

MEMORANDUM FOR: RECORD

July 9, 2015

SUBJECT: DETERMINATION REGARDING THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM GEORGIA-PACIFIC GYPSUM, EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT, FOR UNCONFINED OPEN-WATER DISPOSAL AT THE COMMENCEMENT BAY NONDISPERSIVE SITE.

1. **Introduction.** This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington Departments of Ecology and Natural Resources, and the Environmental Protection Agency) regarding the suitability of 25,450 cubic yards (cy) of dredged material from the Georgia-Pacific Gypsum marine terminal on the Blair Waterway in Tacoma, Washington for disposal at the Commencement Bay nondispersive open-water site.

2. **Background.** Georgia-Pacific Gypsum LLC (GPG) is proposing berth deepening to support continued use of their facility on the Blair Waterway in Commencement Bay (Figure 1). Currently, GPG receives rock shipments of gypsum by a Trillium Class bulk carrier laden with up to 27,000 metric tons of material. In order to optimize vessel capacity and the offloading capability at the terminal, GPG is considering receiving the same class vessel with 54,000 metric tons of material. The Trillium class vessel laden with 54,000 metric tons of material will require a berth depth of -45 ft MLLW. Dredging would entail removing approximately 25,450 cy of material to safely accommodate the increased vessel draft (Grette, 2014).

The existing berthing facility was constructed in 1980. The depth of the berth at the time of construction was -35 feet MLLW. There is no record of dredging activities occurring on-site after the creation of the berth. No known chemical or biological sediment sampling has been conducted within the boundaries of the project site (Grette, 2014).

3. **Project Summary.** Table 1 includes project summary and tracking information.

Table 1. Project Summary

Project ranking	Moderate
Proposed dredging volume	25,450 cubic yards
Proposed dredging depth	-45.5 feet MLLW including a 1/2-foot overdredge allowance
1 st draft SAP received	September 8, 2014
Comments provided by DMMP agencies	September 24, 2014
2 nd draft SAP received	November 17, 2014
Comments provided by DMMP agencies	December 3, 2014
Final SAP received	December 15, 2014
SAP approved	December 16, 2014

Sampling date	January 29, 2015
1 st draft data report received	May 20, 2015
Comments provided by DMMP agencies	June 3, 2015
2 nd draft data report received	June 16, 2015
Comments provided by DMMP agencies	June 17, 2015
Final data report received	June 22, 2015
DMMO tracking number	GPGYP-1-A-F-365
EIM study ID	GPGYP15
USACE Permit Application Number	NWS-2015-634-WRD
Recency Determination (moderate rank = 5 years)	January 2020

4. **Project Ranking and Sampling Requirements.** Ranking for dredging projects on the Blair Waterway are determined by the DMMP agencies on a site-specific basis. There were no prior sediment characterization data available for the GPG facility to inform this ranking. Therefore, the DMMP agencies reviewed the ranking for other dredging projects on the Blair and determined that a 'moderate' rank was applicable to GPG. For a moderate-ranked project with heterogeneous sediment, the number of samples and analyses are calculated using the following guidelines (DMMP, 2014):

- Maximum volume of sediment represented by each field sample = 8,000 cubic yards
- Maximum volume of sediment represented by each analysis in the upper 4-feet of the dredging prism (surface sediment) = 16,000 cubic yards
- Maximum volume of sediment represented by each analysis in the subsurface portion of the dredging prism = 24,000 cubic yards

The total project volume at the time the sampling and analysis plan (SAP) was submitted was 28,710 cubic yards, including a one-foot overdredge allowance to -45 feet MLLW. The project was divided into two dredged material management units (DMMUs), one surface and one subsurface. Surface DMMU 1 included 14,330 cy of material; subsurface DMMU 2 consisted of 14,380 cy. In order to get a good spatial representation of the DMMUs, eight sampling locations were included in the SAP. Figure 2 shows the DMMUs and target sampling locations. Figure 3 includes cross-sectional views of the dredge prism.

5. **Sampling.** Sampling took place January 29, 2015 using a vibracore sampler. Table 2 includes the coordinates of the sampling stations. The target penetration depth was -47 feet MLLW, which included the dredge prism and overdepth (-45 ft MLLW) and 2-foot z-samples (-45 to -47 ft MLLW). The target recovery was 75%.

Table 3 provides the penetration and recovery data. Full penetration was achieved at all coring locations with the exception of station 5, where penetration reached nearly to the lower limit of the dredge prism, but did not extend into the z-layer. Recovery exceeded 75% in all cases, ranging from 79.3% to 99.2%.

The compositing scheme is shown in Table 4. Surface material (0-4 feet) from each station was

composited to represent DMMU 1. Subsurface material (>4 feet) from each station was composited to represent DMMU 2. The lengths of the core sections included in the composites were not corrected for recovery. Because recovery rates were good, the DMMP agencies accepted the uncorrected core lengths as being representative of the DMMUs.

The SAP indicated that 2-foot z-samples would be collected from -45 to -47 feet. Instead, the field crew collected and archived z-sample material from the entire recovered core length deeper than -45 feet. The lengths and depths of the collected z-samples are shown in Table 4. This deviation from the SAP was inconsequential, as analysis of the z-samples was not required.

- Sediment Conventional, Grain-Size and Chemical Analysis.** The sediment conventional and grain-size results can be found in Tables 5 and 6 respectively. The grain-size data show that the proposed dredged material is silty sand, with a higher fines (silt and clay) content in DMMU 1 than in DMMU 2. The fines fractions totaled 45.6% and 25.2% respectively.

The total organic carbon content was relatively low, equaling 1.1% and 0.65% in DMMUs 1 and 2 respectively. Ammonia and sulfides concentrations were also low.

The chemical analysis results and DMMP marine guidelines are found in Table 7. DMMU 1 had DMMP screening level (SL) exceedances for hexachlorobutadiene and dioxins/furans, the latter having the greater significance. DMMU 2 had no SL exceedances.

The dioxin/furan toxic equivalent (TEQ) calculations are found in Table 8. DMMU 1 had a TEQ of 110 ng/kg, while the TEQ for DMMU 2 was only 1.27 ng/kg (with non-detects included at half the estimated detection limit). The high dioxin/furan concentration in DMMU 1 was unexpected and is the highest concentration encountered on any DMMP project on the Blair Waterway (in contrast, high dioxin concentrations are widespread in the adjacent Hylebos Waterway). Because it was unexpected, GPG sent additional samples from the DMMU 1 composite to Analytical Resources (the original lab) and Frontier Analytical Laboratory for confirmatory testing. The secondary analyses confirmed the original results, with ARI and Frontier reporting concentrations of 108 ng/kg and 68 ng/kg respectively.

Data from the original dioxin/furan analysis were subjected to EPA Stage 4 validation by EcoChem. The SAP called for analysis of a duplicate sample, as well as the Puget Sound Sediment Reference Material (PS-SRM). However, these two quality assurance samples were not included in the original analysis. Due to the absence of a duplicate, laboratory precision could not be measured. Although the PS-SRM was not analyzed, EcoChem determined that accuracy was acceptable, as demonstrated by the labeled compounds and ongoing precision and recovery samples. Table 8 includes both lab and validation qualifiers.

- Biological Testing.** The dioxin/furan concentration of 110 ng/kg TEQ in DMMU 1 exceeded the DMMP bioaccumulation trigger (BT) of 10 ng/kg TEQ. Due to the low probability of DMMU 1 passing a bioaccumulation test, GPG decided not to do any further testing of this DMMU and accepted that it was unsuitable for open-water disposal.

DMMU 2 did not have any SL or BT exceedances. Therefore, bioassays and bioaccumulation testing were not required for this DMMU.

8. **Sediment Exposed by Dredging.** Sediment exposed by dredging must either meet the State of Washington Sediment Quality Standards (SQS) (Ecology, 2013) or the State's antidegradation standard (DMMP, 2008). In the case of GPG, the subsurface material in DMMU 2 was clearly less contaminated than the surface material in DMMU 1, indicating that contamination decreases with depth. Further, the core logs indicated that native material was encountered at elevations ranging from -35.5 to -44.1 ft. Dredging to -45 feet or deeper will remove all non-native material in the berthing area, leaving uncontaminated native material as the new sediment surface. Therefore, this project is in compliance with the State of Washington anti-degradation standard.
9. **Suitability Determination.** As indicated previously, a dioxin/furan concentration of 110 ng/kg TEQ makes DMMU 1 unsuitable for open-water disposal. DMMU 2, with no SL exceedances, is suitable for open-water disposal.

In order to adequately separate the unsuitable surface material from the suitable subsurface material during dredging, the DMMP agencies are requiring a one-foot vertical buffer be added to DMMU 1. This means that the surface five feet (not including overdepth), must be dredged and hauled to an upland disposal site. Once the surface material has been removed, the remaining sediment may be dredged and placed at the Commencement Bay open-water disposal site.

GPG has submitted a preliminary dredge design (Figures 4 to 10) that includes the one-foot buffer. The dredge prism also includes other changes from what was presented in the SAP. In order to minimize potential impacts to Graymont Incorporated's dock to the northwest, the northern extent of the dredge prism was reduced. In addition, the overall dredge depth was changed to -45.5 ft from the depth of -45.0 ft included in the SAP. The design depth is now -45.0 ft plus a 0.5 ft overdredge allowance.

The modifications made to the dredge plan resulted in an overall reduction in the total volume from 28,710 cy to 25,450 cy. Due to the addition of the one-foot buffer, the volume of DMMU 1 increased from 14,330 to 16,900 cy. The subsurface volume included in DMMU 2 shrank to 8,550 cy.

In summary, based on the results of the previously described testing, the DMMP agencies concluded that the **16,900 cubic yards of dredged material in DMMU 1 are unsuitable for open-water disposal, while the 8,550 cy in DMMU 2 are suitable for open-water disposal at the Commencement Bay non-dispersive site.**

A pre-dredge meeting with DNR, Ecology, EPA and the Corps of Engineers is required at least 7 days prior to dredging. A dredging and disposal quality control plan must be developed and submitted to the Regulatory Branch of the Seattle District Corps of Engineers at least 7 days prior to the pre-dredge meeting. The quality control plan must clearly show how the unsuitable material will be dredged separately from the suitable material. Dredging, positioning, de-watering, transloading and disposal will all need to be addressed with enough detail to provide assurance to the agencies that the dredge plan will be properly implemented. The unsuitable material must be completely dredged and removed before the suitable material may be dredged and taken to the Commencement Bay site. A bathymetric survey will be required after the unsuitable material has been dredged to verify that it has been completely removed.

A DNR site-use authorization must be acquired for open-water disposal. Disposal at the Commencement Bay site must be by bottom-dump barge.

This suitability determination does not constitute final agency approval of the project. During the public comment period that follows a public notice, the resource agencies will provide input on the overall project. A final decision will be made after full consideration of agency input, and after an alternatives analysis is done under section 404(b)(1) of the Clean Water Act.

10. References.

DMMP, 2008. *Quality of Post-Dredge Sediment Surfaces (Updated)*. A Clarification Paper Prepared by David Fox (USACE), Erika Hoffman (EPA) and Tom Gries (Ecology) for the Dredged Material Management Program, June 2008.

DMMP, 2014. *Dredged Material Evaluation and Disposal Procedures (User Manual)*. Prepared by the Seattle District Dredged Material Management Office for the Dredged Material Management Program, December 2014.

Ecology, 2013. *Sediment Management Standards – Chapter 173-204 WAC*. Washington State Department of Ecology, February 2013.

Grette, 2014. *Georgia-Pacific Tacoma Marine Terminal Dredge – Sampling and Analysis Plan*. Prepared by Grette Associates for Georgia-Pacific Gypsum, Tacoma, WA. December, 2014.

Grette, 2015. *Georgia-Pacific Tacoma Marine Terminal Dredge – Sampling and Analysis Report*. Prepared by Grette Associates for Georgia-Pacific Gypsum, Tacoma, WA. July, 2015.

11. Agency Signatures.

signed copy on file in DMMO - Seattle District office

Concur:

Date David Fox - Seattle District Corps of Engineers

Date Justine Barton - Environmental Protection Agency

Date Laura Inouye, Ph.D. - Washington Department of Ecology

Date Celia Barton - Washington Department of Natural Resources

Copies furnished:

- DMMP signatories
- Olivia Romano – Seattle District Regulatory
- Matthew Boyle – Grette Associates
- Debby Bennett – Georgia-Pacific Gypsum
- Tony Warfield – Port of Tacoma

Table 2: Sample Coordinates – SAP and Field Sample locations

Sample Station	SAP Sample Location				Field Sample Location				Is sample location within 3 meters of approved SAP location?	SAP and Field Location Difference (Meters)
	Latitude	Longitude	State Plane Coordinates		Latitude	Longitude	State Plane Coordinates			
			Northing	Easting			Northing	Easting		
1	47.2693319	-122.3972288	711682	1169443	47.269325	-122.397255	711680	1169436	Yes	2.22
2	47.2691106	-122.3970114	711600	1169495	47.269103	-122.397023	711597	1169492	Yes	1.29
3	47.2690471	-122.396699	711575	1169572	47.269054	-122.396723	711577	1169566	Yes	1.93
4	47.2687935	-122.396275	711480	1169675	47.268801	-122.396292	711483	1169671	Yes	1.52
5	47.2685759	-122.3961666	711400	1169700	47.268572	-122.396126	711398	1169710	No	3.11
6	47.2684996	-122.3958013	711370	1169790	47.268497	-122.395801	711369	1169790	Yes	0.30
7	47.2681884	-122.3955486	711255	1169850	47.268183	-122.39558	711253	1169842	Yes	2.51
8	47.268085	-122.3951621	711215	1169945	47.268081	-122.39515	711214	1169948	Yes	0.96

Table 3: Field Sample Penetration Depth and Recovery Data

	1¹	2	3	4	5	6	7	8
Sample Collection Time	1329	1137	1208	1358	0951	1059	1500	1427
Tidal Stage	+ 10.20 ft MLLW	+ 11.00 ft MLLW	+ 11.10 ft MLLW	+ 09.50 ft MLLW	+ 09.60 ft MLLW	+10.70 ft MLLW	+ 07.60 ft MLLW	+ 08.70 ft MLLW
Measured Water Depth at Sample Location	49.4 ft	51.6 ft	47.1 ft	44.7 ft	43.3 ft	45.0 ft	45.7 ft	43.7 ft
SAP Identified Mudline Elevation	- 33.00 ft MLLW	- 40.15 ft MLLW	- 34.30 ft MLLW	- 34.89 ft MLLW	- 37.32 ft MLLW	- 34.66 ft MLLW	-37.77 ft MLLW	-34.59 ft MLLW
Tide Corrected Mudline Elevation	- 39.20 ft MLLW	- 40.60 ft MLLW	- 36.00 ft MLLW	- 35.20 ft MLLW	- 33.70 ft MLLW	- 34.30 ft MLLW	- 38.10 ft MLLW	- 35.00 ft MLLW
SAP Identified Sample Length	14.0 ft	6.85 ft	12.70 ft	12.11 ft	9.68 ft	12.34 ft	9.23 ft	12.41 ft
Contact Depth to Native Material (based on sample material transition, Refer to data sheets)	-40.2 ft MLLW	-44.1 ft MLLW	-37.5 ft MLLW	-38.2 ft MLLW	-33.7 ft MLLW	-36.3 ft MLLW	-40.1 ft MLLW	-35.5 ft MLLW
Depth from Tide Correct Mudline to Native Material	1 ft	3.5 ft	1.5 ft	3 ft	0 ft	2 ft	2 ft	0.5 ft
Field Sample Length Penetration	15.0 ft	14.0 ft	14.0 ft	14.0 ft	14.0 ft	14.0 ft	14.0 ft	14.0 ft
Length of Sediment in Tube	14.1 ft	11.9 ft	13.8 ft	13.9 ft	11.1 ft	12.9 ft	11.1 ft	12.9 ft
Calculated Percent Recovery²	94.0%	85.0%	98.6%	99.2%	79.3%	92.1%	79.3%	92.1%

- 1- Sample 1 was moved from the approved SAP location on January 28, 2015. The movement was necessary because a suitable length of core tube could not be sourced for the originally proposed sample depth. This was approved by the DMMO.
- 2- The calculated percent recovery value is based on each sample's length of sediment in the tube divided by the penetration. Core penetration exceeded the lower extent of the planned z-layer (-47 feet) at all sampling locations, with the exception of station 5. The field crew assumed that the unrecovered portion of the cores came at the deepest extent of penetration (i.e. the vibrocore was pile-driving near the bottom of the core) and not from the targeted DMMU depth intervals. Therefore, core recovery during penetration of the DMMUs was considered to be 100%. The samples were used based on SAP measurements without recovery correction.

Table 4: Compositing Scheme

	1	2	3	4	5	6	7	8
Length of Sediment in Sample Tube	14.1 ft	11.9 ft	13.8 ft	13.9 ft	11.1 ft	12.9 ft	11.1 ft	12.9 ft
Tide Corrected Mudline Elevation	- 39.20 ft MLLW	- 40.60 ft MLLW	- 36.00 ft MLLW	- 35.20 ft MLLW	- 33.70 ft MLLW	- 34.30 ft MLLW	- 38.10 ft MLLW	- 35.00 ft MLLW
Sample Depth Elevation (based on tide corrected mudline elevation and sample length)	-53.3 ft MLLW	-52.50 ft MLLW	-49.80 ft MLLW	-49.10 ft MLLW	-44.80 ft MLLW	-47.20 ft MLLW	-49.20 ft MLLW	-47.90 ft MLLW
DMMU1 (surface to 4' depth)	-39.20 to -43.20 ft MLLW	-40.60 to - 44.60 ft MLLW	-36.00 to -40.00 ft MLLW	-35.20 to - 39.20 ft MLLW	-33.70 to - 37.70 ft MLLW	-34.30 to -38.30 ft MLLW	-38.10 to - 42.10 ft MLLW	-35.00 to - 39.00 ft MLLW
DMMU1 Core sample length	4.00 ft	4.00 ft	4.00 ft	4.00 ft	4.00 ft	4.00 ft	4.00 ft	4.00 ft
DMMU2 (sub-surface; 4 ft depth below sample surface to start of z-layer – 45' MLLW)	-43.20 to -45.00 ft MLLW	-44.60 to - 45.00 ft MLLW	-40.00 to -45.00 ft MLLW	-39.20 to - 45.00 ft MLLW	-37.70 to - 44.80 ft MLLW	-38.30 to -45.00 ft MLLW	-42.10 to - 45.00 ft MLLW	-39.00 to - 45.00 ft MLLW
DMMU2 Layer core sample length	1.80 ft	0.4 ft	5.00 ft	5.80 ft	7.10 ft	6.70 ft	2.90 ft	6.00 ft
Z-Layer	-45.00 to -53.3 ft MLLW	-45.00 to - 52.50 ft MLLW	-45.00 to -49.80 ft MLLW	-45.00 to - 49.10 ft MLLW	--	-45.00 to -47.20 ft MLLW	-45.00 to - 49.20 ft MLLW	-45.00 to - 47.90 ft MLLW
Z-layer core sample length ¹	8.30 ft	7.50 ft	4.80 ft	4.10 ft	--	2.20 ft	4.20 ft	2.90 ft

¹ The SAP indicated that 2-foot z-samples would be collected from -45 to -47 feet. Instead, the field crew collected and archived z-samples materials from the entire recovered core length assigned to the z-layer. As such the z-layer sample materials included sediment obtained from depths deeper than -45 feet, which exceeded the 2-foot length required by DMMP and planned for in the SAP.

Table 5: Conventional Analysis Results

Conventional	Method	DMMU 1		DMMU 2	
		Analytical Reporting Limit	Sample	Analytical Reporting Limit	Sample
Total Solids (percent)	SM2540G	0.01	46.32	0.01	35.46
Preserved Total Solids (percent)	SM2540G	0.01	51.45	0.01	78.56
Total Volatile Solids (percent)	SM2540G	0.01	26.70	0.01	26.05
N-Ammonia (mg-N/kg)	EPA350.1M	0.20	11.3	1.38	54.5
Sulfide (mg/kg)	SM4500-S2D	1.94	17.5	1.25	<1.25, U
Total Organic Carbon (percent)	Plumb, 1981	0.020	1.10	0.020	0.650

U – undetected at reporting limit

Table 6: Grain Size Analysis Results

Grain Type	Phi Size	Sieve Size	DMMU1 ¹	DMMU2
			(Percent retained in each size fraction)	
Gravel	< - 1	> #10	2.8	1.9
Very Coarse Sand	- 1 to 0	10 to 19	1.1	0.7
Coarse Sand	0 to 1	18-35	5.9	5.1
Medium Sand	1 to 2	35-60	16.9	22.2
Fine Sand	2 to 3	60-120	17.1	27
Very Fine Sand	3 to 4	120-230	10.7	17.9
Coarse Silt	4 to 5	52.5-31.0	6.7	8.0
Medium Silt	5 to 6	31.0-15.6	9.1	5.9
Fine Silt	6 to 7	15.5-7.8	8.8	3.5
Very Fine Silt	7 to 9	7.8-3.9	6.9	2.4
8-9 Phi Clay	8 to 9	3.9-2.0	4.4	1.6
9-10 Phi Clay	9 to 10	2.0-1.0	2.9	1.0
> 10 Phi Clay	> 10	<1.0	6.8	2.8

¹ Total Percentages may not equal 100% due to rounding.

Table 7: Project COC's, Associated Regulatory Marine Guidelines and Analysis Results

Chemical	DMMP Marine Guidelines			DMMU1		DMMU 2	
	Screening Level	Bioaccumulation Trigger	Maximum Level	LOQ or RL	Analysis Result	LOQ or RL	Analysis Result
Metals (mg/kg dry weight)							
Antimony	150	--	200	7	7, U	6	6, U
Arsenic	57	507.1	700	7	14	6	6, U
Cadmium	5.1	11.3	14	0.3	0.3	0.2	0.2
Chromium	260	260	--	0.7	19.9	0.6	13.8
Copper	390	1,027	1,300	0.3	35.8	0.2	14.5
Lead	450	975	1,200	3	14	2	2, U
Mercury	0.41	1.5	2.3	0.03	0.06	0.02	0.02, U
Nickel	--	--	--	1	12	1	9
Selenium	--	3	--	0.7	0.7, U	0.6	0.6, U
Silver	6.1	6.1	8.4	0.4	0.4, U	0.3	0.3, U
Zinc	410	2,783	3,800	1	47	1	21
PAHs (µg/kg dry weight)							
Napthalene	2,100	--	2,400	20	70	19	28
Acenaphthylene	560	--	1,300	20	26	19	<19, U
Acenaphthene	500	--	2,000	20	19, J	19	<19, U
Fluorene	540	--	3,600	20	24	19	<19, U
Phenanthrene	1,500	--	21,000	20	96	19	50
Anthracene	960	--	13,000	20	41	19	6.7, J
2-Methylnaphthalene	670	--	1,900	20	34	19	16, J
Total LPAH	5,200	--	29,000	--	310, J	--	100.7, J
Fluoranthene	1,700	4,600	30,000	20	110	19	34
Pyrene	2,600	11,980	16,000	20	260	19	39
Benzo(a)anthracene	1,300	--	5,100	20	50	19	12, J

Chemical	DMMP Marine Guidelines			DMMU1		DMMU 2	
	Screening Level	Bioaccumulation Trigger	Maximum Level	LOQ or RL	Analysis Result	LOQ or RL	Analysis Result
Chrysene	1,400	--	21,000	20	82	19	21
Benzofluoranthenes (b, j, k)	3,200	--	9,900	39	220	38	28, J
Benzo(a)pyrene	1,600	--	3,600	20	78	19	14, J
Indeno (1,2,3-c,d)pyrene	600	--	4,400	20	50, Q	19	<19, U
Dibenz(a,h)anthracene	230	--	1,900	4.9	27	4.8	5.1
Benzo(g,h,i)perylene	670	--	3,200	20	55, Q	19	11, Q,J
Total HPAH	12,000	--	69,000	--	932	--	164.1, J
Chlorinated Hydrocarbons (µg/kg dry weight)							
1,4-Dichlorobenzene	110	--	120	4.9	9.3	4.8	<4.8, U
1,2-Dichlorobenzene	35	--	110	4.9	8.9	4.8	<4.8, U
1,2,4-Trichlorobenzene	31	--	64	4.9	9.4	4.8	<4.8, U
Hexachlorobenzene (HCB)	22	168	230	4.9	11	4.8	<4.8, U
Phthalates (µg/kg dry weight)							
Dimethyl phthalate	71	--	1,400	4.9	9.9	4.8	<4.8, U
Diethyl phthalate	200	--	1,200	20	<20, U	19	<19, U
Di-n-butyl phthalate	1,400	--	5,100	20	9.8, J	19	<19, U
Butyl benzyl phthalate	63	--	970	4.9	16	4.8	<4.8, U
Bis(2-ethylhexyl)phthalate	1,300	--	8,300	49	110	48	< 48, U
Di-n-octyl phthalate	6,200	--	6,200	20	<20, U	19	<19, U
Phenols (µg/kg dry weight)							
Phenol	420	--	1,200	20	65	19	11, J
2-Methylphenol	63	--	77	4.9	9.8	4.8	<4.8, U
4-Methylphenol	670	--	3,600	20	33	19	<19, U
2,4-Dimethylphenol	29	--	210	24	22, J	24	<24, U
Pentachlorophenol	400	504	690	20	76	19	<19, U

Chemical	DMMP Marine Guidelines			DMMU1		DMMU 2	
	Screening Level	Bioaccumulation Trigger	Maximum Level	LOQ or RL	Analysis Result	LOQ or RL	Analysis Result
Miscellaneous Extractables (µg/kg dry weight)							
Benzyl alcohol	57	--	870	20	31	19	<19, U
Benzoic Acid	650	--	760	200	240	190	<190, U
Dibenzofuran	540	--	1,700	20	32	19	<19, U
Hexachlorobutadiene	11	--	270	4.9	12, Q	4.8	2.6, Q,J
N-Nitrosodiphenylamine	28	--	130	4.9	< 4.9, U	4.8	<4.8, U
Pesticides & PCBs (µg/kg dry weight)							
4,4'-DDD	16	--	--	0.97	<0.97, U	0.98	<0.98, U
4,4'-DDE	9	--	--	0.97	<0.97, U	0.98	<0.98, U
4,4'-DDT	12	--	--	5.7	< 5.7, Y	0.98	<0.98, U
(sum of 4,4'-DDD; 4,4'-DDE; 4,4'-DDT)	--	50	69	--	< 5.7, Y	--	< 0.98, U
Aldrin	9.5	--	--	0.48	< 0.48, U	0.49	< 0.49, U
Total Chlordane (sum of cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane)	2.8	37	--	--	<4.5, Y	--	< 0.98, U
cis-chlordane	--	--	--	0.48	< 0.48, U	0.49	< 0.49, U
trans-chlordane	--	--	--	1.7	< 1.7, Y	0.49	< 0.49, U
cis-nonachlor	--	--	--	0.97	< 0.97, U	0.98	< 0.98, U
trans-nonachlor	--	--	--	4.0	< 4.0, Y	0.98	< 0.98, U
oxychlordane	--	--	--	4.5	< 4.5, Y	0.98	< 0.98, U
Dieldrin	1.9	--	1,700	0.97	< 0.97, U	0.98	< 0.98, U
Heptachlor	1.5	--	270	0.48	< 0.48, U	0.49	< 0.49, U
Total PCBs (aroclor)	130.0	38	3,100	--	102	--	< 8.9, U
1016	--	--	--	9.2	< 9.2, U	8.9	<8.9, U

Chemical	DMMP Marine Guidelines			DMMU1		DMMU 2	
	Screening Level	Bioaccumulation Trigger	Maximum Level	LOQ or RL	Analysis Result	LOQ or RL	Analysis Result
1221	--	--	--	9.2	< 9.2, U	8.9	<8.9, U
1232	--	--	--	9.2	< 9.2, U	8.9	<8.9, U
1242	--	--	--	9.2	< 9.2, U	8.9	<8.9, U
1248	--	--	--	140	< 140, Y	8.9	<8.9, U
1254	--	--	--	9.2	69	8.9	<8.9, U
1260	--	--	--	9.2	33, P	8.9	<8.9, U
Non-standard COCs required for this project							
Organometallic Compounds							
Tributyltin ion (interstitial water, ug/L)	--	0.15	--	--	--	--	--
Tributyltin ion (bulk, ug/kg)	--	73	--	3.6	13	3.4	<3.4, U
Dioxins/Furans – Refer to Table 7 below for specific TEQ calculations							
Total TEQ (pptr dry weight)(U = 1/2 EDL or EMPC)	4-10	10	--	--	110	--	1.27

Data Reporting Qualifiers Key

Inorganic data

U – Indicates that the target analyte was not detected at the reported concentration.

Organic data

U - Indicates that the target analyte was not detected at the reported concentration.

J – Estimated concentration when the value is less than ARI’s established reporting limit.

Q – Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20%Drift or minimum RRF).

Y – Analyte is not detected at or above the reported concentration. The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a raised reporting limit.

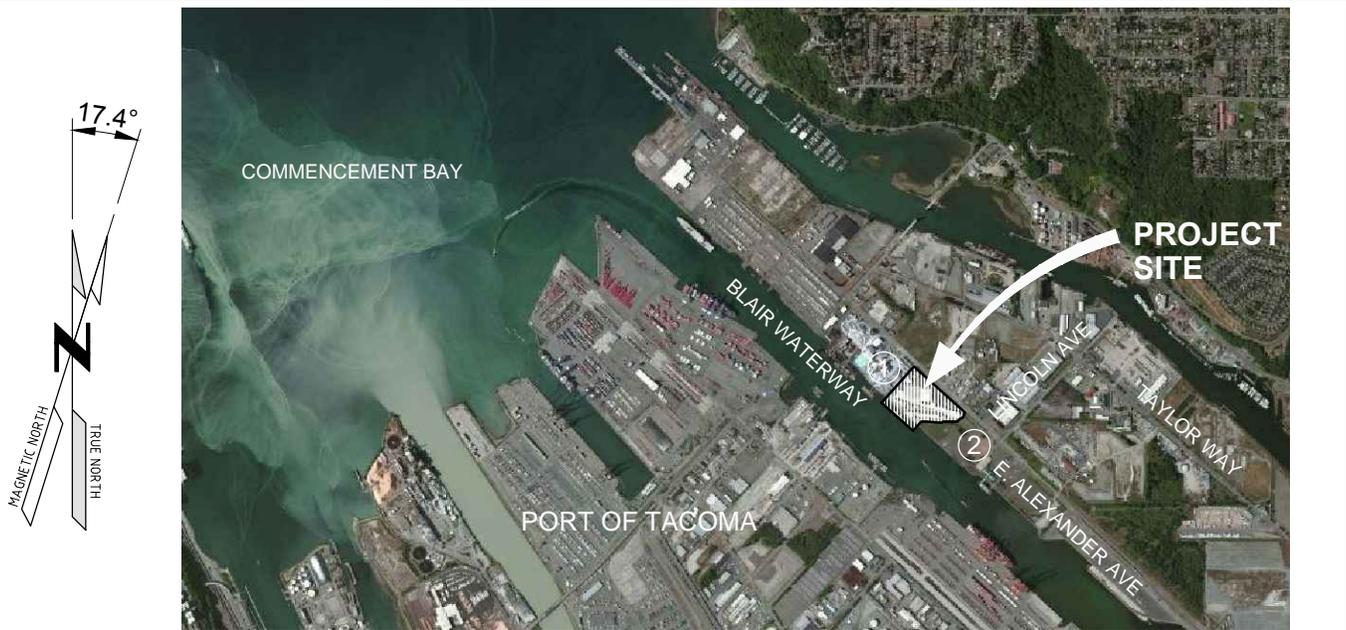
P – The analyte was detected on both chromatograph columns but the quantified values differ by $\geq 40\%$ RPD with no obvious chromatographic interference.

Table 8: Dioxin/Furan TEQ Results

Congeners / Isomers		TEF	DMMU 1	Lab Flag	Validation Qualifier	Validation Reason	TEQ	DMMU 2	Lab Flag	Validation Qualifier	Validation Reason	TEQ
Dioxins	2,3,7,8-TCDD	1	2.42	--	--	--	2.42	0.38	JEMPC	U	Compound Identification	0.19
	1,2,3,7,8-PeCDD	1	15.0	--	--	--	15.0	0.915	JEMPC	U	Compound Identification	0.4575
	1,2,3,4,7,8-HxCDD	0.1	19.2	--	--	--	1.92	0.355	JEMPC	U	Compound Identification	0.01775
	1,2,3,6,7,8-HxCDD	0.1	136	--	--	--	13.6	0.737	JEMPC	U	Compound Identification	0.03685
	1,2,3,7,8,9-HxCDD	0.1	48.4	--	--	--	4.84	0.652	BJEMPC	U	Compound Identification	0.0326
	1,2,3,4,6,7,8-HpCDD	0.01	3040	--	--	--	30.4	8.23	B	U	Lab Blank Contamination	0.04115
	OCDD	0.0003	43,100	E	J	Calibration or Linear Range Exceeded	12.93	97.9	B	--	--	0.02937
Furans	2,3,7,8-TCDF	0.1	10.5	--	--	--	1.05	0.793	J	--	--	0.0793
	1,2,3,7,8-PeCDF	0.03	14.5	X	J	Bias from Matrix Interference	0.435	0.525	JEMPC	U	Compound Identification	0.07875
	2,3,4,7,8-PeCDF	0.3	14.6	--	--	--	4.38	0.690	J	--	--	0.207
	1,2,3,4,7,8-HxCDF	0.1	76.9	--	--	--	7.69	0.468	J	--	--	0.0468
	1,2,3,6,7,8-HxCDF	0.1	25.0	--	--	--	2.50	0.457	J	--	--	0.0457
	2,3,4,6,7,8-HxCDF	0.1	36.5	--	--	--	3.65	0.425	JEMPC	U	Compound Identification	0.02125
	1,2,3,7,8,9-HxCDF	0.1	28.5	--	--	--	2.85	0.306	EJ	--	--	0.0306
	1,2,3,4,6,7,8,-HpCDF	0.01	545	--	--	--	5.45	2.10	--	--	--	0.021
	1,2,3,4,7,8,9-HpCDF	0.01	46.0	--	--	--	0.46	0.329	J	--	--	0.00329
OCDF	0.0003	1560	--	--	--	0.468	5.27	--	--	--	0.001581	
TEQ Summation (ppt dry weight)							110					1.27

TEQs calculated with non-detects included at 1/2 the estimated detection limit and non-detects are included at 1/2 the estimated detection limit.

Figure 1



VICINITY MAP
NOT TO SCALE

PURPOSE: ALLOW VESSEL SERVICE
W/OUT GROUNDING RISK

PROPOSED: DREDGING

REFERENCE #:

COORDINATES:
STATE PLANE (US SURVEY FEET)
N 711676, E 1170211
LATITUDE: 47°16'9.72"N
LONGITUDE: 122°23'38.89"W

LEGAL DESCRIPTION:
S-T-R: S35,T21N,R03W WM
TAX PARCEL # 0321352061
COUNTY: PIERCE
STATE: WA

DATUM: MLLW (MLLW TO NAVD 88;
SUBTRACT 2.67')

IN: BLAIR WATERWAY

APPLICANT:
PORT OF TACOMA FOR
GEORGIA-PACIFIC GYPSUM LLC
1240 E. ALEXANDER AVE
TACOMA, WA 98421

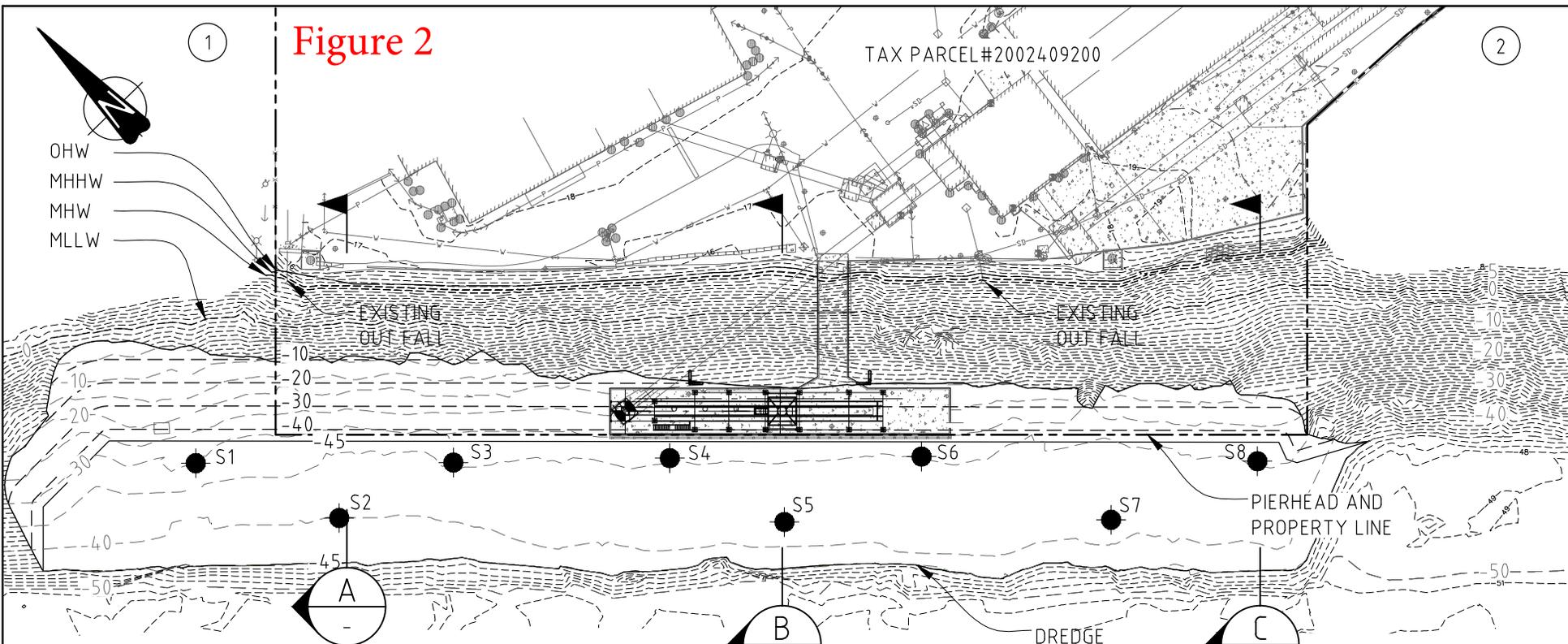
- ADJACENT PROPERTY OWNERS:
- ① GRAYMONT
 - ② PUYALLUP TRIBE OF INDIANS

NOTE: OHW = 13'±
MHHW = 11.84'
MHW = 10.96'
MLLW = 0.00'

								A SHEET	SCALE SHOWN
								Oneway to zero harm	
A	12-DEC-14	ISSUED FOR REVIEW	RM	TWF	BCT	TWF	TWF	-	WORLEYPARSONS PROJ No.
REV	DATE	REVISION DESCRIPTION	DRN	CHKD	DES	ENG CHK	APPRD	CUST	308106-00030
ENGINEERING AND PERMIT STAMPS			CUSTOMER			 GEORGIA-PACIFIC TACOMA MARINE TERMINAL DREDGE COVER SHEET & VICINITY MAP			
PRELIMINARY DO NOT USE FOR CONSTRUCTION Last Saved: Dec. 12/14 2:32pm						DRG No		REV	
						00030-EN-DAL-8100		1 OF 1 A	
"This drawing is prepared for the use of the contractual customer of WorleyParsons Group and WorleyParsons Group assumes no liability to any other party for any representations contained in this drawing."									

LOC: U:\PDX\2013\00030_GP_ESA\11_DRAWINGS\10_STRUCT\PERMIT\DRAWING PACKAGE 2 - DREDGE\00030-00-EN-DAL-8100.DWG
 SAVE DATE & TIME: 12/12/2014 2:32:07 PM USER NAME: robert.muller

Figure 2



DMMU SPOT ELEVATION TABLE

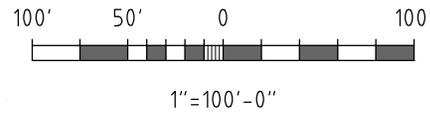
PT. #	EXISTING MUDLINE ELEVATION	PROPOSED MUDLINE ELEVATION	COORDINATES	
			NORTHING	EASTING
S1	-30.57'	-45.00'	711690	1169450
S2	-40.15'	-45.00'	711600	1169495
S3	-34.30'	-45.00'	711575	1169572
S4	-34.89'	-45.00'	711480	1169675
S5	-37.32'	-45.00'	711400	1169700
S6	-34.66'	-45.00'	711370	1169790
S7	-37.77'	-45.00'	711255	1169850
S8	-34.59'	-45.00'	711215	1169945

BLAIR WATERWAY

THE HYDROGRAPHIC SURVEY WAS PERFORMED BY AXIS ON MAY 5, 2014

DREDGE NOTES:
 DREDGE ELEVATION (INCLUDING 1' OVERDREDGE) = -45'
 DMMU1 APPROXIMATE SURFACE DREDGE VOLUME: 14,330 CY
 DMMU2 APPROXIMATE SUB-SURFACE DREDGE VOLUME: 14,380 CY

LEGAL DESCRIPTION:
 S-T-R: S35,T21N,R03W WM
 TAX PARCEL # 0321352061
 COUNTY: PIERCE
 STATE: WA



FOR PERMIT APPLICATION ONLY

LOCATION: U:\PDX\2013\00030_GP_ESA\11_DRAWINGS\10_STRUCTURE\PERMIT\DRAWING PACKAGE 2 - DREDGE\00030-00-EN-DAL-8101.DWG
 PLOT DATE & TIME: 12/12/2014 2:38:46 PM USER NAME: robert.muller
 SAVE DATE & TIME: 12/12/2014 2:29:59 PM

PROPOSED: DREDGING.

ADJACENT PROPERTY OWNERS:
 ① GRAYMONT
 ② PUYALLUP TRIBE OF INDIANS

PROJECT COORDINATES: 47°16'9.72"N, 122°23'38.89"W

GEORGIA-PACIFIC TACOMA MARINE TERMINAL DREDGE SAMPLING PLAN

"This drawing is prepared for the use of the contractual customer of WorleyParsons Group and WorleyParsons Group assumes no liability to any other party for any representations contained in this drawing."

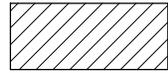


00030-EN-DAL-8101

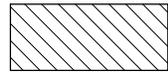
PURPOSE: ALLOW VESSEL SERVICE W/OUT GROUNDING RISK.
 IN: BLAIR WATERWAY AT: TACOMA
 COUNTY OF: PIERCE STATE OF: WA
 APPLICATION BY: GP GYPSUM LLC 1240 E. ALEXANDER AVE. TACOMA WA. 98421

SHEET NO. 1 OF 1 DATE: 12/12/2014

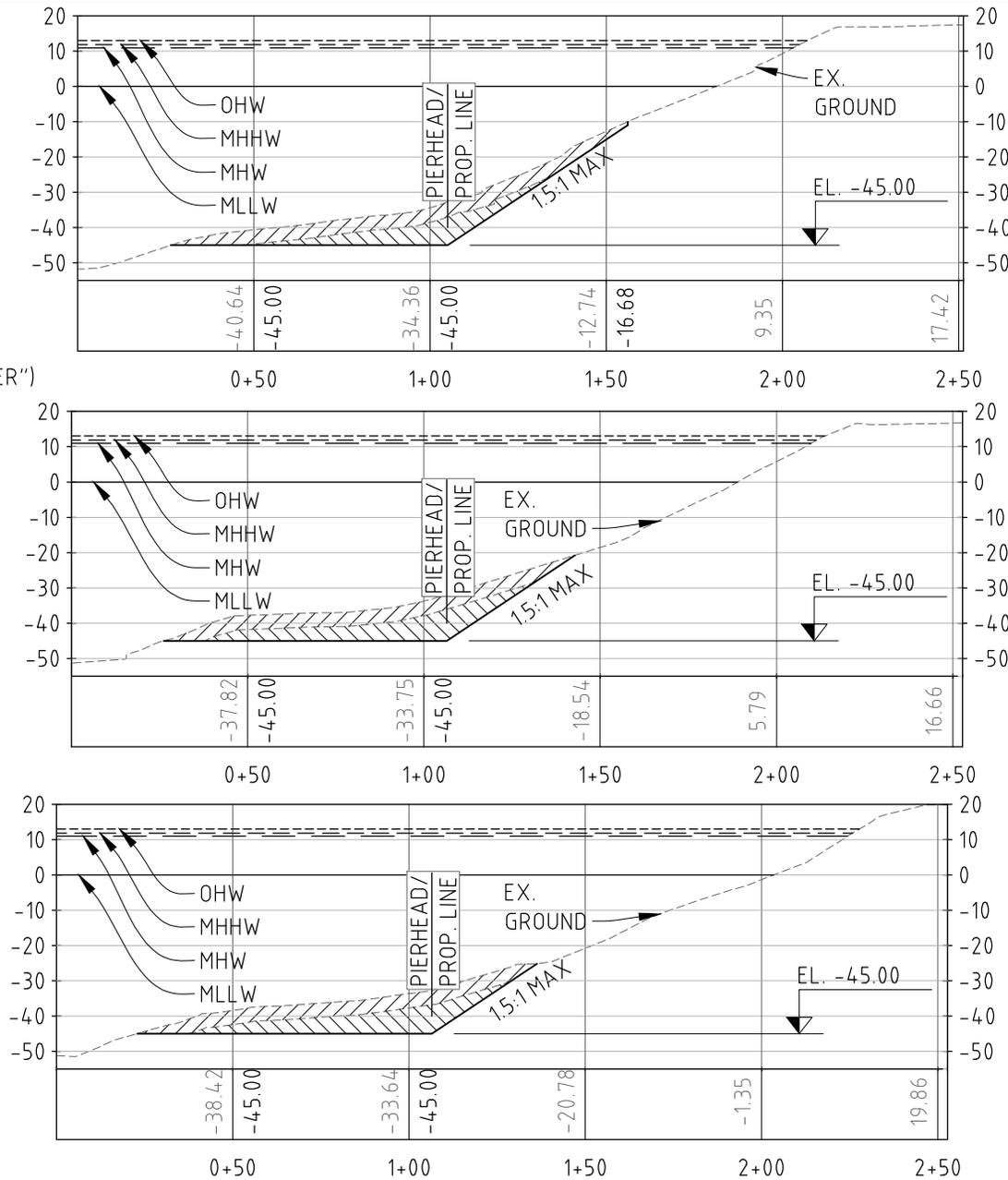
Figure 3



DREDGE SECTION
("DMMU 1 SURFACE LAYER")



DREDGE SECTION
("DMMU 2 SUB-SURFACE LAYER")



**FOR PERMIT
APPLICATION ONLY**

LEGAL DESCRIPTION:
S-T-R: S35,T21N,R03W WM
TAX PARCEL # 0321352061
COUNTY: PIERCE
STATE: WA

PROPOSED: DREDGING.

**GEORGIA-PACIFIC TACOMA
MARINE TERMINAL DREDGE
DREDGE SECTIONS**

"This drawing is prepared solely for the use of the contractual customer of WorleyParsons Westmar Corporation and WorleyParsons Westmar Corporation assumes no liability to any other party for any representations contained in this drawing."



00030-EN-DAL-8102

PURPOSE: ALLOW VESSEL SERVICE W/OUT GROUNDING RISK.
IN: BLAIR WATERWAY AT: TACOMA
COUNTY OF: PIERCE STATE OF: WA
APPLICATION BY: GP GYPSUM LLC 1240 E. ALEXANDER AVE. TACOMA WA. 98421

SHEET NO. 1 OF 1 DATE: 10/30/2014

PROJECT COORDINATES: 47°16'9.72"N, 122°23'38.89"W

BASELINE CONTROL POINT TABLE		
STATION	NORTHING	EASTING
0+00	711824.1	1169326.8
9+00	711197.7	1169973.0

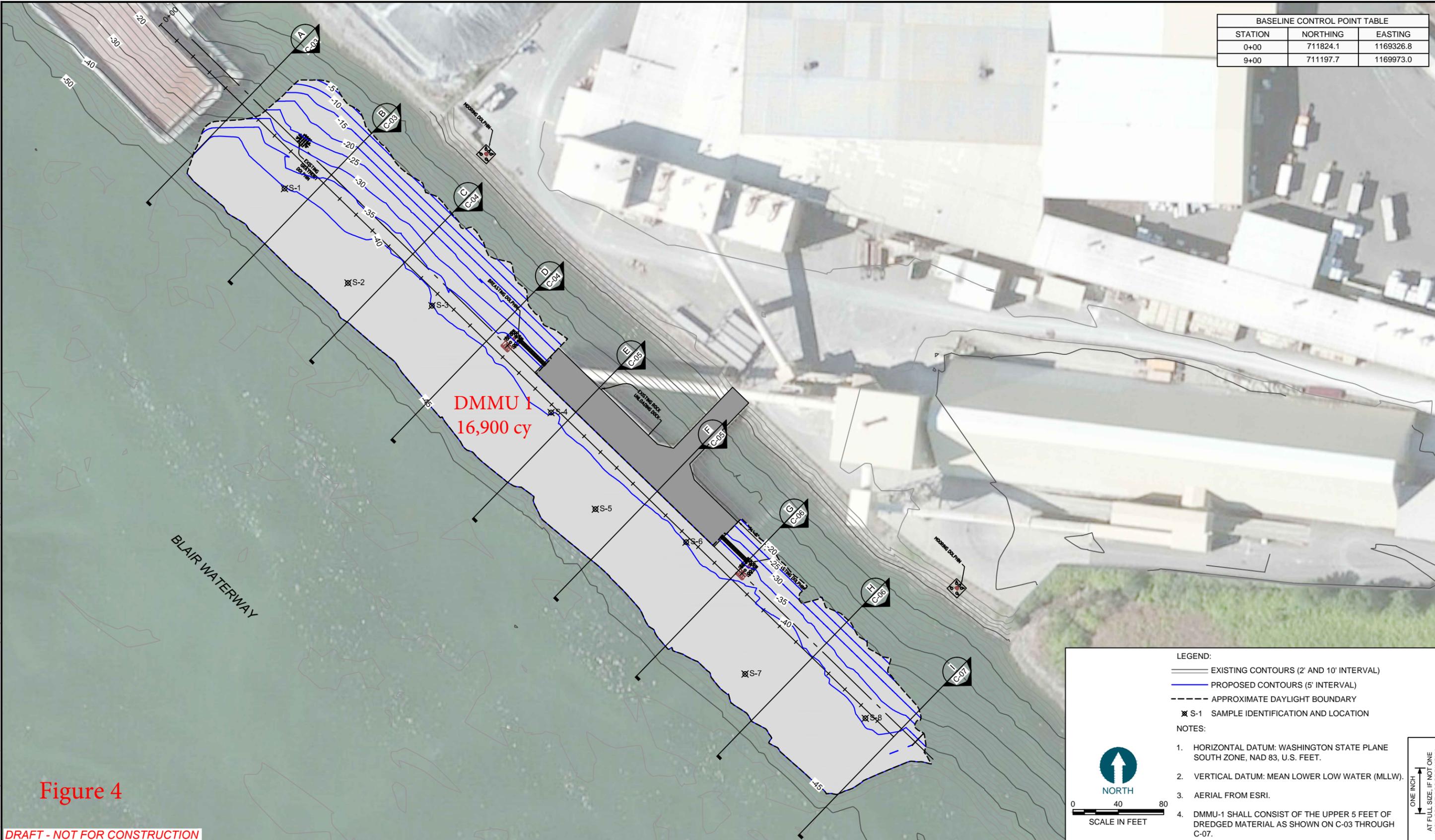


Figure 4

DRAFT - NOT FOR CONSTRUCTION

LEGEND:

- EXISTING CONTOURS (2' AND 10' INTERVAL)
- PROPOSED CONTOURS (5' INTERVAL)
- APPROXIMATE DAYLIGHT BOUNDARY
- S-1 SAMPLE IDENTIFICATION AND LOCATION

NOTES:

- HORIZONTAL DATUM: WASHINGTON STATE PLANE SOUTH ZONE, NAD 83, U.S. FEET.
- VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW).
- AERIAL FROM ESRI.
- DMMU-1 SHALL CONSIST OF THE UPPER 5 FEET OF DREDGED MATERIAL AS SHOWN ON C-03 THROUGH C-07.

SCALE IN FEET

0 40 80

NORTH

ONE INCH AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY



REVISIONS				
REV	DATE	BY	APPD	DESCRIPTION

DESIGNED BY: T. PARKER
 DRAWN BY: C. HEWETT
 CHECKED BY: J. VERDUIN
 APPROVED BY: J. VERDUIN
 SCALE: AS NOTED
 DATE: JUNE 2015

GEORGIA-PACIFIC TACOMA MARINE TERMINAL
30% DREDGE DESIGN

DMMU-1 DREDGE PLAN

C-01

SHEET NO. 3 OF 9

K:\Projects\02030-Georgia Pacific Corporation\GP Tacoma Marine Terminal\Dredge Design\Construction Plans\02030-C-01 (Dredging).dwg DMMU-1 Jun 17, 2015 2:37pm chiewett

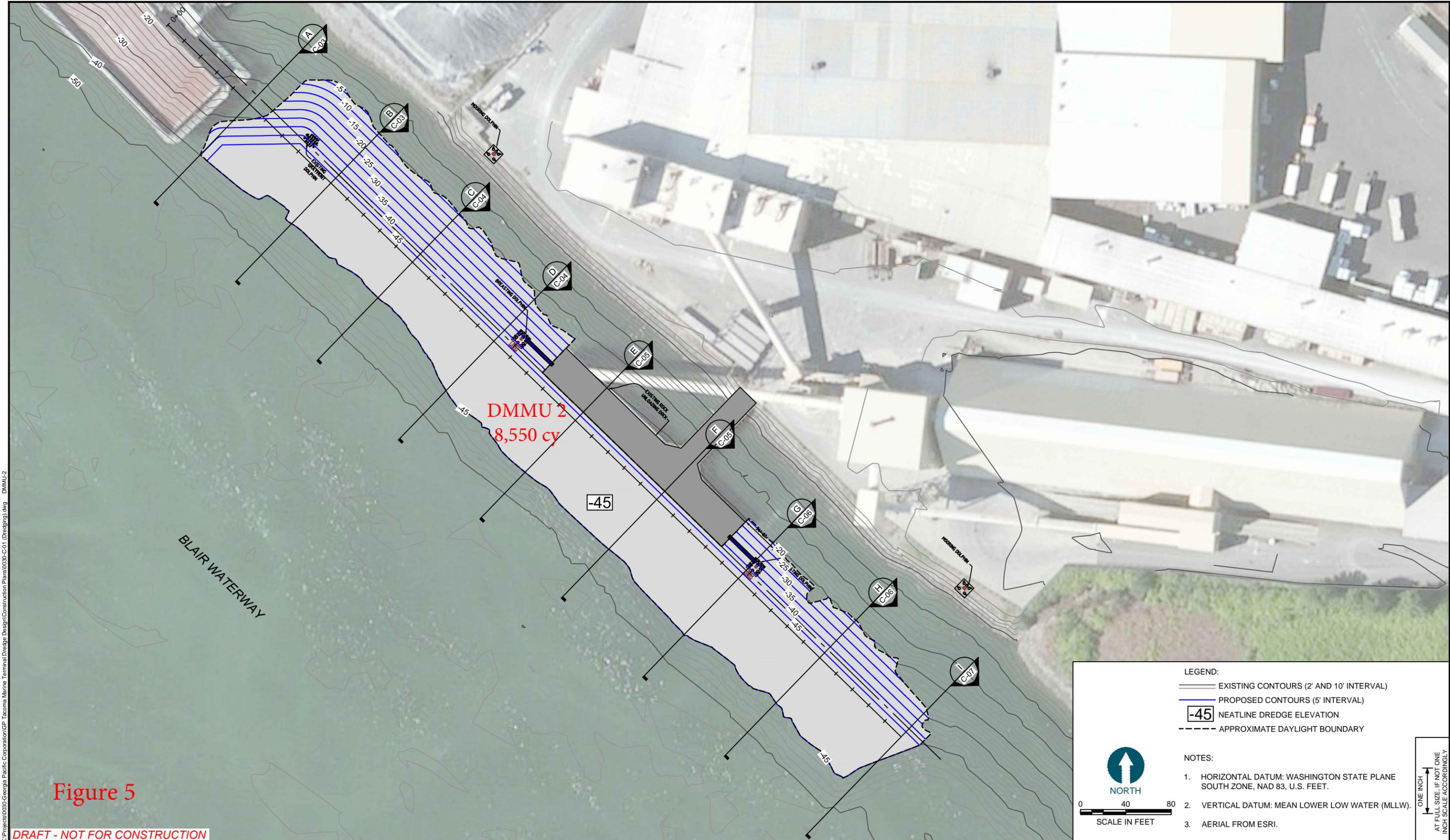


Figure 5

DRAFT - NOT FOR CONSTRUCTION

LEGEND:

- EXISTING CONTOURS (2' AND 10' INTERVAL)
- PROPOSED CONTOURS (5' INTERVAL)
- 45 NEATLINE DREDGE ELEVATION
- APPROXIMATE DAYLIGHT BOUNDARY

NOTES:

- HORIZONTAL DATUM: WASHINGTON STATE PLANE SOUTH ZONE, NAD 83, U.S. FEET.
- VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW).
- AERIAL FROM ESRI.

SCALE IN FEET
0 40 80

NORTH

ONE INCH AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY



REVISIONS				
REV	DATE	BY	APPD	DESCRIPTION

DESIGNED BY: T. PARKER
 DRAWN BY: C. HEWETT
 CHECKED BY: J. VERDUIN
 APPROVED BY: J. VERDUIN
 SCALE: AS NOTED
 DATE: JUNE 2015

**GEORGIA-PACIFIC TACOMA MARINE TERMINAL
 30% DREDGE DESIGN**

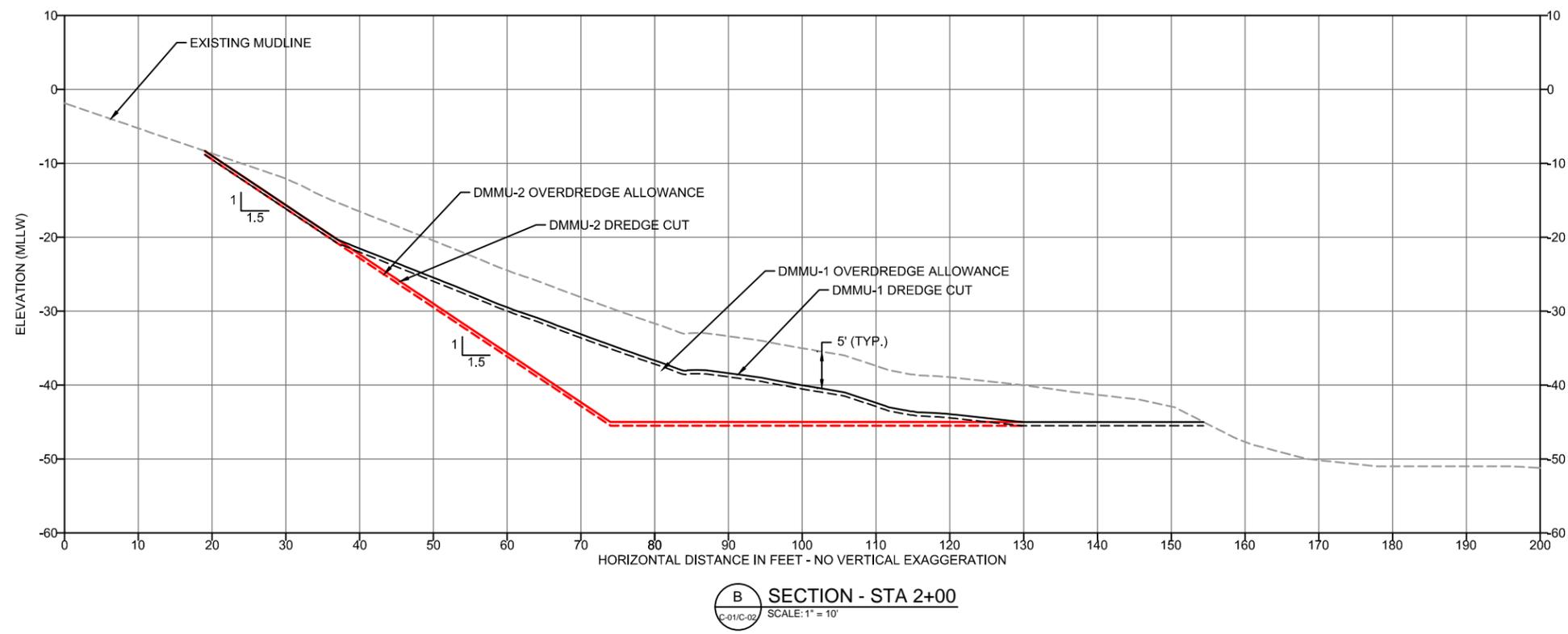
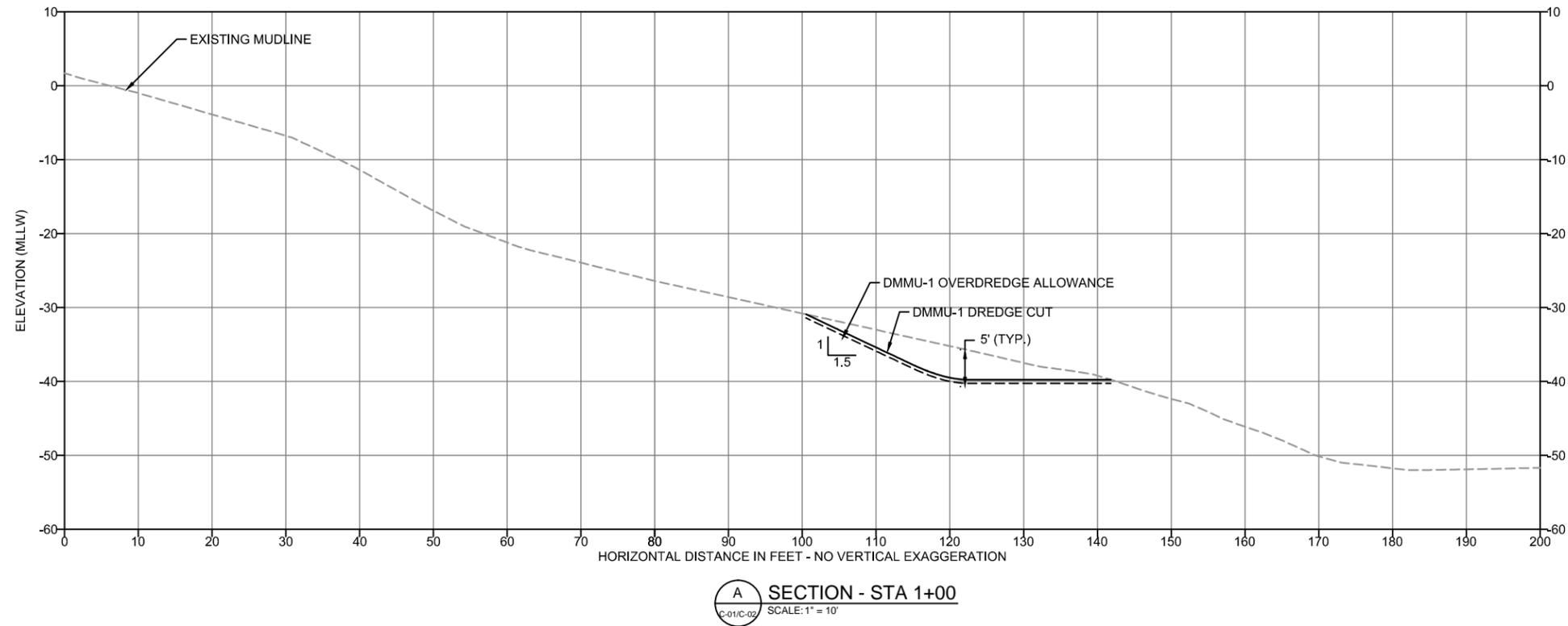
DMMU-2 DREDGE PLAN

C-02

SHEET NO. 4 OF 9

K:\Projects\02030-Georgia Pacific Corporation\GP Tacoma Marine Terminal\Dredge Design\Construction Plans\02030-C-01 (Dredging).dwg DMMU-2 Jun 17, 2015 2:37pm chiewett

Figure 6



- LEGEND:
- EXISTING MUDLINE
 - DMMU-1 DREDGE CUT
 - - - DMMU-1 OVERDREDGE ALLOWANCE (0.5 FT)
 - DMMU-2 DREDGE CUT
 - - - DMMU-2 OVERDREDGE ALLOWANCE (0.5 FT)

- NOTES:
1. HORIZONTAL DATUM: WASHINGTON STATE PLANE SOUTH ZONE, NAD 83, U.S. FEET.
 2. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW).

ONE INCH AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY.

K:\Projects\0209-Georgia Pacific Corporation\GP Tacoma Marine Terminal\Dredge Design\Construction Plans\0209-C-01 (Dredging).dwg - Cross Sections (1)

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REV	DATE	BY	APPD	DESCRIPTION

DESIGNED BY: T. PARKER
 DRAWN BY: C. HEWETT
 CHECKED BY: J. VERDUIN
 APPROVED BY: J. VERDUIN
 SCALE: AS NOTED
 DATE: JUNE 2015

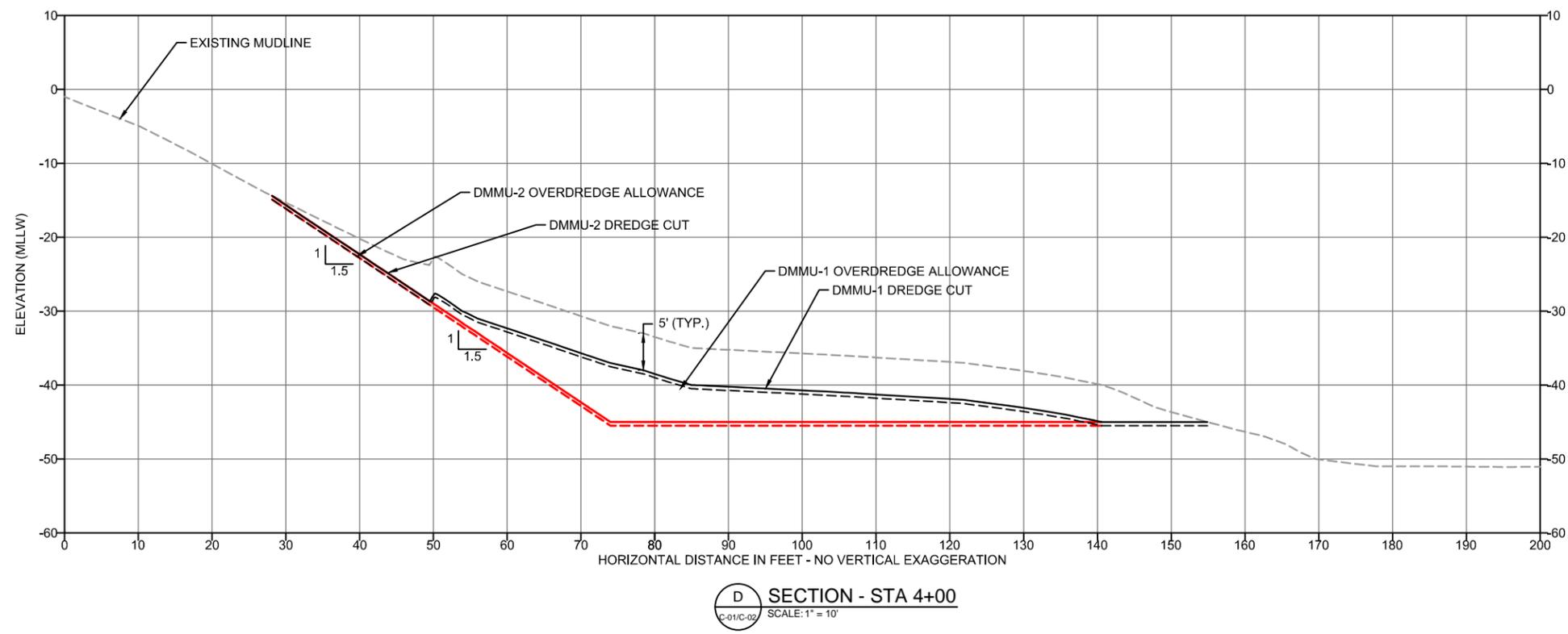
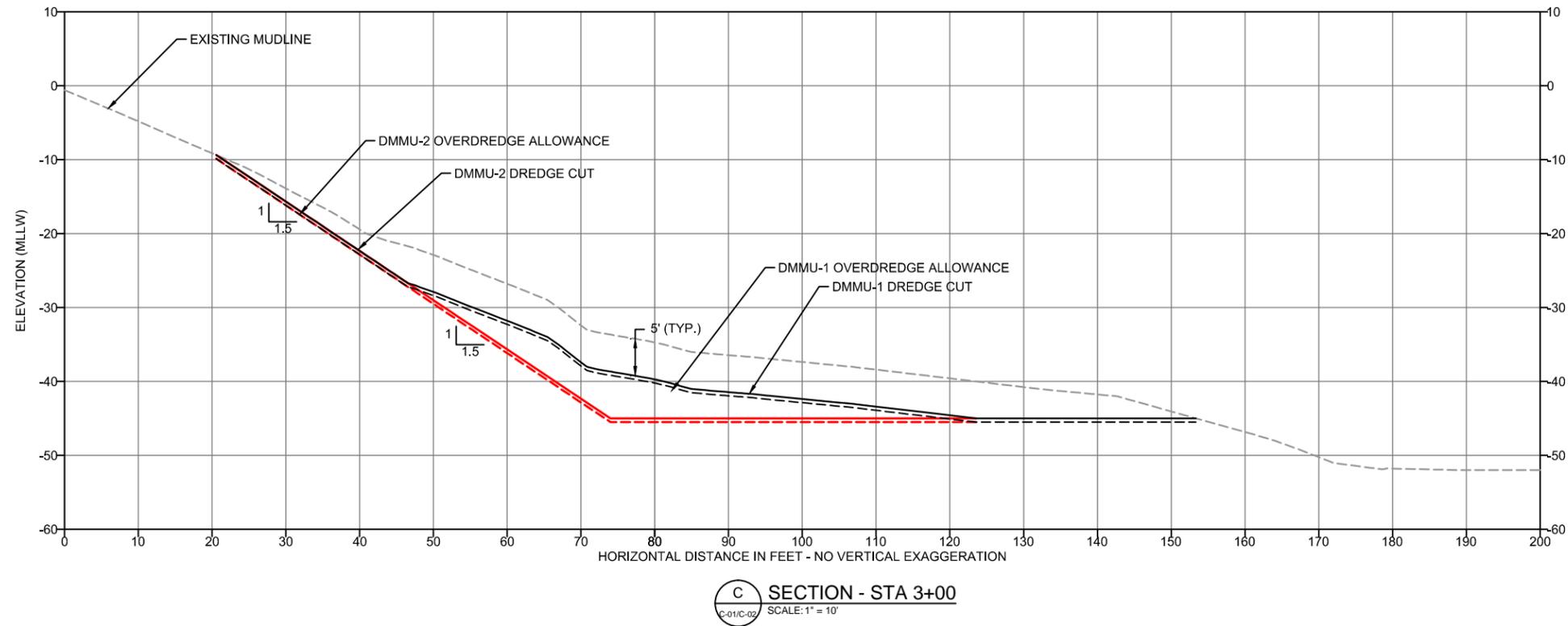
GEORGIA-PACIFIC TACOMA MARINE TERMINAL
30% DREDGE DESIGN

DREDGE PLAN SECTIONS (1 OF 5)

C-03

SHEET NO. 5 OF 9

Figure 7



- LEGEND:
- EXISTING MUDLINE
 - DMMU-1 DREDGE CUT
 - - - DMMU-1 OVERDREDGE ALLOWANCE (0.5 FT)
 - DMMU-2 DREDGE CUT
 - - - DMMU-2 OVERDREDGE ALLOWANCE (0.5 FT)

- NOTES:
1. HORIZONTAL DATUM: WASHINGTON STATE PLANE SOUTH ZONE, NAD 83, U.S. FEET.
 2. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW).

ONE INCH
↑
AT FULL SIZE, IF NOT ONE
INCH SCALE ACCORDINGLY

K:\Projects\0209-Georgia Pacific Corporation\GP Tacoma Marine Terminal\Dredge Design\Construction Plans\0209-C-01 (Dredging).dwg - Cross Sections (2)

DRAFT - NOT FOR CONSTRUCTION



REVISIONS				
REV	DATE	BY	APPD	DESCRIPTION

DESIGNED BY: T. PARKER
 DRAWN BY: C. HEWETT
 CHECKED BY: J. VERDUIN
 APPROVED BY: J. VERDUIN
 SCALE: AS NOTED
 DATE: JUNE 2015

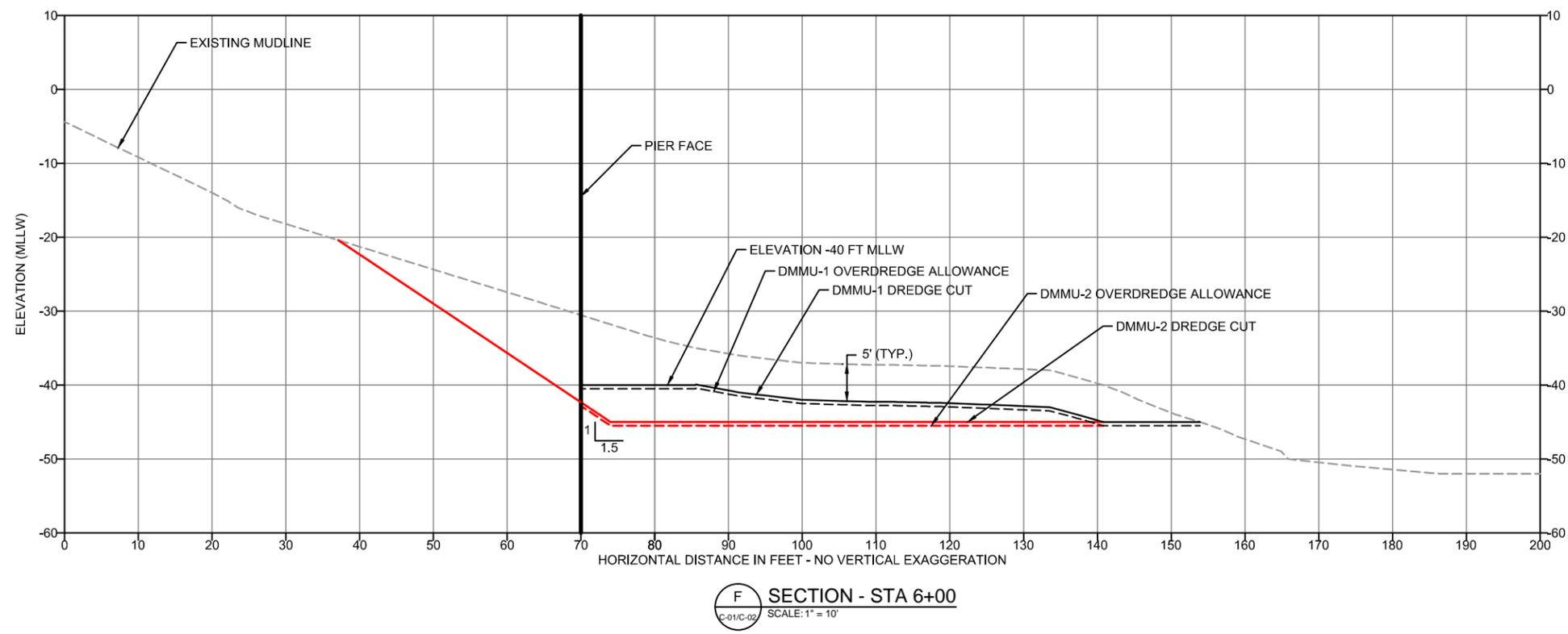
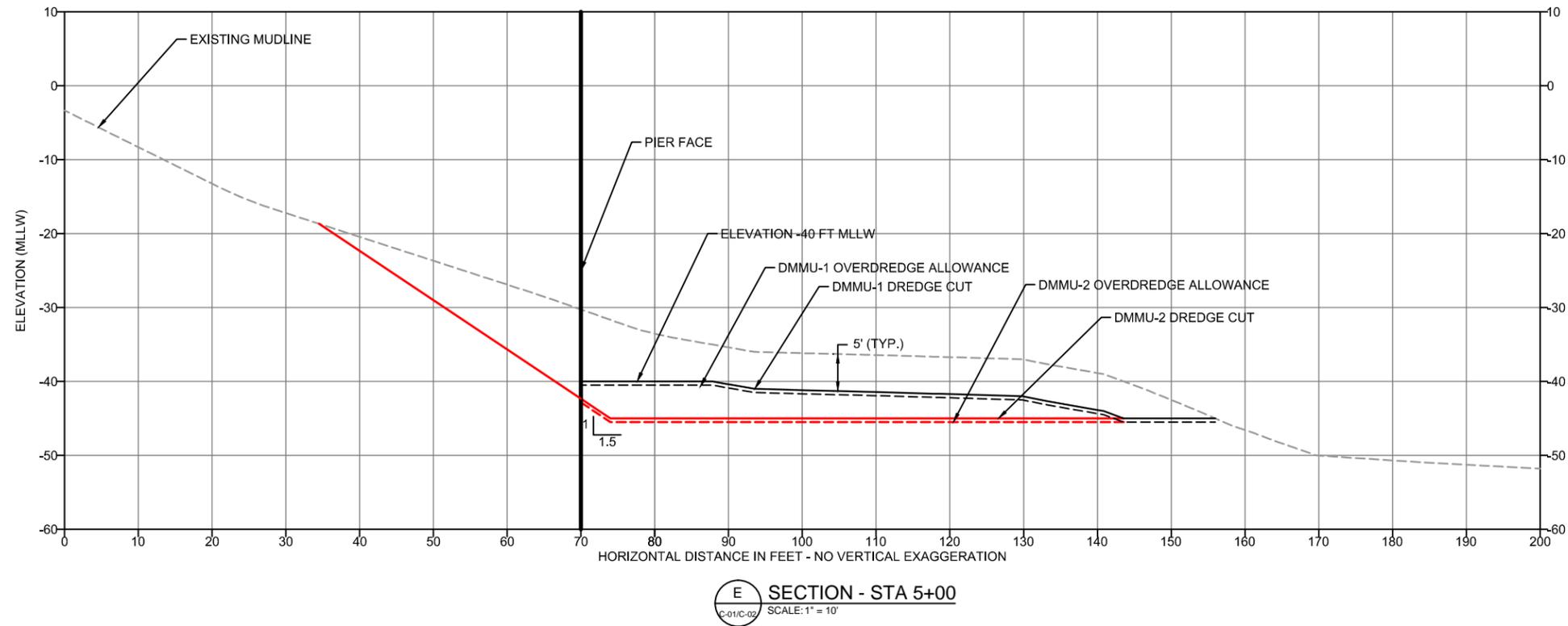
GEORGIA-PACIFIC TACOMA MARINE TERMINAL
30% DREDGE DESIGN

DREDGE PLAN SECTIONS (2 OF 5)

C-04

SHEET NO. 6 OF 9

Figure 8



- LEGEND:**
- EXISTING MUDLINE
 - DMMU-1 DREDGE CUT
 - - - DMMU-1 OVERDREDGE ALLOWANCE (0.5 FT)
 - DMMU-2 DREDGE CUT
 - - - DMMU-2 OVERDREDGE ALLOWANCE (0.5 FT)
 - EXISTING PIER

- NOTES:**
1. HORIZONTAL DATUM: WASHINGTON STATE PLANE SOUTH ZONE, NAD 83, U.S. FEET.
 2. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW).

ONE INCH AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

K:\Projects\0209\Georgia Pacific Corporation\GP Tacoma Marine Terminal\Dredge Design\Construction Plans\0209-C-01 (Dredging).dwg Cross Sections (3)

DRAFT - NOT FOR CONSTRUCTION



REVISIONS				
REV	DATE	BY	APPD	DESCRIPTION

DESIGNED BY: T. PARKER
 DRAWN BY: C. HEWETT
 CHECKED BY: J. VERDUIN
 APPROVED BY: J. VERDUIN
 SCALE: AS NOTED
 DATE: JUNE 2015

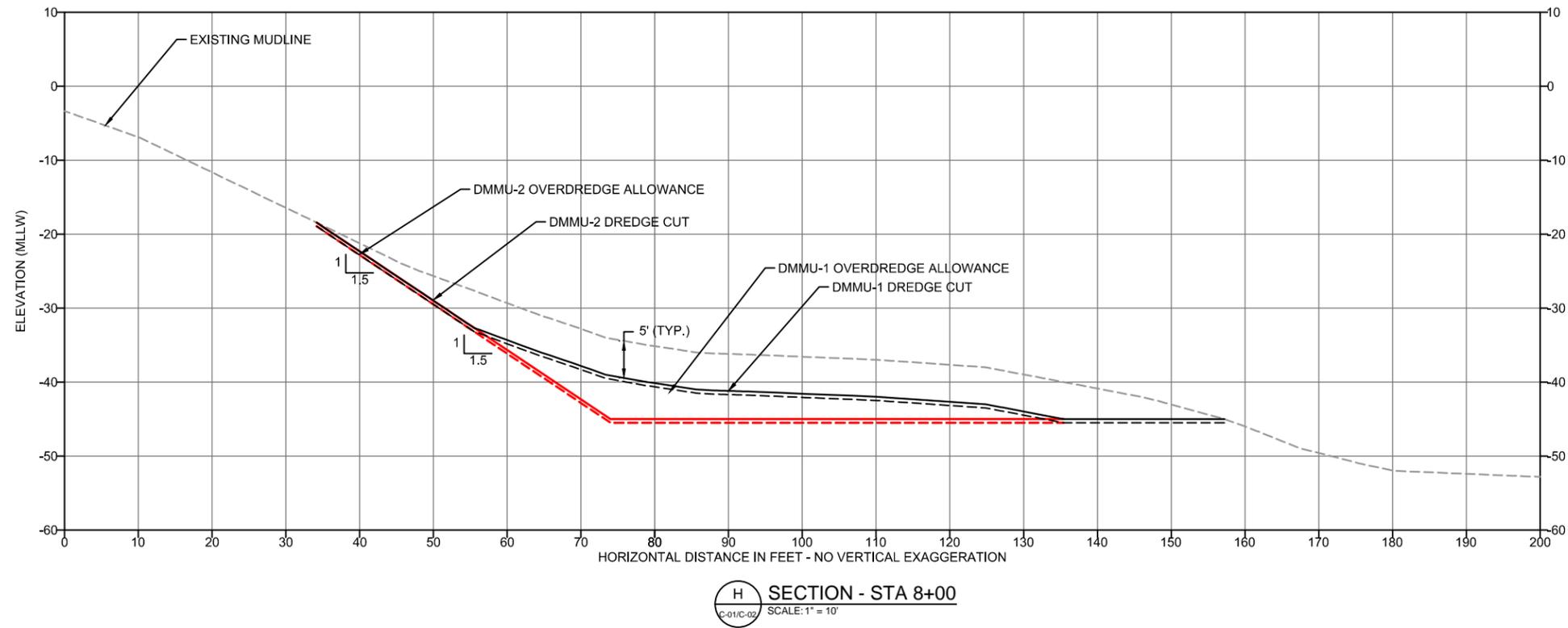
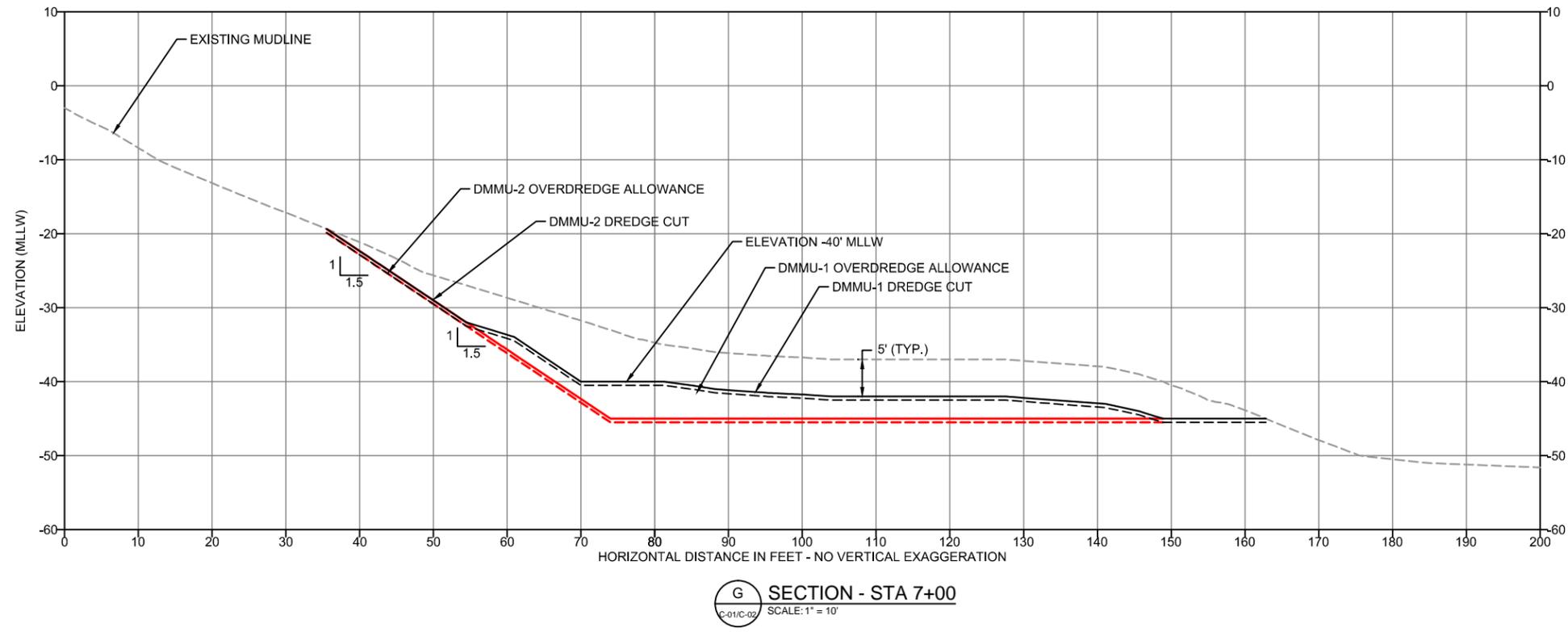
GEORGIA-PACIFIC TACOMA MARINE TERMINAL
30% DREDGE DESIGN

DREDGE PLAN SECTIONS (3 OF 5)

C-05

SHEET NO. 7 OF 9

Figure 9



- LEGEND:
- EXISTING MUDLINE
 - DMMU-1 DREDGE CUT
 - - - DMMU-1 OVERDREDGE ALLOWANCE (0.5 FT)
 - DMMU-2 DREDGE CUT
 - - - DMMU-2 OVERDREDGE ALLOWANCE (0.5 FT)

- NOTES:
1. HORIZONTAL DATUM: WASHINGTON STATE PLANE SOUTH ZONE, NAD 83, U.S. FEET.
 2. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW).

ONE INCH AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY.

DRAFT - NOT FOR CONSTRUCTION

Jun 17, 2015 2:37pm chiewett



REVISIONS				
REV	DATE	BY	APPD	DESCRIPTION

DESIGNED BY: T. PARKER
 DRAWN BY: C. HEWETT
 CHECKED BY: J. VERDUIN
 APPROVED BY: J. VERDUIN
 SCALE: AS NOTED
 DATE: JUNE 2015

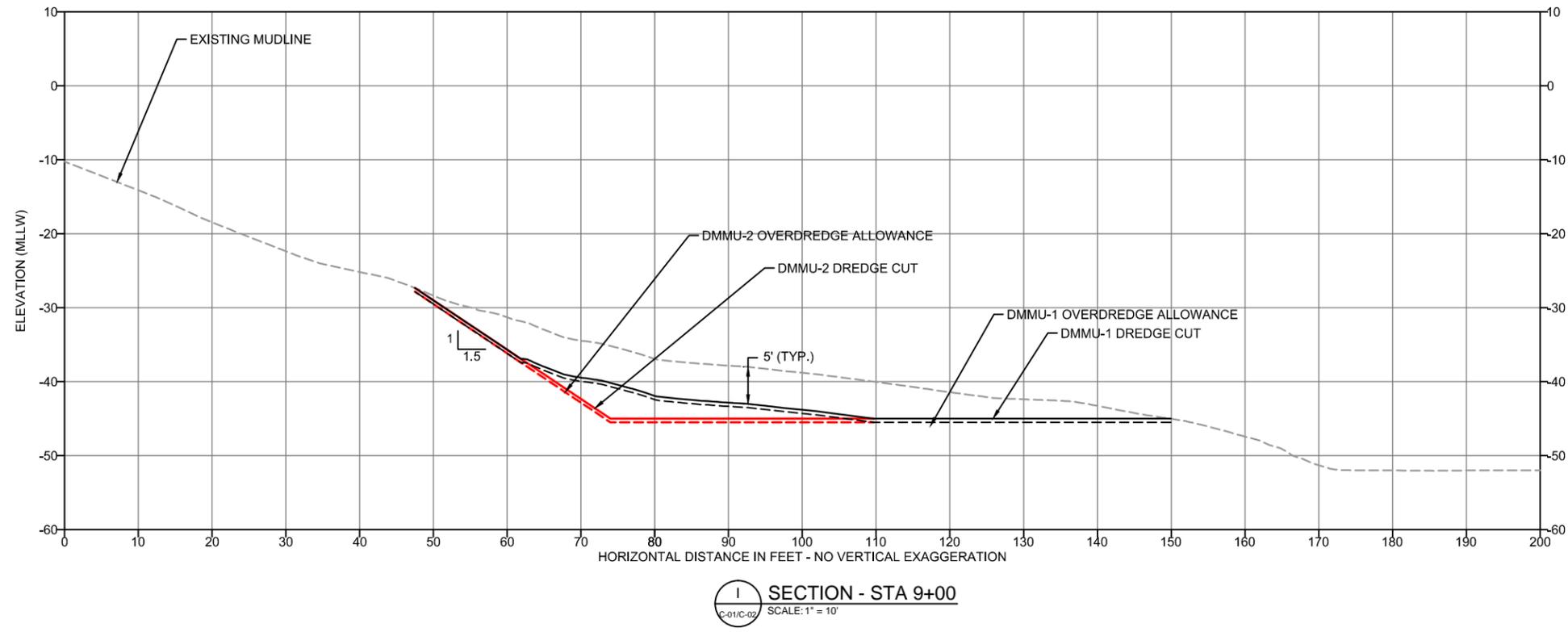
**GEORGIA-PACIFIC TACOMA MARINE TERMINAL
 30% DREDGE DESIGN**

DREDGE PLAN SECTIONS (4 OF 5)

C-06

SHEET NO. 8 OF 9

Figure 10



I SECTION - STA 9+00
SCALE: 1" = 10'

- LEGEND:
- EXISTING MUDLINE
 - DMMU-1 DREDGE CUT
 - - - DMMU-1 OVERDREDGE ALLOWANCE (0.5 FT)
 - DMMU-2 DREDGE CUT
 - - - DMMU-2 OVERDREDGE ALLOWANCE (0.5 FT)

- NOTES:
1. HORIZONTAL DATUM:
WASHINGTON STATE PLANE
SOUTH ZONE, NAD 83, U.S. FEET.
 2. VERTICAL DATUM: MEAN LOWER
LOW WATER (MLLW).

ONE INCH
↑
AT FULL SIZE, IF NOT ONE
INCH SCALE ACCORDINGLY

K:\Projects\0030-Georgia Pacific Corporation\GP Tacoma Marine Terminal\Dredge Design\Construction Plans\0030-C-01 (Dredging).dwg - Cross Sections (5)

DRAFT - NOT FOR CONSTRUCTION



REVISIONS				
REV	DATE	BY	APPD	DESCRIPTION

DESIGNED BY: T. PARKER
 DRAWN BY: C. HEWETT
 CHECKED BY: J. VERDUIN
 APPROVED BY: J. VERDUIN
 SCALE: AS NOTED
 DATE: JUNE 2015

GEORGIA-PACIFIC TACOMA MARINE TERMINAL
30% DREDGE DESIGN

DREDGE PLAN SECTIONS (5 OF 5)

C-07

SHEET NO. 9 OF 9