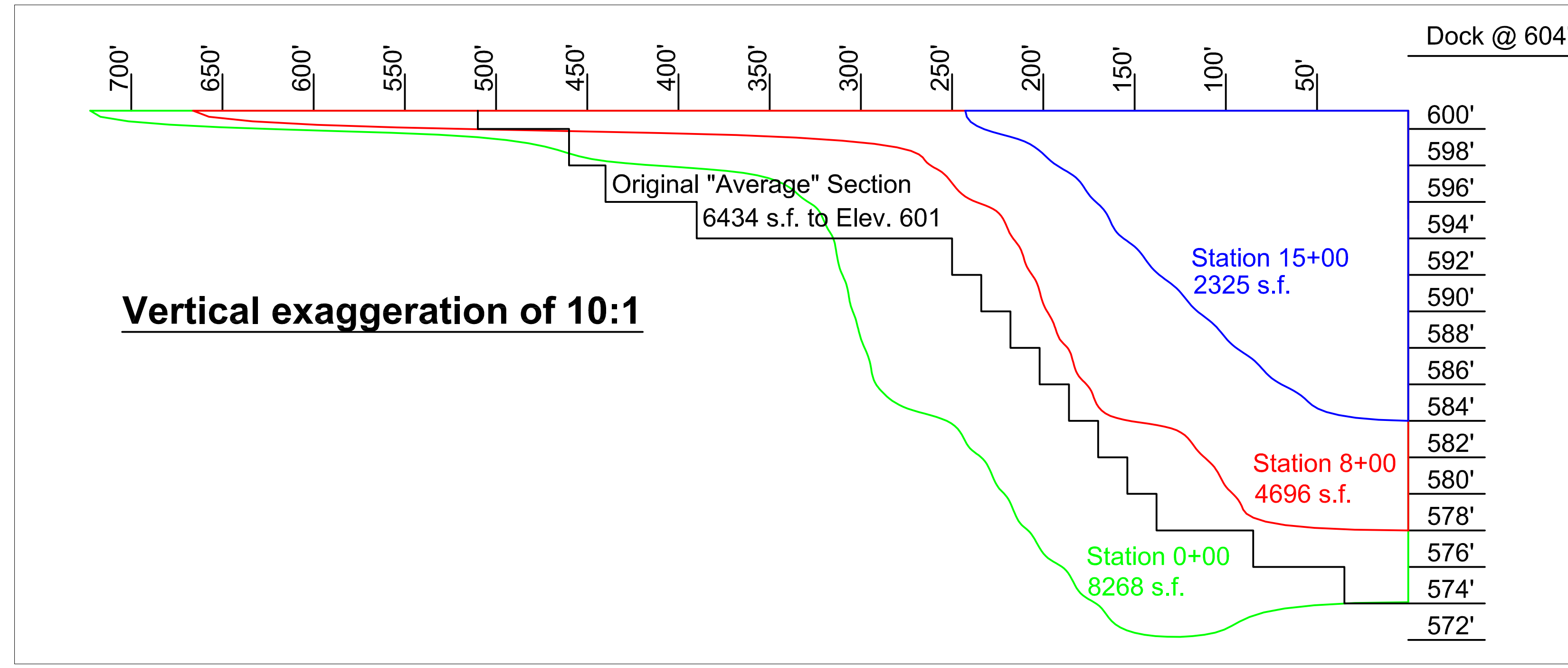
SERVICE ENGINEERING GROUP

	Dredge/Cap Hybrid Minimum	Dredge/Cap Hybrid Maximum	Dredge/Off-Site Disposal Minimum	Dredge/Off-Site Disposal Maximum
MISCELLANEOUS	$1,713,951	$1,874,811	$2,512,415	$2,851,000
DREDGING	$4,257,064	$5,596,871	$12,223,091	$14,718,034
CONTAINMENT	$1,414,629	$1,414,629	$636,600	$636,600
TRANSPORTATION AND DISPOSAL	0	$0	$17,758,628	$21,570,808
TREATMENT	$2,183,207	$2,457,882	$18,214,952	$21,526,307
CAPPING	$9,262,205	$9,262,205	$6,333,577	$6,333,577
WETLAND CONSTRUCTION	$553,110	$553,110	$925,307	$925,307
CONTINGENCY (30%)	$5,815,250	$6,347,853	$17,581,371	$20,568,490
TOTAL CONTRACTOR COST	$25,199,416	$27,507,361	$76,185,940	$89,130,123
PROPERTY ACQUISITION	$12,000,000	$12,000,000	$1,400,000	$1,400,000
PERMITTING and EAW	$250,000	$250,000	$250,000	$250,000
DESIGN & OVERSIGHT (22%)	$5,543,872	$6,051,619	$16,760,907	$19,608,627
TOTAL CAPITAL COST	$42,993,288	$45,808,980	$94,596,847	$110,388,750
LONG TERM MONITORING & MAINTENACE (Present Value)	$936,871	$936,871	$328,992	$328,992
TOTAL REMEDIATION COST (Million)	**$43.9**	**$46.7**	**$94.9**	**$110.7**
PUBLIC WATERS MITIGATION RANGE (Million)	$0.04-1.6	$0.04-1.6	$0	$0
TOTAL PROJECT COST (Million)	**$43.8-45.4**	**$46.6-48.2**	**$94.9**	**$110.7**



Fixed Capacity down to Station 15+00

Original Average Section moved North & South, creating a prizm volume matched to the estimated Storage needs.



The Original "Average" Section was used to project the volume between stations 15+00 and 8+00. The "Average" section, being too deep and too wide, was not average. This caused an overestimate of the available capacity of a CAD ending at Station 8+00.

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DATE	021104
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DATE	021104
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x	.

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FS ADDENDUM - SLRIDT SITE
DULUTH, MINNESOTA

99006

CURRENT DATE: Mar. 12, 2004 | CAD FILE NAME: MC04-Previous On-Site Storage

Figure 2-1
Previous On-Site Storage Volume Estimating Technique

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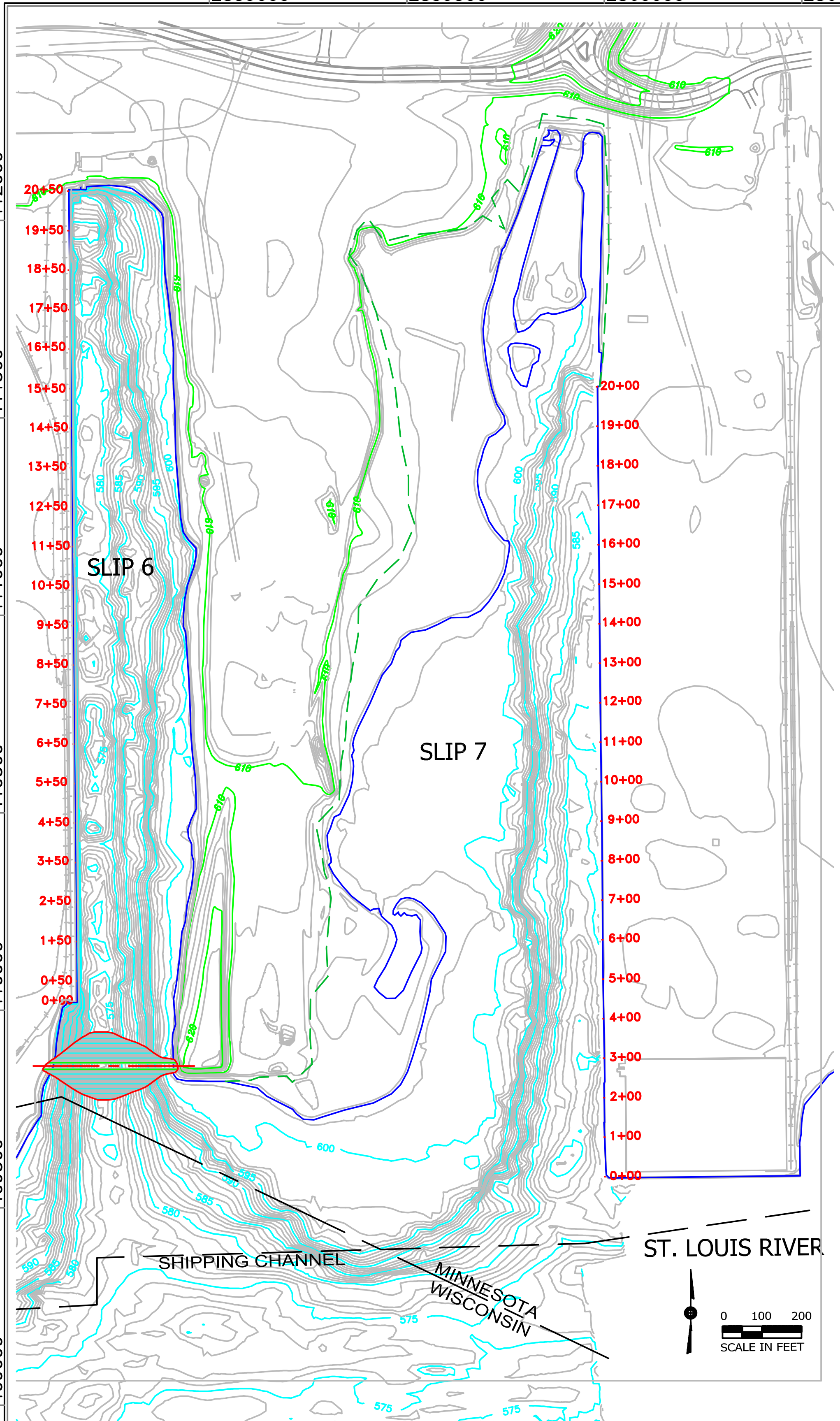

Depth/Volume Analysis of Slip 6 CAD

Station -1-65 (165 feet south of south end of dock wall)

Depth	Elevation	Area	Avg. End Area	Cumulative Volume		
						* In Situ Equivalent Capacity Cu Yd
Ft	Ft	Sq. Ft	Sq. Ft	Cu Ft	Cu Yd	
	573	1,927				
27.8	574	7,892	4,910	4,910	182	152
26.8	575	18,246	13,069	17,979	666	555
25.8	576	34,460	26,353	44,332	1,642	1,368
24.8	577	54,097	44,279	88,610	3,282	2,735
23.8	578	77,209	65,653	154,263	5,713	4,761
22.8	579	112,320	94,765	249,028	9,223	7,686
21.8	580	149,183	130,752	379,779	14,066	11,722
20.8	581	173,033	161,108	540,887	20,033	16,694
19.8	582	192,863	182,948	723,835	26,809	22,341
18.8	583	210,873	201,868	925,703	34,285	28,571
17.8	584	228,875	219,874	1,145,577	42,429	35,357
16.8	585	247,445	238,160	1,383,737	51,250	42,708
15.8	586	266,696	257,071	1,640,808	60,771	50,642
14.8	587	296,257	281,477	1,922,284	71,196	59,330
13.8	588	317,548	306,903	2,229,187	82,562	68,802
12.8	589	334,844	326,196	2,555,383	94,644	78,870
11.8	590	350,016	342,430	2,897,813	107,326	89,439
10.8	591	364,528	357,272	3,255,085	120,559	100,466
9.8	592	378,764	371,646	3,626,731	134,323	111,936
8.8	593	393,279	386,022	4,012,752	148,620	123,850
7.8	594	408,483	400,881	4,413,633	163,468	136,223
6.8	595	424,687	416,585	4,830,218	178,897	149,081
5.8	596	442,937	433,812	5,264,030	194,964	162,470
4.8	597	464,094	453,516	5,717,546	211,761	176,467
3.8	598	488,549	476,322	6,193,867	229,402	191,169
2.8	599	516,756	502,653	6,696,520	248,019	206,683
1.8	600	553,386	535,071	7,231,591	267,837	223,197

Volume is the volume of water stored behind an end dike with 2.5:1 slopes located at Station -1-65 assuming normal water level of 601.8 using the average end area method of calculating volumes.

Areas measured in AutoCad based on most recent bathymetry. Acres @ 601 13.7772268

Bulking estimated to be by a factor of: 1.2

* In situ equivalent capacity for storage is reduced by the bulking factor.

Detail of Contours used for Volume Calculation

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FS ADDENDUM - SLRIDT SITE
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CURRENT DATE: Mar. 12, 2004 | CAD FILE NAME: MC05-Current On-Site Storage

Figure 2-2
Current On-Site Storage Volume Estimating Technique

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Figure 2-3
Summary of Slip 6 CAD On-Site Storage Capacity
SLRIDT Site, Duluth, MN

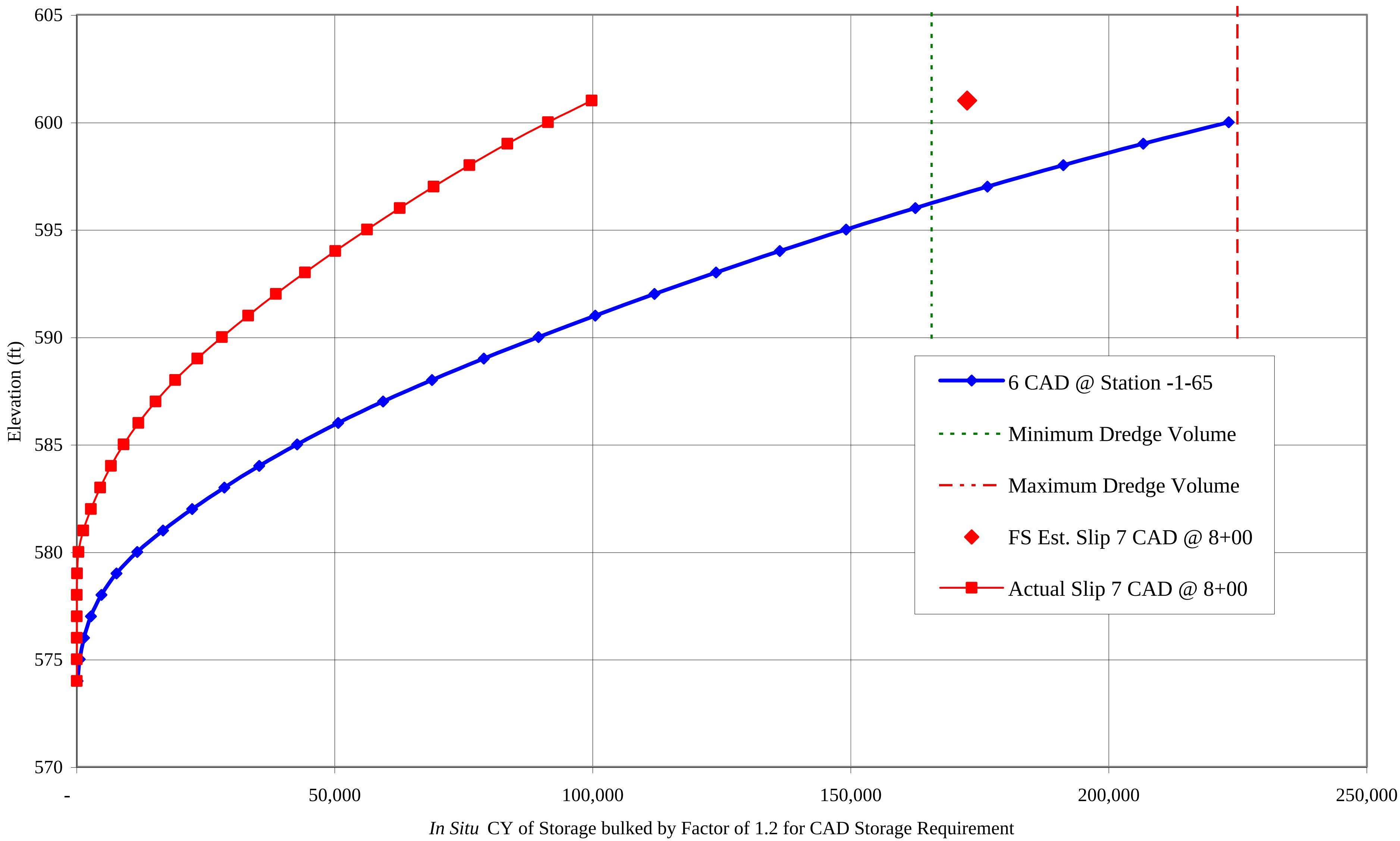

Figure 2-3 with Full length 6 CAD.xls

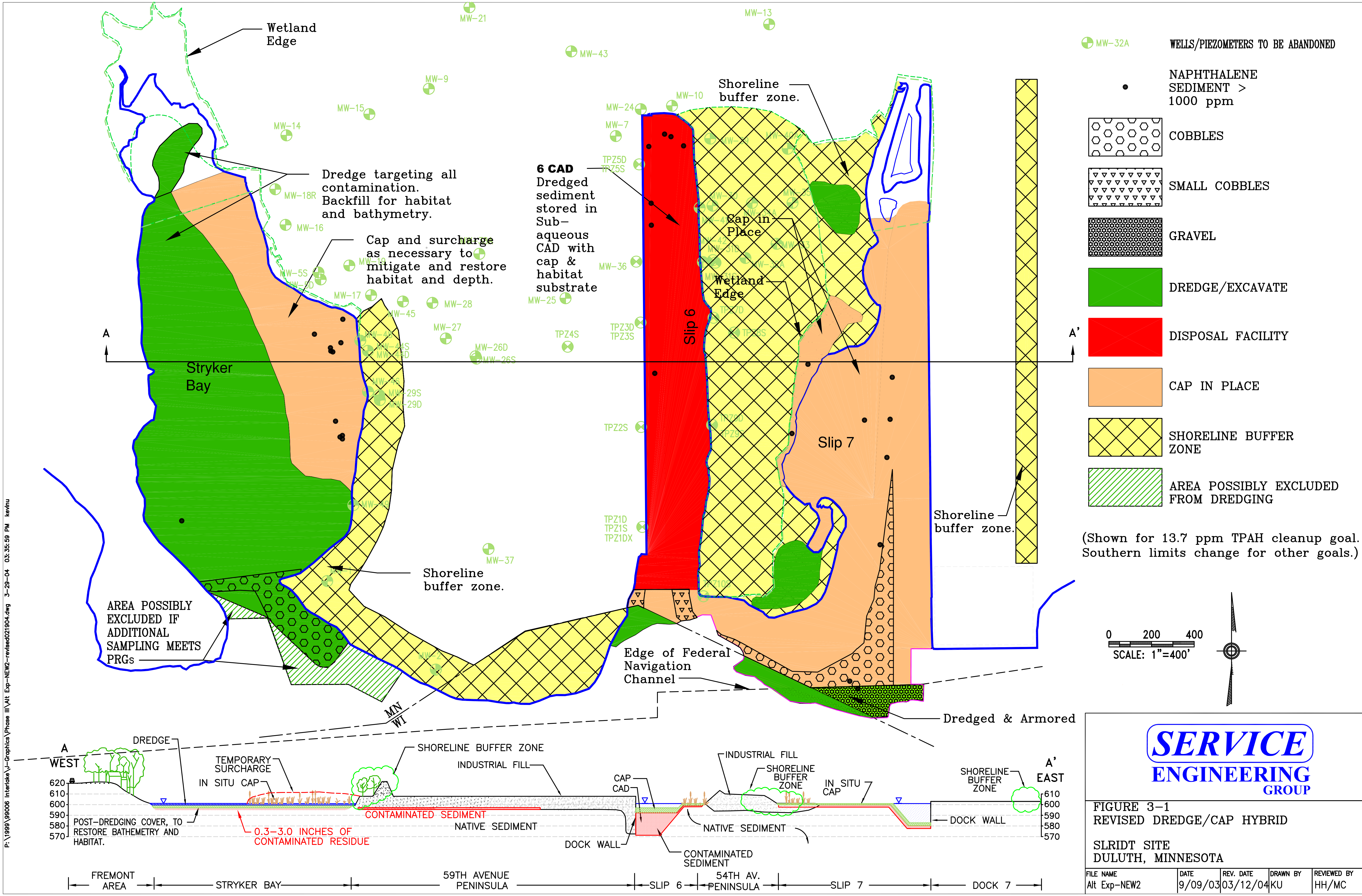

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FIGURE 3–1
REVISED DREDGE/CAP HYBRID

SLRIDT SITE
DULUTH, MINNESOTA

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Alt Exp–NEW2	9/09/03	03/12/04	KU	HH/MC

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FIGURE 3-2
DREDGE/OFF-SITE DISPOSAL

SLRIDT SITE
DULUTH, MINNESOTA

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