GeoEngineers

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Tacoma, Washington 98402
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November 17, 2014

Washington State Department of Ecology
Toxics Cleanup Program
300 Desmond Drive
Lacey, Washington 98504

Attention: Steve Teel

Subject: As-Built Report
Shoreline Habitat Restoration
Irondale Iron and Steel Plant
Irondale, Washington
File No. 0504-042-02

Thank you for choosing GeoEngineers, Inc. to provide this as-built report required for the Irondale Iron and Steam Plant Habitat Enhancement, in Irondale, Jefferson County, Washington. Enclosed please find the report entitled "As-Built Report Irondale Iron and Steel Plant Shoreline Habitat Restoration, Jefferson County, Washington."

We appreciate the opportunity to be of service to you on this and future projects. Please contact us if you have questions, or require clarification regarding the information presented in this report.

Sincerely,
GeoEngineers, Inc.

Joseph O. Callaghan, PWS
Associate

Shawn M. Mahugh
Senior Biologist

SMM:JOC:leh

Enclosure:
As-Built Report Irondale Iron and Steel Plant Shoreline Habitat Restoration, Jefferson County, Washington

As-Built Report

Irondale Iron and Steel Plant
Shoreline Habitat Restoration
Jefferson County, Washington

for

Washington Department of Ecology

November 17, 2014

GeoEngineers
Earth Science + Technology

As-Built Report

Irondale Iron and Steel Plant
Shoreline Habitat Restoration
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As-Built Report

Irondale Iron and Steel Plant
Shoreline Habitat Restoration
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Prepared for:

Washington State Department of Ecology
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300 Desmond Drive
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Prepared by:

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GeoEngineers

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APPENDICES

1.0 INTRODUCTION

GeoEngineers, Inc. (GeoEngineers) has prepared this as-built report for the Washington State Department of Ecology (Ecology) to document the habitat restoration and enhancement associated with the Irondale Iron and Steel Plant Cleanup Project (project) located in Irondale, Jefferson County, Washington (Figure 1). From 1881 to 1919, iron and steel were produced intermittently at the site by various owners. Steel plant operations during this time resulted in metals, carcinogenic polycyclic aromatic hydrocarbons (cPAHs) and/or petroleum contamination of soil, sediment and/or groundwater. The site is owned by Jefferson County and is currently used as an undeveloped day-use park (Irondale Beach Park). Environmental cleanup and remediation activities were conducted in 2012 as detailed in the Irondale Iron and Steel Plant Cleanup Action Plan (GeoEngineers, 2009) and Final Engineering Design Report (GeoEngineers, 2012).

In addition to environmental cleanup activities, habitat enhancement work was conducted along shoreline, backshore and upland areas. These activities were conducted in late 2012/early 2013 following completion of environmental remediation tasks. This report will serve to document the "as-built" conditions of the shoreline habitat restoration and to establish a scientific baseline for monitoring the success or failure of the restored areas over the monitoring period.

2.0 PROJECT DESCRIPTION

Habitat restoration and enhancement activities focused on creating approximately 0.92 acres of new upper intertidal habitat and 1.86 acres of backshore dune habitat. Invasive species were removed and native vegetation was planted throughout the newly graded areas. Large woody debris (LWD) was installed along the newly defined ordinary high water (OHW) line and along the banks of two drainage swales located within the restoration area. Photographs are included in Appendix A and site grading and planting plans are depicted in Sheets C3.0 through C3.10 and L1.0 through L1.2 in Appendix B of this report.

2.1 Grading

The nearshore habitat within the restoration area was impacted by historic industrial uses. Large amounts of dredged sand and decomposed bark were present along the shoreline as a result of the historic iron mill and log storage uses. The restoration project removed these materials to achieve a more gradual slope and a net increase of intertidal and backshore habitat. The OHW line of approximately 10.5-foot elevation was drawn back (extended landward) by a distance ranging from approximately 20 to 50 feet relative to the historic OHW alignment. Grading at the north end of the site was designed to match the OHW line of the Chimicum Creek shoreline restoration area previously completed by Washington Department of Fish and Wildlife (WDFW). Through removal of the dredged sand and organic materials along the shoreline suitable beach sand was exposed for the intertidal and backshore areas. Disturbed upland areas were covered in approximately 12 inches of topsoil.

2.2 LWD Installation

LWD was installed above the new OHW line and within the two surface drainages. In the northern portion of the restoration area LWD (consisting of boom sticks without attached root wads) was randomly placed and not anchored. In the southern portion of the site (the remediation area), LWD with root wads attached was keyed in place with smaller diameter logs driven vertically on the waterward side of the LWD structures. Installed LWD was a minimum in size from approximately 18 to 24 inches in diameter and at least 30 feet in length.

2.3 Invasive Species Removal and Native Vegetation Plantings

Invasive species such as Himalayan blackberry (*Rubus armeniacus*) were removed during the grading activities. Additional removal of Himalayan blackberry and English ivy (*Hedera helix*) have also been conducted by local volunteer groups. Areas disturbed by remedial excavation, soil caps, or shoreline restoration grading were replanted to restore or enhance vegetation composition and wildlife habitat. In the northern restoration area, dune grass was planted in the backshore area that extends approximately 55 feet landward of the new OHW. Along the two drainage swales and in the southern portion of the shoreline restoration area native shrubs and trees were installed. The western and northern edges of the large upland cap were also planted with shrubs and small trees. Shrubs and trees also had a perimeter of mulch applied in a 2-foot diameter ring around each plant. The remaining upland cap areas were hydroseeded to help stabilize the surface of the cap material.

3.0 RESTORATION MONITORING METHODS

3.1 Vegetation Monitoring

Five circular monitoring stations with a radius of 11.8 feet (0.01 acre) were installed on site (Figure 2). Monitoring locations were chosen to provide representation of the various conditions within restoration planting areas. Monitoring Station 1 is located in shrub-planted area at the southwest corner of the large upland cap. Monitoring Stations 2 and 3 are located in the southern portion of shoreline restoration; one at the historic kiln site and one at the transition from tree/shrub plantings to dunegrass. Monitoring Stations 4 and 5 were located in the restored drainage swales.

During the as-built monitoring event, an 11.8-foot line was secured to the t-post that marks the station and rotated 360 degrees to define the circular sampling plot. Aerial coverage was estimated for the tree, shrub and herbaceous vegetation layers. Coverage for a vegetative layer is the sum of the aerial cover of all species in that layer. Total aerial coverage values greater than 100 percent indicate multiple vegetation layers within the sample plot. A plant does not have to be rooted in the plot to be considered in the estimate of canopy cover. The percent cover of invasive species within each monitoring station was also documented during monitoring event.

The health of the plant community was noted at each sample plot. Living plants were counted at each monitoring station to serve as a baseline for survivability calculations in future monitoring events. Plants within each monitoring station were inspected for signs of new plant growth, flowering and seed production. Recruitment and other native volunteer species were also noted, if observed. Plant stress was documented based on observations of the presence of dead wood, root

suckering and signs of disease or predation. Vegetation was monitored for signs of drought stress, and corrective measures will be recommended if plants are not receiving adequate water.

3.2 Wildlife Monitoring

Wildlife observations were made at each monitoring station. Wildlife sightings and other indications of use, such as bird nests, burrows, tracks, and scat, were noted when observed. Wildlife observations will be used as an indicator of general habitat quality.

3.3 Photographic Sampling

The objective of photographic sampling is to produce a visual record of the mitigation area over time. Photographs from set positions over a long period of time will be used to document whether performance standards related to vegetation are being met. Photographs were taken at each monitoring station from the top of the monitoring station post (approximately 4-foot height) toward the directions indicated in Section 5 of this report.

3.4 Maintenance

Maintenance of enhanced areas should be conducted as necessary throughout the monitoring period. Early maintenance activities may include periodic water (irrigation) and control of undesirable species. Species to be removed primarily include exotic invasive species such as reed canary grass (*Phalaris arundinacea*), Himalayan blackberry and English ivy. Other maintenance responsibilities such as trash removal and vandalism repair should be performed on an as-needed basis.

4.0 PERFORMANCE STANDARDS

Performance standards provide benchmarks against which the success of the restoration may be evaluated. Performance standards are to be evaluated during each monitoring event through the collection of quantitative data. Failure to meet the performance standards should trigger immediate corrective action. The performance standards are designed to measure key elements of the restoration plan that have been designed to improve overall habitat functions of the area.

4.1 Performance Standards

- There shall be a minimum of 80 percent survival of all planted species throughout the monitoring period. Survival will be identified by counting and documenting the numbers of dead versus live plants within each monitoring station. Species, quantities, general conditions, and sizes of plants will be described and recorded.
- Invasive, exotic and undesirable species shall be represented by an average of less than 15 percent aerial coverage within each vegetative stratum in the monitoring stations.
- Acceptable cover for native emergent, shrub and tree species within each monitoring station will be a minimum of 20 percent during Year 1 and show distinct increases during each subsequent year.

4.2 Monitoring Schedule

The site will be monitored for plant survival, aerial coverage and invasive species presence. Evidence of wildlife use and general plant health will be noted during each monitoring event. Monitoring will be required one year following the acceptance of this report (Ecology, 2012). During this one year window all dead and/or disfigured plants are to be replaced during appropriate planting periods and according to the original planting plan.

5.0 AS-BUILT BASELINE (YEAR-ZERO) MONITORING RESULTS

GeoEngineers biologists visited the restoration site on February 18, 2013 to confirm that the restoration plan had been followed to completion. Construction on site was conducted summer through winter 2012. In December 2012, the plants were installed in general accordance to the design drawing located in Appendix B. Minor modifications were made to the locations of species based on hydrologic conditions observed at the site and cultural resources concerns in the southern portion of the site. Trees were not installed in the southernmost portion of the shoreline due to historic kilns located several feet below ground surface. A full list of plants installed can be found in Table 1 below and the purchasing invoice is included in Appendix C of this report.

TABLE 1. SPECIES AND NUMBER OF PLANTS INSTALLED

Common Name	Latin Name	Container Size	Recommended On-Center Spacing (ft.)	Number Installed
Douglas Fir	*Pseudotsuga menziesii*	1 Gallon	12	11
Western Red Cedar	*Thuja plicata*	1 Gallon	12	16
Shore Pine	*Pinus contorta*	1 Gallon	12	11
Oceanspray	*Holodus discolor*	1 Gallon	5	237
Nootka Rose	*Rosa nutkana*	1 Gallon	5	169
Vine Maple	*Acer circinatum*	1 Gallon	6	97
Red elderberry	*Sambucus racemosa*	1 Gallon	6	164
Snowberry	*Symphocarpus albus*	1 Gallon	5	137
Dunegrass	*Leymus mollis*	Plug	2	Approximately 20,000

Upland soil cap areas were hydroseeded following the completion of earthwork activities. The grass seed mix used for the upland caps is contained in Table 2 below. Areas around the larger soil cap were planted with mixed shrub species (Figure 2). Invasive species control surrounding these upland areas is community-driven, volunteer-based and ongoing. While the extent of invasive vegetation removal to date is commendable, invasive species seed sources still exist on site and the success of seeded and planted areas depends on the continued monitoring and control of target species.

TABLE 2. HYDROSEED MIX

Common Name	Latin Name	Percent by Weight (%)	Minimum Percent Pure Seed (%)	Minimum Percent Germination (%)
Red Creeping Fescue	*Festuca rubra*	40	98	90
Perrenial Rygrass	*Lollium perenne*	40	98	90
White Sweetclover	*Melilotus alba*	10	98	90
Highland Colonial Bentgrass	*Agrostis capillaris*	10	98	90

5.1 Upland Soil Cap

The main surface of each upland shrub cap was hydroseeded rather than planted with shrubs. Developing a relatively flat, grass-dominated area will increase habitat diversity and recreational and historic value within the park. The new grass was observed to be germinating with even and complete coverage during the February 18th site visit. An area approximately 20 feet wide was planted with shrubs along the northwest and southwest borders of the larger soil cap (Figure 2).

5.1.1 Monitoring Station 1

Monitoring Station 1 is located in the southern portion of the larger upland soil cap within the hydroseed and shrub planting areas (Figure 2). Photographs were taken facing the Northwest, Northeast, Southeast and Southwest to better align with local conditions (Appendix A). Plant species and quantities are presented below in Table 3 and the canopy cover values in Table 4. Overall, shrubs appeared to be in good health following planting. Signs of new buds sprouting were noted on several plants.

Overall low values for cover can be attributed to how recent this as-built event followed restoration plantings. Visible mounds of mulch are still evident surrounding each plant and the area between plantings remained bare topsoil.

No invasive, volunteer, or recruited species have yet colonized this monitoring station. Mole and canine presence were noted in the surrounding area, as were sightings of crows, seagulls and robins.

TABLE 3. HEALTH AND QUANTITY OF SPECIES OBSERVED AT MONITORING STATION 1

Species	Canopy Layer	Status[1]	Planted	Alive 2013	Apparent Health
Oceanspray (*Holodus discolor*)	Shrub	P	12	12	Healthy in appearance.
Vine maple (*Acer circinatum*)	Shrub	P	9	9	Healthy in appearance.

Note:
[1]P = Planted, V = Volunteer, R = Recruit, TNTC = Too Numerous To Count

TABLE 4. PERCENT CANOPY COVER AT MONITORING STATION 1

Event and Year	Percent Cover (%)					
	Trees/Saplings	Shrubs	Herbaceous	Invasive	Bare Ground	Open Water
Spring 2013	0	5	2	0	93	0

5.2 Shoreline Restoration

Shoreline enhancement occurred above OHW from the southern limits of the site north along the beach tying into the WDFW Chimacum Creek beach restoration area. Activities included removing fill and re-grading the shoreline, installing LWD along the newly defined OHW, and creation of a backshore habitat area. This created a more natural beach slope angle and reduced erosion of the previous fill materials into the upper intertidal area. Backshore habitat areas were graded with clean sand and re-vegetated with American dunegrass (*Leymus mollis*). Trees and shrubs were installed landward of the dunegrass, creating a natural habitat transition.

5.2.1 Monitoring Station 2

Monitoring Station 2 is located near the southern end of the site in an area planted with shrubs. No trees were planted in this area to minimize potential impacts from deep rooting plants to the historic kilns (Figure 2). Photographs were taken aligned with the shoreline, approximately North, South, East and West (Appendix A). LWD with attached root wads were placed along OHW and anchored with vertical, buried timbers to retain shoreline elevation and protect the landward row of kilns. The plant species and quantities are presented below in Table 5 and the canopy cover values in Table 6. Overall, shrubs appeared to be in good health following planting. Signs of new buds sprouting were noted on several plants.

Overall low values for cover can be attributed to how recently this as-built event followed restoration plantings. Visible mounds of mulch were still evident surrounding each plant and the area between plantings was still bare topsoil and straw.

No invasive or recruited species have yet occurred within this monitoring station. Grass was noted growing through the mulch around some plantings. Seagulls were active in this area.

TABLE 5. HEALTH AND QUANTITY OF SPECIES OBSERVED AT MONITORING STATION 2

Species	Canopy Layer	Status[1]	Planted	Alive 2013	Apparent Health
Nootka rose (*Rosa nootkana*)	Shrub	P	15	15	Healthy in appearance.
Vine maple (*Acer circinatum*)	Shrub	P	7	7	Healthy in appearance.

Note:
[1]P = Planted, V = Volunteer, R = Recruit, TNTC = Too Numerous To Count

TABLE 6. PERCENT CANOPY COVER AT MONITORING STATION 2

Event and Year	Percent Cover (%)					
	Trees/Saplings	Shrubs	Herbaceous	Invasive	Bare Ground	Open Water
Spring 2013	0	5	2	0	93	0

5.2.2 Monitoring Station 3

Monitoring Station 3 is located in the southern portion of the site, where upland tree/shrub plantings transition from to dune grass (Figure 2). Photographs were taken aligned with the shoreline, approximately North, South, East and West (Appendix A). LWD has been placed along OHW near this monitoring station. The plant species and quantities are presented below in Table 7 and the canopy cover values in Table 8. Overall, trees and shrubs appeared to be in good health following planting. Signs of new buds sprouting were noted on several plants.

Overall low values for cover can be attributed to how recently this as-built event followed restoration plantings. Visible mounds of mulch were still evident surrounding each plant and the area between plantings remained bare topsoil.

No invasive, volunteer or recruited species have yet occurred within this monitoring station. Seagulls were active in this area. Track marks from a small all-terrain vehicle were noticed traversing the beach and turning around through the dune grass near this station.

TABLE 7. HEALTH AND QUANTITY OF SPECIES OBSERVED AT MONITORING STATION 3

Species	Canopy Layer	Status[1]	Planted	Alive 2013	Apparent Health
Oceanspray (*Holodus discolor*)	Shrub	P	2	2	Healthy in appearance.
Vine maple (*Acer circinatum*)	Shrub	P	5	5	Healthy in appearance.
Western redcedar (*Thuja plicata*)	Tree	P	5	5	Healthy in appearance.
Shore pine (*Pinus contorta*)	Tree	P	2	2	Healthy in appearance.
Red elderberry (*Sambucus racemosa*)	Shrub	P	15	15	Healthy in appearance.

Note:
[1]P = Planted, V = Volunteer, R = Recruit, TNTC = Too Numerous To Count

TABLE 8. PERCENT CANOPY COVER AT MONITORING STATION 3

Event and Year	Percent Cover (%)					
	Trees/Saplings	Shrubs	Herbaceous	Invasive	Bare Ground	Open Water
Spring 2013	0	5	0	0	95	0

5.2.3 Monitoring Station 4

Monitoring Station 4 is located on the south side of a small drainage swale southeast of the parking area (Figure 2). The plot encompasses both shrub plantings and dunegrass areas. Photographs were taken aligned with the shoreline, approximately Northeast, Southeast, Southwest and Northwest (Appendix A). LWD has been placed along OHW near this monitoring station. The plant species and quantities are presented below in Table 9 and the canopy cover values in Table 10. Overall, shrubs appeared to be in good health following planting. Signs of new buds sprouting were noted on several plants.

Overall low values for aerial cover can be attributed to how recently this as-built event followed restoration plantings. Visible mounds of mulch were still evident surrounding each plant and the area between plantings remained bare topsoil.

No invasive, volunteer or recruited species have yet occurred within this monitoring station. This drainage was previously dominated by Himalayan blackberry, which was removed prior to planting. Seagulls and crows were active in this area.

TABLE 9. HEALTH AND QUANTITY OF SPECIES OBSERVED AT MONITORING STATION 4

Species	Canopy Layer	Status[1]	Planted	Alive 2013	Apparent Health
Oceanspray (*Holodus discolor*)	Shrub	P	6	6	Healthy in appearance.
Vine maple (*Acer circinatum*)	Shrub	P	2	2	Healthy in appearance.
Red Elderberry (*Sambucus racemosa*)	Shrub	P	1	1	Healthy in appearance.
Dunegrass (*Leymus mollis*)	Herbaceous	P	19	19	Healthy in appearance.

Note:
[1]P = Planted, V = Volunteer, R = Recruit, TNTC = Too Numerous To Count

TABLE 10. PERCENT CANOPY COVER AT MONITORING STATION 4

Event and Year	Percent Cover (%)					
	Trees/Saplings	Shrubs	Herbaceous	Invasive	Bare Ground	Open Water
Spring 2013	0	5	5	0	90	0

5.2.4 Monitoring Station 5

Monitoring Station 5 is located on the north side of a small drainage swale just north of the parking area (Figure 2). A small portion of the plot extends from the shrub plantings into the dune grass areas. Photographs were taken aligned with the shoreline, approximately Northeast, Southeast, Southwest and Northwest (Appendix B). LWD has been placed along OHW near this monitoring station. The plant species and quantities are presented below in Table 11 and the canopy cover values in Table 12. Overall, shrubs appeared to be in good health following planting. Signs of new buds sprouting were noted on several plants.

Overall low values for cover can be attributed to how recent this as-built event followed restoration plantings. Visible mounds of mulch were still evident surrounding each plant and the area between plantings remained bare topsoil.

No invasive, volunteer, or recruited species have yet occurred within this monitoring station. This drainage was previously dominated by Himalayan blackberry, which has been removed, preserving large patches of native rose and emergent vegetation. Seagulls, crows and bufflehead were active in this area.

TABLE 11. HEALTH AND QUANTITY OF SPECIES OBSERVED AT MONITORING STATION 5

Species	Canopy Layer	Status[1]	Planted	Alive 2013	Apparent Health
Oceanspray (*Holodus discolor*)	Shrub	P	16	16	Healthy in appearance.
Dune grass (*Leymus mollis*)	Herbaceous	P	26	26	Healthy in appearance.

Note:
[1]P = Planted, V = Volunteer, R = Recruit, TNTC = Too Numerous To Count

TABLE 12. PERCENT CANOPY COVER AT MONITORING STATION 5

Event and Year	Percent Cover (%)					
	Trees/Saplings	Shrubs	Herbaceous	Invasive	Bare Ground	Open Water
Spring 2013	0	5	5	0	90	0

5.2.5 LWD Installation

To protect the newly graded shoreline and increase the habitat value of restored areas, LWD was installed along the newly defined OHW. A total of 52 logs were counted along OHW during the February site visit. Overall the wood appeared to be firmly in place and performing as expected. It was noted that several gaps exist along the line of installed logs, probably resulting from recent king tides that occurred following installation. Shoreline LWD can be viewed in pages 2 and 3 of Appendix A and plan diagrams found in Appendix B.

To protect backshore areas near the historic kiln site, 12 logs with root wads attached were placed parallel to shore with vertical timbers buried near the root wad to maintain their alignment. This installation is visible in photograph 4 of Appendix A with plan diagrams included in Appendix B.

6.0 SUMMARY

Construction was recently completed on the Irondale Iron and Steel Mill restoration site, with a few minor modifications as documented above. Observations made during the final site visit revealed that the installed plant species appear to be healthy with no signs of disease or insect damage. LWD shoreline protection is in place and functioning properly.

GeoEngineers scientists have identified that the installation is generally consistent with the restoration plan with minor adjustments due to hydrologic conditions and agency requirements.

Overall, the condition of the plants and habitat areas are satisfactory. Continued project success will be reliant upon compliance with the monitoring and maintenance measures outlined herein.

7.0 LIMITATIONS

GeoEngineers, Inc. has prepared this as-built report in general accordance with the scope and limitations of our proposal. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No warranty or other conditions expressed or implied should be understood.

This report has been prepared for the exclusive use of Washington State Department of Ecology and authorized agents and regulatory agencies, following the described methods and information available at the time of the work. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. The information contained herein should not be applied for any purpose or project except the one originally contemplated.

8.0 REFERENCES

GeoEngineers, Inc. 2012. Final Engineering Design Report, Irondale Iron and Steel Plant. Prepared for Washington State Department of Ecology. May 1, 2012.

GeoEngineers, Inc. 2009. Revised Draft Cleanup Action Plan, Irondale Iron and Steam Plant. Prepared for Washington State Department of Ecology. August 31, 2009.

Washington State Department of Ecology (Ecology). April 2012. Specifications for Irondale Iron and Steel Plant Cleanup Action. Irondale, Washington. IFB 1237 TCP.

FIGURES

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Data Sources: ESRI Data & Maps, Street Maps 2005.
Chimacum Creek Tidelands location obtained from "Health Consultation. Evaluation of Selected Metals in Irondale Beach Park and Chimacum Creek Tidelands Shell Fish." Irondale, Jefferson County, Washington. Agency for Toxic Substances and Disease Registry. July 28, 2008.

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

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Vicinity Map

Irondale Iron and Steel Plant
Irondale, Washington

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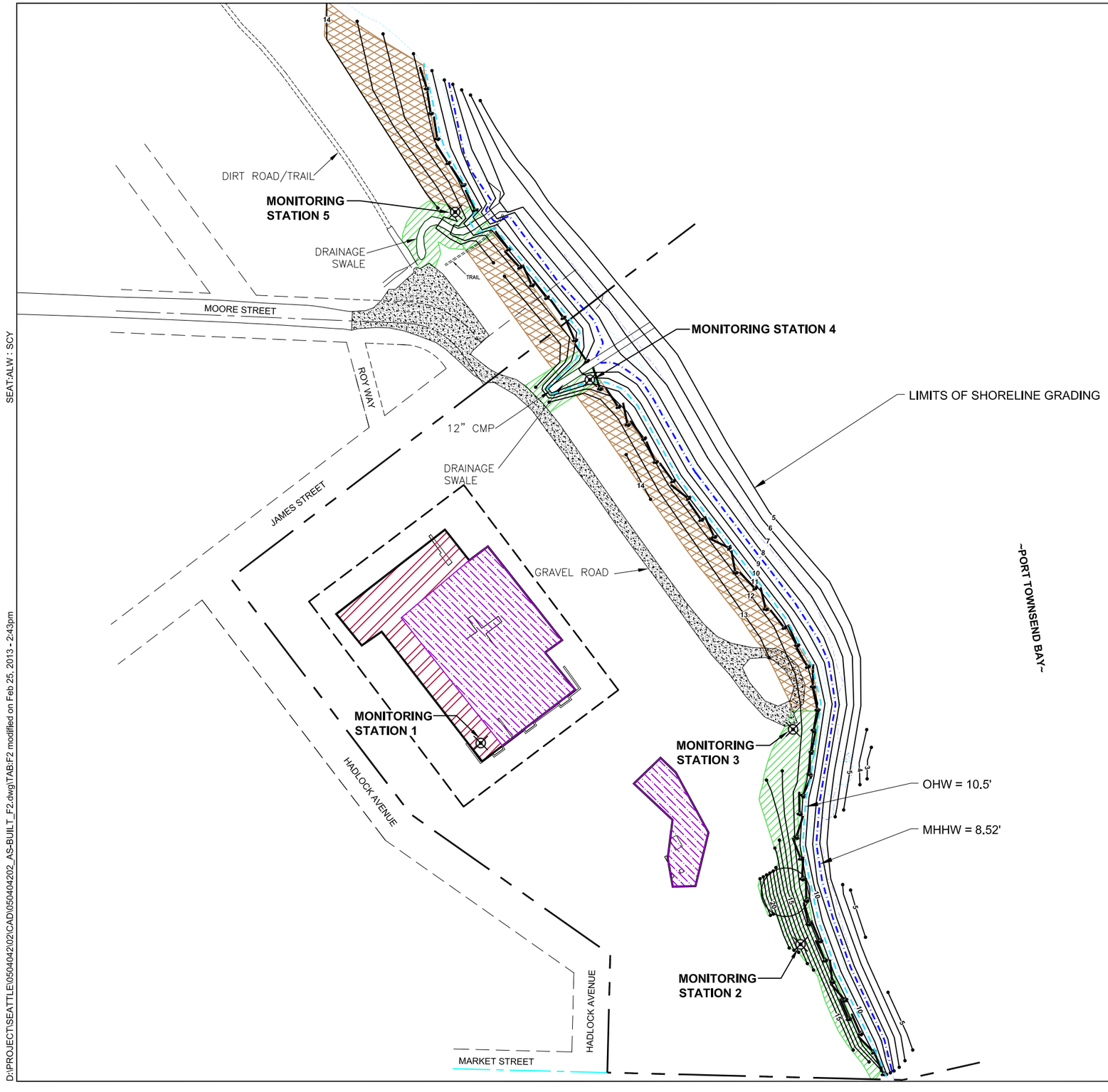
Figure 1



LEGEND

- BACKSHORE DUNEGRASS PLANTING AREA
- SHORELINE TREE AND SHRUB PLANTING AREA
- UPLAND CAP SHRUB PLANTING AREA
- UPLAND CAP HYDRO-SEED AREA
- LARGE WOODY DEBRIS
- FINAL GRADE CONTOURS
- MHHW
- OHW
- **MONITORING STATION 1** — MONITORING STATION NUMBER AND APPROXIMATE LOCATION

N, W, E, S

150 0 150
Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Drawing provided by Washington State Department of Ecology.

Landscaping As-Built Drawing

Irondale Remedial Cleanup Action
Irondale, Washington

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Figure 2

SEAT:ALW : SCY

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APPENDICES

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APPENDIX A
Site Photographs

Photograph 1
Hydroseed area of upland soil cap showing new germination.

Photograph 2
Volunteer-labor invasive species removal was conducted following environmental remediation.

Photograph 3
Invasive species removal included Himalayan blackberry and English ivy.

Photograph 4
View south of plantings and LWD root wads around historic kiln site.

Site Photographs

Irondale Iron and Steel Plant
Irondale, Washington

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Figure A-1

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Photograph 5
View north of transition from shoreline tree/shrub plantings to backshore dunegrass. Recent ATV tracks visible in dunegrass area.

Photograph 6
Shoreline LWD viewed south toward historic kiln area.

Photograph 7
Lower (restored) section of the southern drainage swale.

Photograph 8
Upstream of the restored portion of the southern drainage swale. Some invasive species removal evident to the left (southeast).

Site Photographs

Irondale Iron and Steel Plant
Irondale, Washington

GeoEngineers | **Figure A-2**

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Photograph 9
Restored portion of the northern drainage swale
viewed from the north.

Photograph 10
View south from the northern extent of shoreline
LWD installation.

Photograph 11
King tides following shoreline LWD installation
resulted in several logs being relocated.

Site Photographs	
Irondale Iron and Steel Plant Irondale, Washington	
GeoEngineers	Figure A-3

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Photograph 12
Monitoring station 1 looking northwest.

Photograph 13
Monitoring station 1 looking northeast.

Photograph 14
Monitoring station 1 looking southwest.

Photograph 15
Monitoring station 1 looking southeast.

Site Photographs Monitoring Station 1

Irondale Iron and Steel Plant
Irondale, Washington

GeoEngineers | **Figure A-4**

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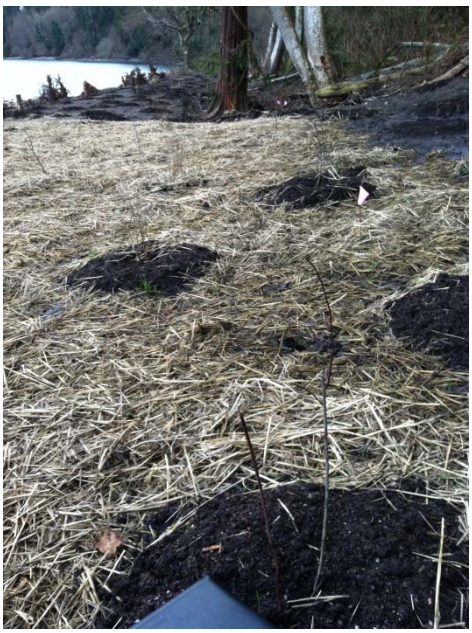
Photograph 16
Monitoring station 2 looking north.

Photograph 17
Monitoring station 2 looking east.



Photograph 18
Monitoring station 2 looking south.

Photograph 19
Monitoring station 2 looking west.

Site Photographs Monitoring Station 2

Irondale Iron and Steel Plant
Irondale, Washington

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Figure A-5

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Photograph 20
Monitoring station 3 looking north.

Photograph 21
Monitoring station 3 looking east.

Photograph 22
Monitoring station 3 looking south.

Photograph 23
Monitoring station 3 looking west.

Site Photographs Monitoring Station 3

Irondale Iron and Steel Plant
Irondale, Washington

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Figure A-6

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Photograph 24
Monitoring station 4 looking northwest.

Photograph 25
Monitoring station 4 looking northeast.

Photograph 26
Monitoring station 4 looking southwest.

Photograph 27
Monitoring station 4 looking southeast.

Site Photographs Monitoring Station 4	
Irondale Iron and Steel Plant Irondale, Washington	
GeoEngineers	Figure A-7

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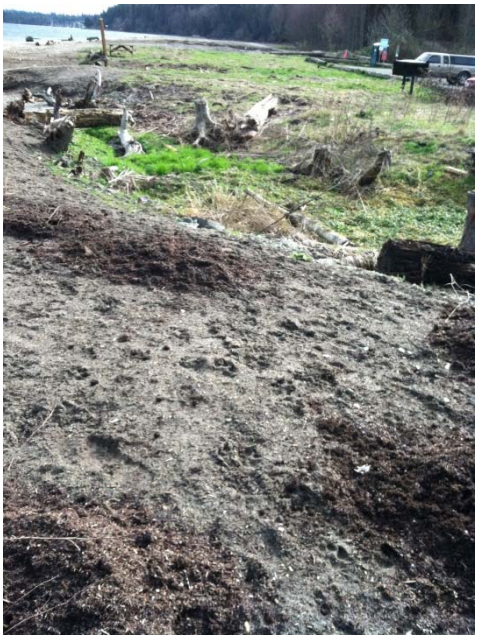
Photograph 28
Monitoring station 5 looking northwest.

Photograph 29
Monitoring station 5 looking northeast.

Photograph 30
Monitoring station 5 looking southwest.



Photograph 31
Monitoring station 5 looking southeast.

Site Photographs Monitoring Station 5

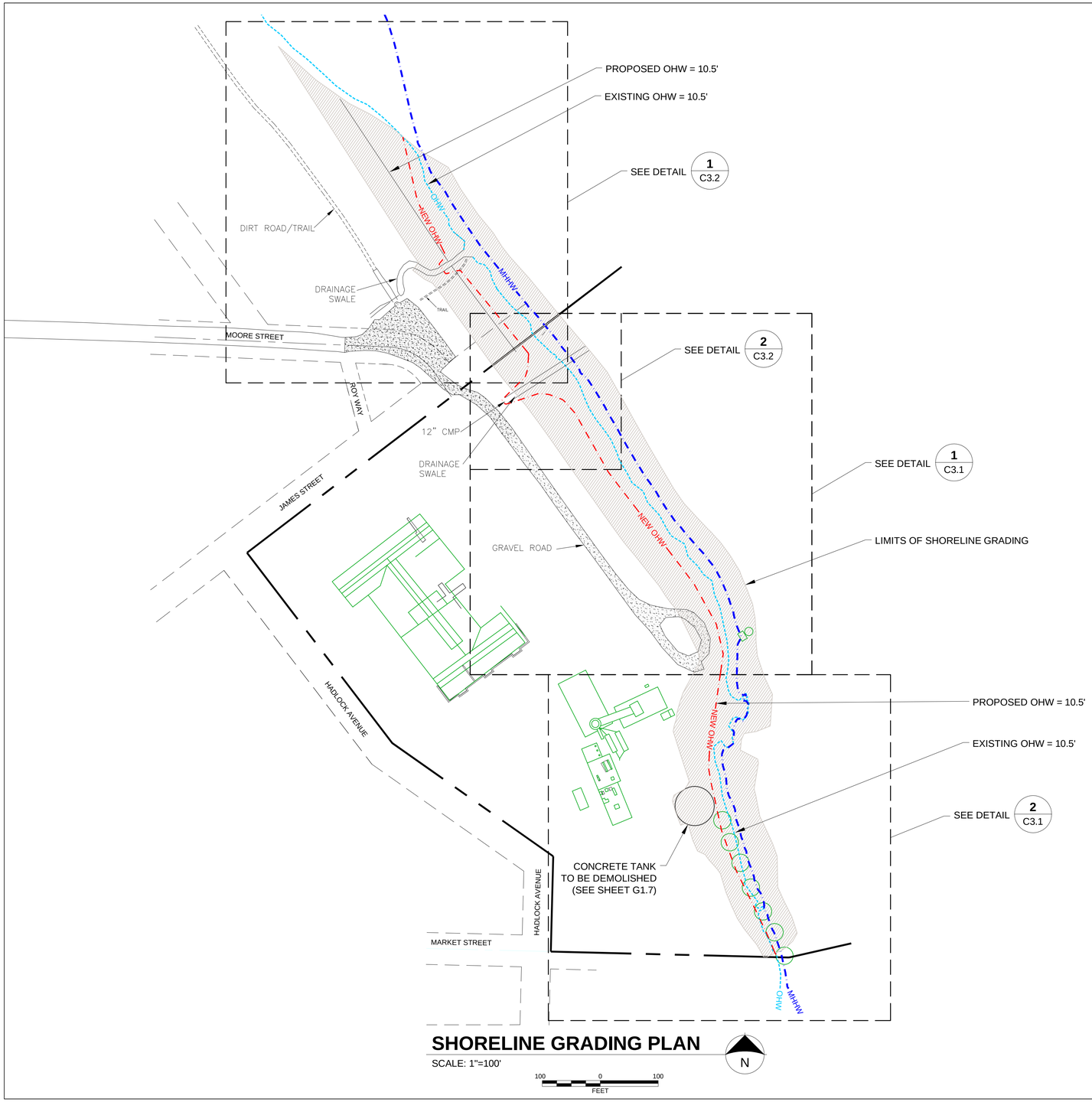
Irondale Iron and Steel Plant
Irondale, Washington

GeoEngineers

Figure A-8

0504-042-02

APPENDIX B
100 Percent Design Drawings



SHORELINE GRADING PLAN

SCALE: 1"=100'

N

100 0 100
FEET

NOTES

1. CONTRACTOR SHALL GRADE UPLAND SURFACE SOIL AND MARINE SEDIMENT WITHIN LIMITS SHOWN TO ACHIEVE PROPOSED GRADES AS SHOWN ON SHEETS C3.2 THROUGH C3.10.
2. ALL CONSTRUCTION VEHICLE INGRESS AND EGRESS SHALL BE PERFORMED IN ACCORDANCE WITH THE CONSTRUCTION PHASING/TRAFFIC CONTROL PLANS ON DRAWING G1.3.
3. CONTRACTOR MUST ADHERE TO ALL TERMS AND CONDITIONS SPECIFIED IN THE USACE NATIONWIDE PERMIT 38 FOR THE PROJECT.
4. THE CONTRACTOR SHALL PERFORM IN-WATER WORK (BELOW OHW) ONLY DURING THE PERIODS OF JULY 16 THROUGH OCTOBER 14, 2012.
5. EXCAVATION OF CONTAMINATED MARINE SEDIMENT BELOW OHW SHALL NOT OCCUR WHEN THE IMMEDIATE WORK AREA IS INUNDATED BY TIDAL WATERS. CONTINUED WORK AS TIDE RISES IS ALLOWED IF BEHIND SHORING THAT LIMITS INFILTRATION OF TIDE WATERS AND PREVENTS RELEASE OF CONSTRUCTION WATER DIRECTLY TO TIDE WATER.
6. WATER QUALITY SHALL BE MAINTAINED TO WITHIN PROJECT PERMIT LIMITS AT ALL TIMES. CONTRACTOR SHALL UTILIZE BEST MANAGEMENT PRACTICES TO MINIMIZE TURBIDITY AND CONTAIN TURBID WATERS, SHEEN, AND DEBRIS WITHIN THE WORK AREA.
7. WORK IN THE INTERTIDAL ZONE WILL TAKE PLACE, WHENEVER POSSIBLE, AROUND THE TIDE CYCLE AND BE PERFORMED WHILE THE SITE IS EXPOSED. FOR WORK OUTSIDE AREAS OF CONTAMINATED SEDIMENT THAT REQUIRES LONGER THAN ONE LOW TIDE CYCLE, AN ANCHORED SILT CURTAIN WILL BE USED TO CONTAIN SEDIMENTS. FOR AREAS WHERE CONTAMINATED SEDIMENT IS EXCAVATED BEHIND SHORING, AS PRESENTED ON SHEET C1.1, BACKFILL OF THE CONTAMINATED SEDIMENT EXCAVATIONS SHALL BE COMPLETED PRIOR TO REMOVING SHORING.
8. VESSEL SPECIFICATIONS, NAVIGATION, AND MOORAGE SHALL BE COMPLETED IN ACCORDANCE WITH ALL U.S. COAST GUARD, STATE, AND LOCAL REGULATIONS, AND CONTRACTOR'S VESSEL MANAGEMENT PLAN.
9. AREAS WITH MATERIAL TO BE REMOVED FOR SHORELINE GRADING PURPOSES ONLY, OUTSIDE OF REMEDIAL EXCAVATION AREAS, SHALL BE GRADED TO PROPOSED FINAL GRADE SHOWN ON DRAWINGS AND MADE ACCESSIBLE TO ECOLOGY'S REPRESENTATIVE TO DETERMINE IF NATIVE MATERIAL AT GRADE IS SUITABLE AS FINAL SURFACE MATERIAL. IF NATIVE MATERIAL AT PROPOSED FINAL GRADE IS UNSUITABLE, CONTRACTOR SHALL EXCAVATE AN ADDITIONAL 1-FOOT OF MATERIAL BELOW PROPOSED FINAL GRADE.
10. ALL EXCAVATION ACTIVITIES WILL BE MONITORED BY ECOLOGY-CONTRACTED ARCHEOLOGICAL RESOURCES SPECIALIST IN ACCORDANCE WITH THE CULTURAL RESOURCES MONITORING AND DISCOVERY PLAN. DISCOVERY OF POTENTIAL ARTIFACTS MAY RESULT IN TEMPORARY WORK STOPPAGES.
11. SOIL AND SEDIMENT EXCAVATED OUTSIDE OF REMEDIAL EXCAVATION AREAS WILL BE STOCKPILED ON SITE AND USED FOR BACKFILLING REMEDIAL EXCAVATIONS AND AS UPLAND CAP MATERIAL. MATERIAL EXCAVATED OUTSIDE OF REMEDIAL EXCAVATIONS SHALL BE STOCKPILED SEPERATELY FROM POTENTIALLY CONTAMINATED SOIL AND SEDIMENT FROM REMEDIAL EXCAVATION AREAS. ALL STOCKPILED MATERIAL WILL BE SAMPLED FOR VERIFICATION OF CONTAMINANT CONCENTRATIONS BY ECOLOGY'S REPRESENTATIVE.
12. STOCKPILED MATERIAL WILL BE EVALUATED BY ECOLOGY'S REPRESENTATIVE FOR SUITABILITY FOR BACKFILL USE PRIOR TO APPROVAL FOR USE AS BACKFILL.
13. SHORELINE EXCAVATION IN AREAS NORTH OF SLAG OUTCROP SHALL BE PERFORMED PRIOR TO OR CONCURRENT WITH REMEDIAL EXCAVATION (SHEET C1.0) AND ENVIRONMENTAL CAPPING (SHEET C2.0) TO ENSURE AVAILABILITY OF BACKFILL AND CAP MATERIAL.
14. DRAINAGE SWALE LOCATED AT NORTH END OF JEFFERSON COUNTY PROPERTY (SHEET C3.2, DETAIL 2) SHALL BE REGRADED PER THE LINES PRESENTED ON THE DRAWINGS, WITHOUT ALTERING THE 12-INCH CMP CULVERT.
15. REMEDIAL EXCAVATION AREAS WATER-WARD OF PROPOSED NEW OHW SHALL BE BACKFILLED TO PROPOSED FINAL GRADE WITH VERIFIED CLEAN AND SUITABLE SAND BACKFILL MATERIAL GENERATED ON SITE. REMEDIAL EXCAVATION AREAS ABOVE PROPOSED NEW OHW SHALL BE BACKFILLED TO 1-FOOT BELOW PROPOSED FINAL GRADE WITH VERIFIED CLEAN BACKFILL MATERIAL GENERATED ON SITE.
16. THE UPPER 1-FOOT OF ALL EXCAVATION AREAS ABOVE PROPOSED NEW OHW SHALL BE BACKFILLED TO PROPOSED FINAL GRADE WITH TOPSOIL MEETING SPECIFICATIONS FOR PLANTING.
17. AREA WITHIN 6,000 BARREL OPEN TOP CONCRETE TANK SHALL BE BACKFILLED CONCURRENT WITH DEMOLITION (SEE SHEET G1.7) TO THE EXTENT POSSIBLE TO PREVENT COLLAPSE OF NATIVE SOIL AGAINST THE WALL OF THE TANK.
18. LARGE WOODY DEBRIS SHALL BE PLACED ALONG THE PROPOSED NEW OHW IN ACCORDANCE WITH THE LANDSCAPE AND RESTORATION PLAN DRAWING L1.0.
19. GRAVEL TURNAROUND AT SOUTHERN END OF EXISTING ACCESS ROAD SHALL BE REMOVED AS NEEDED TO ACHIEVE GRADING AND RESTORED IN ACCORDANCE WITH THE LANDSCAPE AND RESTORATION PLAN DRAWING L1.0.

LEGEND

- Concrete Tank to be Removed
- Approximate location of Historic Kiln
- Approximate Location of new OHW
- Limits of Shoreline Grading for Restoration

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Irondale Iron and Steel Plant Cleanup Action

Washington State Department of Ecology

SHORELINE GRADING PLAN

DRAWN:	TJM	PROJECT NO.:	50404201
DESIGN:	CLB	SCALE:	1"=80'
CHECKED:	DAC	DATE:	8/31/11

SHEET NO.
C3.0

100-PERCENT DESIGN

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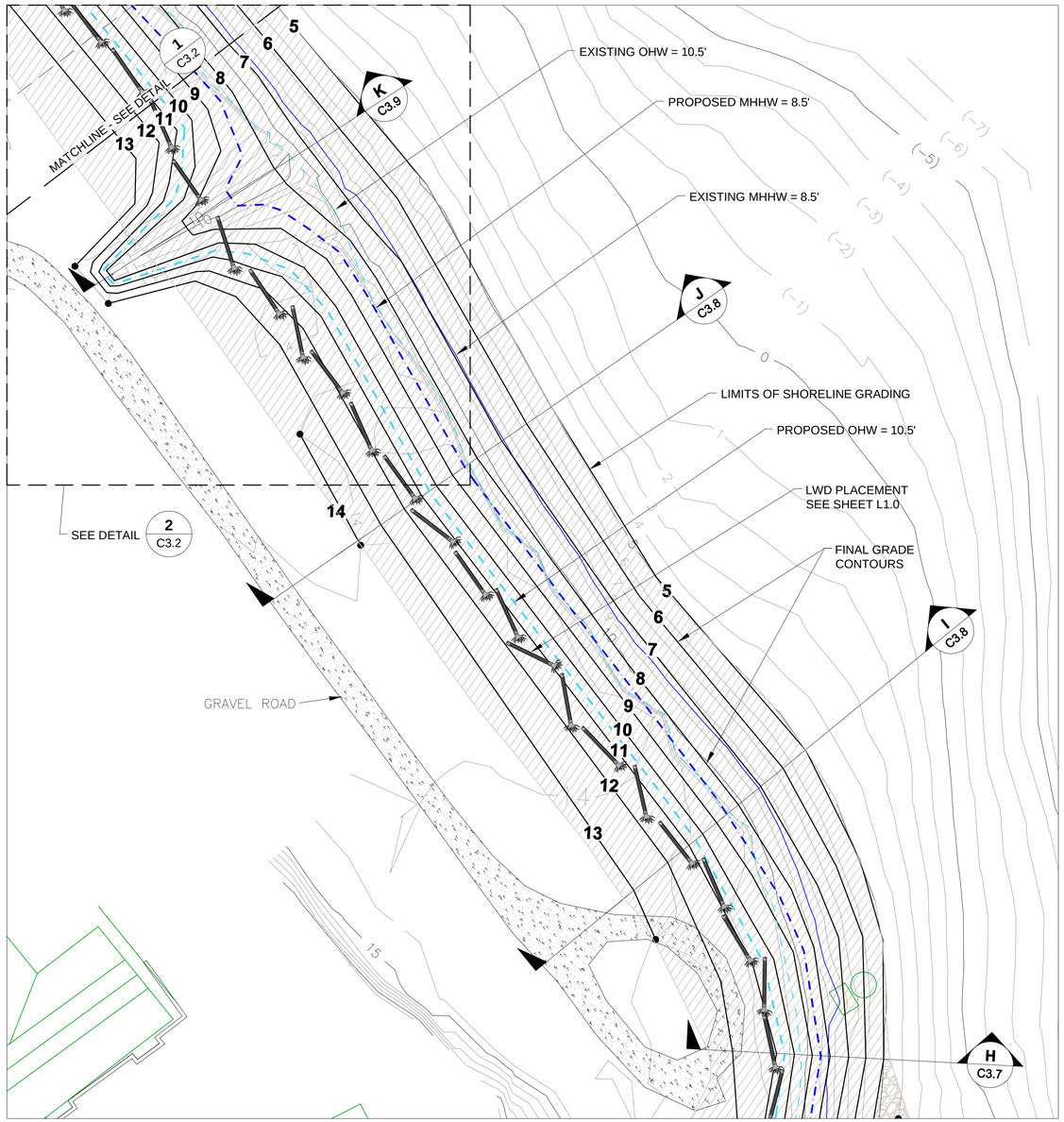


NORTH SHORELINE GRADING DETAILS 1

SCALE: 1"=40'

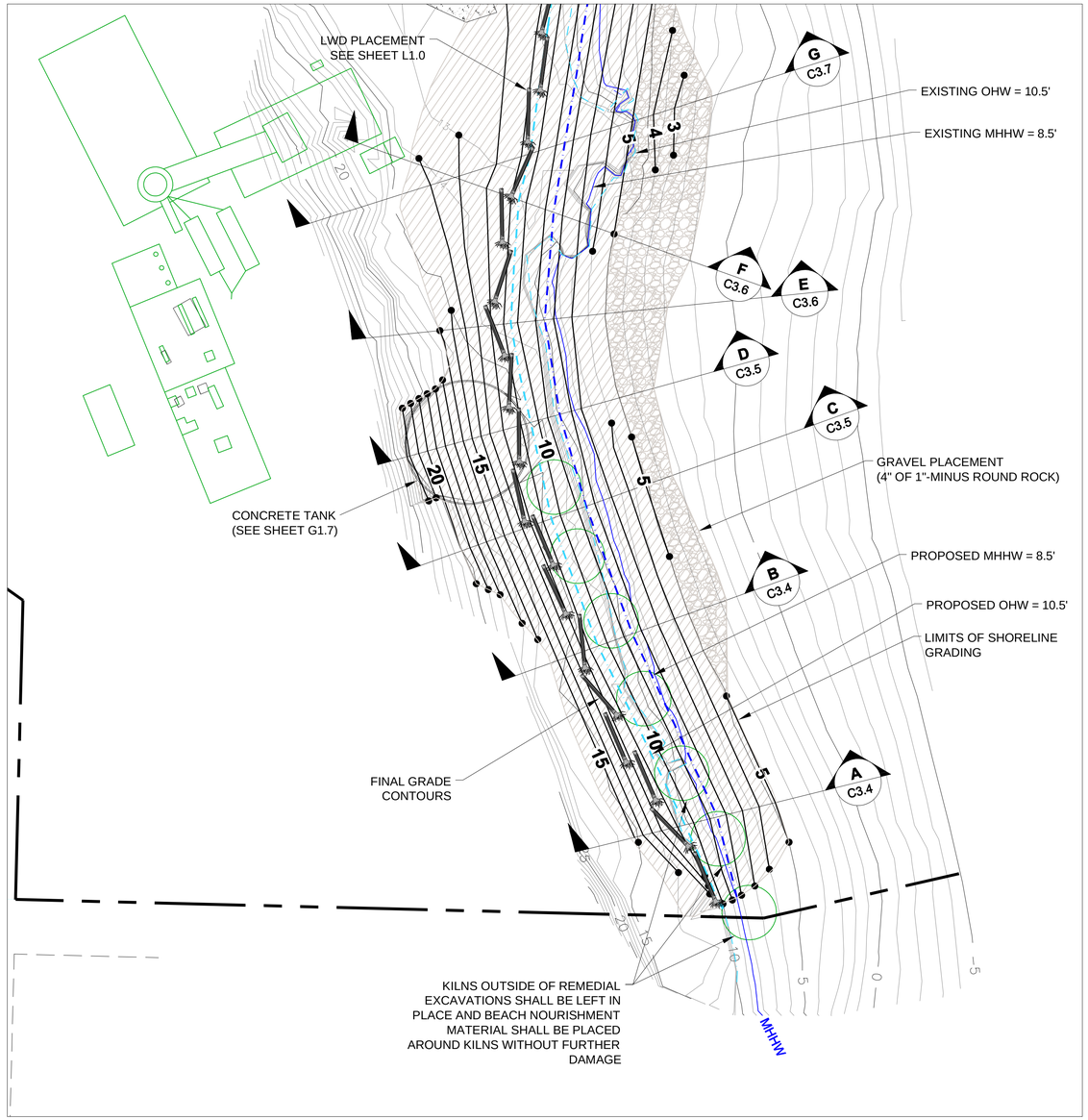
C3.0

GRAPHIC SCALE

N

40 0 40

FEET



SOUTH SHORELINE GRADING DETAILS 2

SCALE: 1"=40'

C3.0

GRAPHIC SCALE

N

40 0 40

FEET

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SHORELINE GRADING DETAILS

DRAWN:	TJM	PROJECT NO.:	50404201
DESIGN:	CLB	SCALE:	1"=40'
CHECKED:	DAC	DATE:	8/31/11

SHEET NO.

C3.1

100-PERCENT DESIGN

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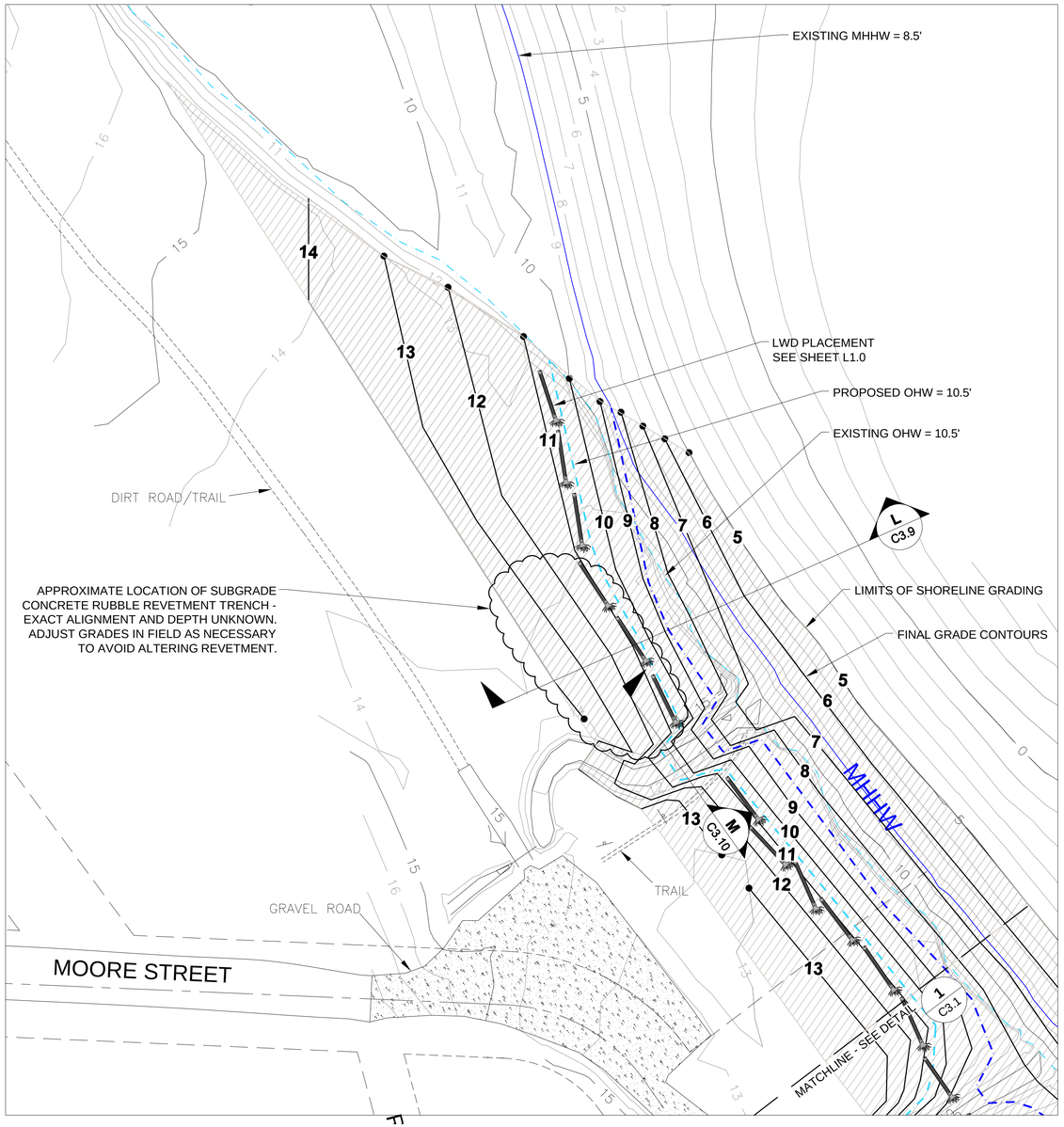


WDFW PROPERTY SHORELINE GRADING DETAIL 1

SCALE: 1"=40'

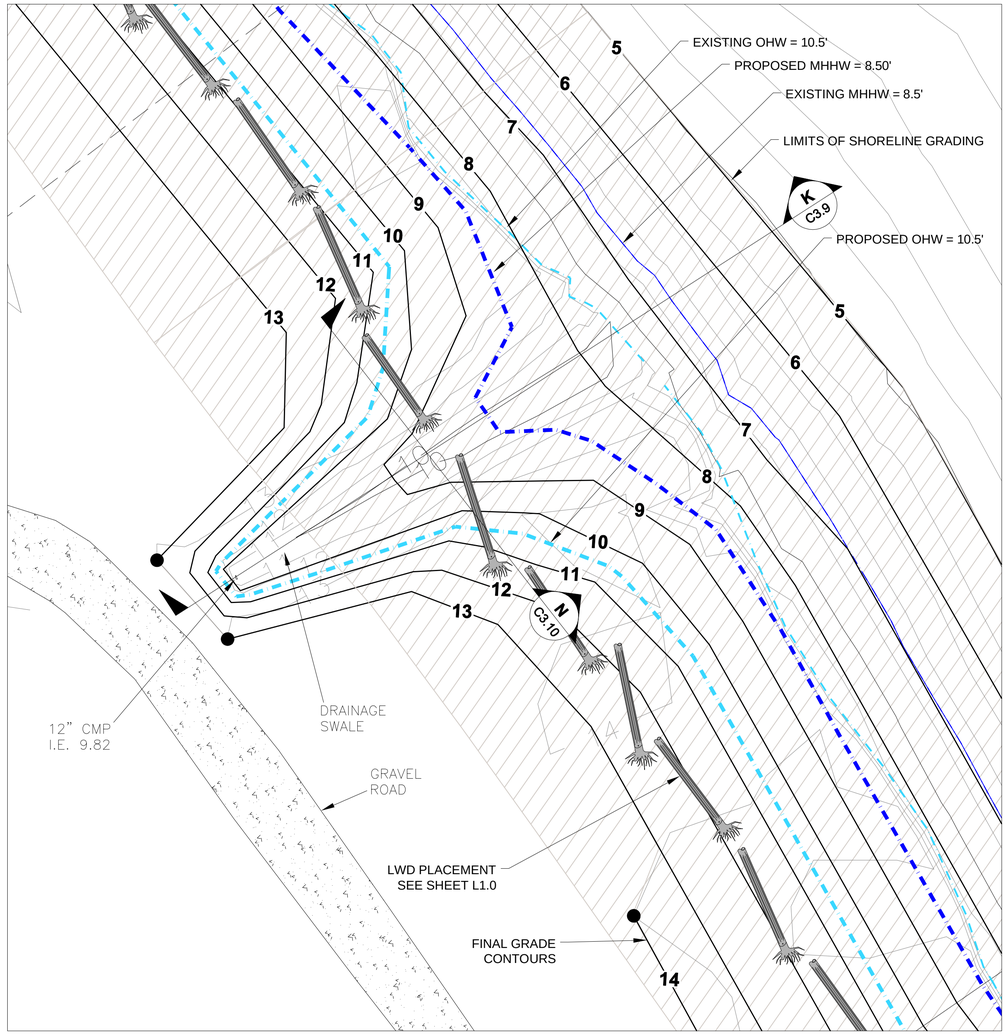
C3.0

GRAPHIC SCALE

N

40 0 40

FEET



DRAINAGE SWALE GRADING DETAILS 2

SCALE: 1"=20'

C3.0

GRAPHIC SCALE

N

20 0 20

FEET

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SHORELINE GRADING DETAILS

DRAWN:	TJM	PROJECT NO.:	50404201
DESIGN:	CLB	SCALE:	
CHECKED:	DAC	DATE:	8/31/11

SHEET NO.

C3.2

100-PERCENT DESIGN

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SHORELINE GRADING DETAILS

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DESIGN: CLB	SCALE:
CHECKED:	DATE: 8/31/11
SHEET NO. C3.3	

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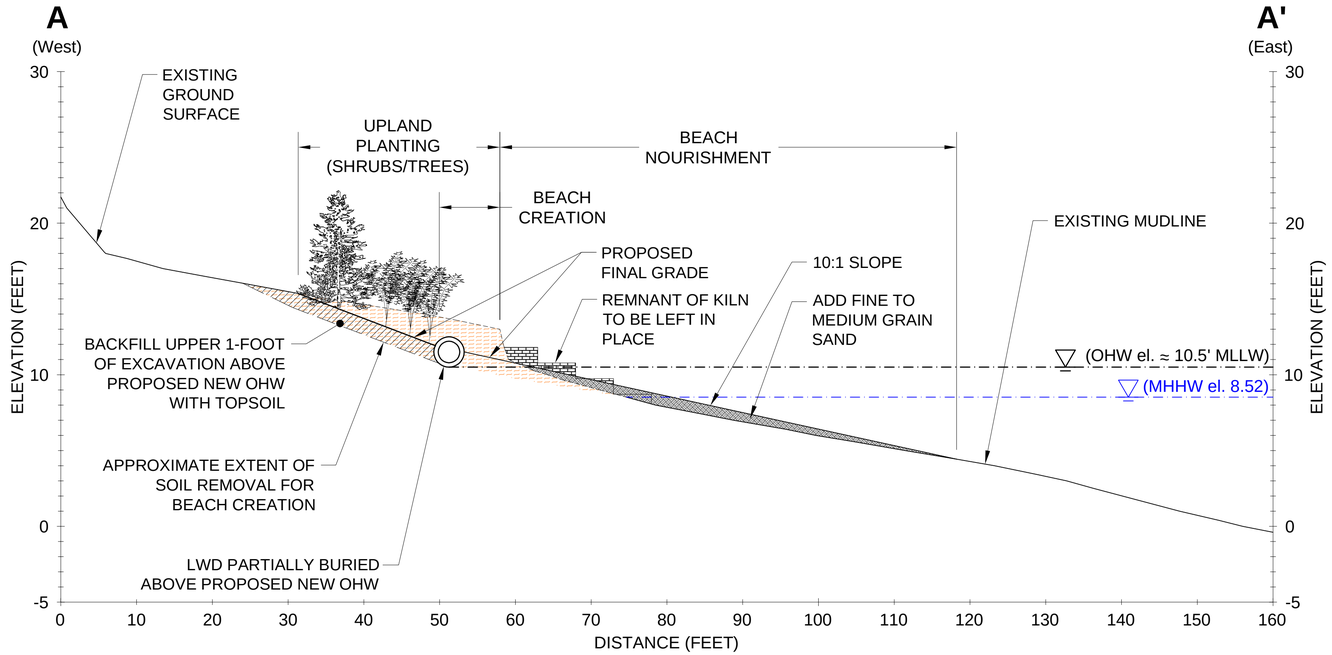
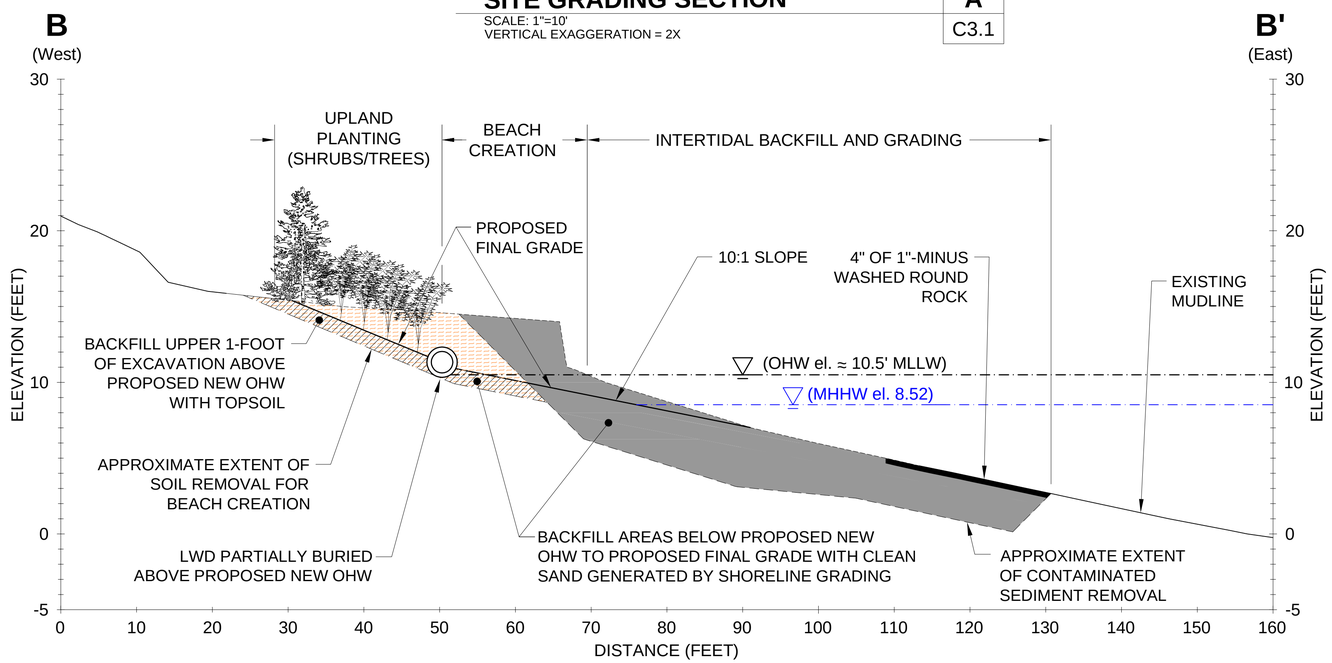


SITE GRADING SECTION

SCALE: 1"=10'
VERTICAL EXAGGERATION = 2X

A
C3.1



SITE GRADING SECTION

SCALE: 1"=10'
VERTICAL EXAGGERATION = 2X

B
C3.1

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SITE GRADING SECTIONS

DRAWN:	TJM	PROJECT NO.:	50404201
DESIGN:	CLB	SCALE:	
CHECKED:	DAC	DATE:	8/31/11

SHEET NO.
C3.4

100-PERCENT DESIGN

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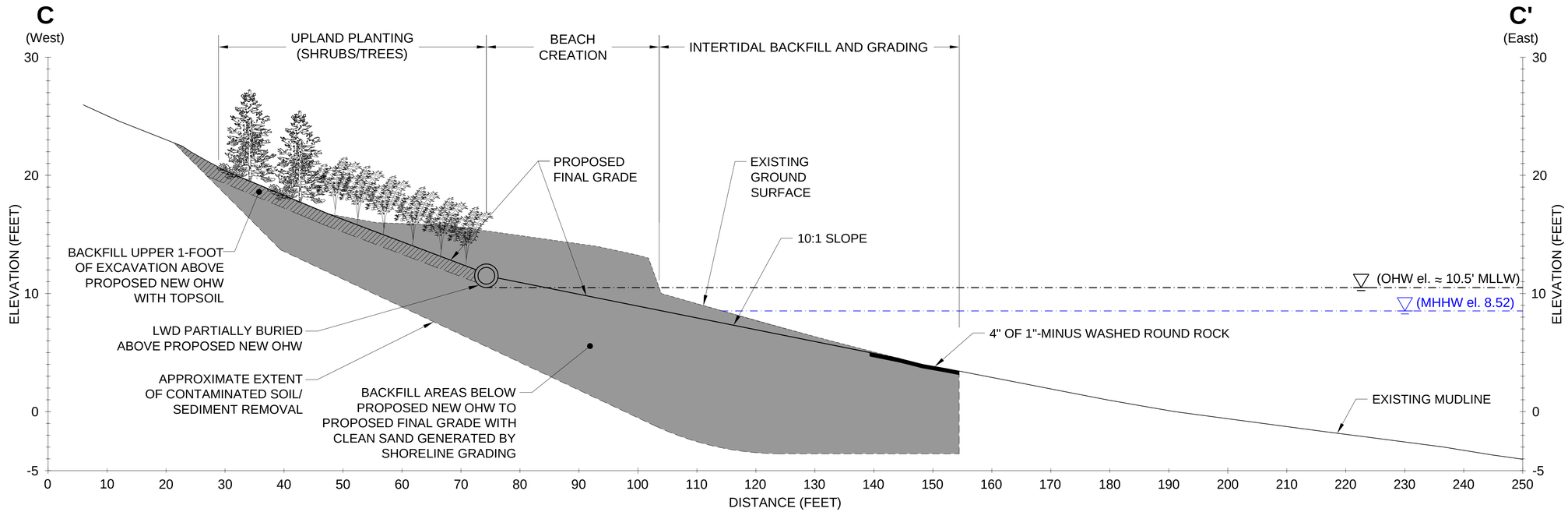

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SCALE: 1"=10'
VERTICAL EXAGGERATION = 2X

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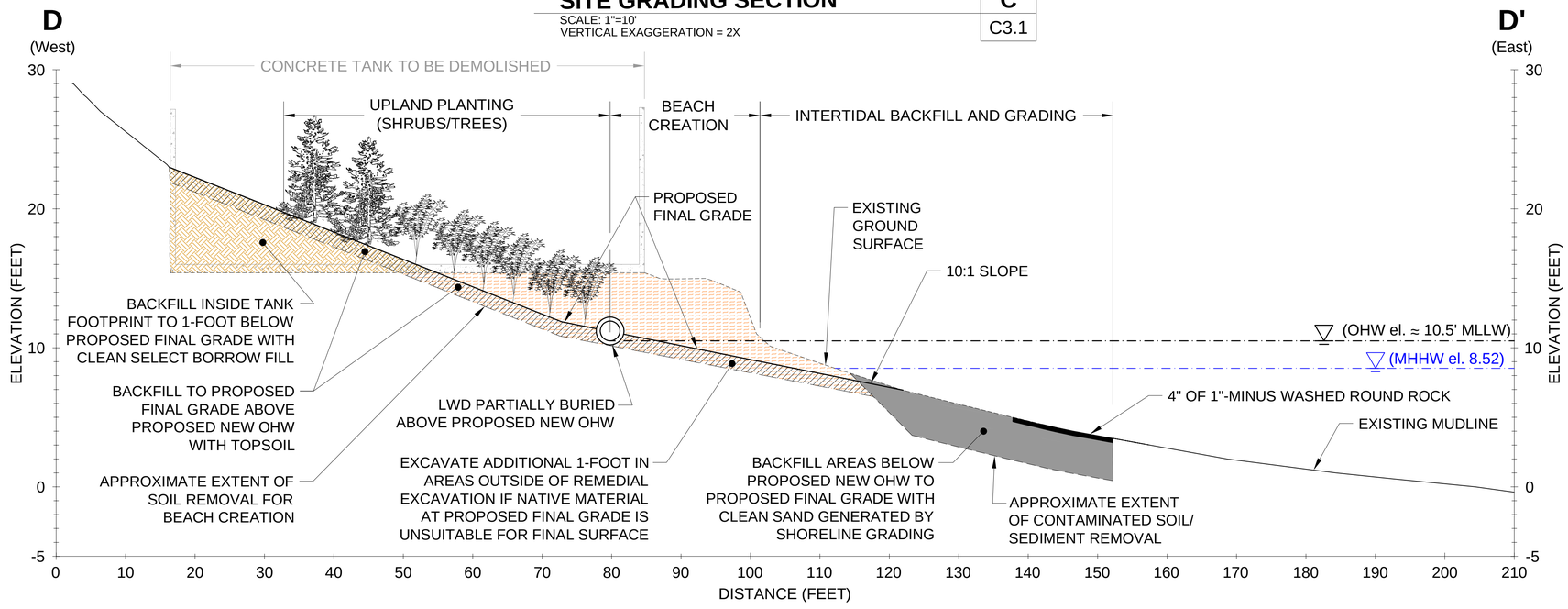

SITE GRADING SECTION

SCALE: 1"=10'
VERTICAL EXAGGERATION = 2X

D
C3.1

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SITE GRADING SECTIONS

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CHECKED:	DAC	DATE:	8/31/11

SHEET NO.
C3.5

100-PERCENT DESIGN

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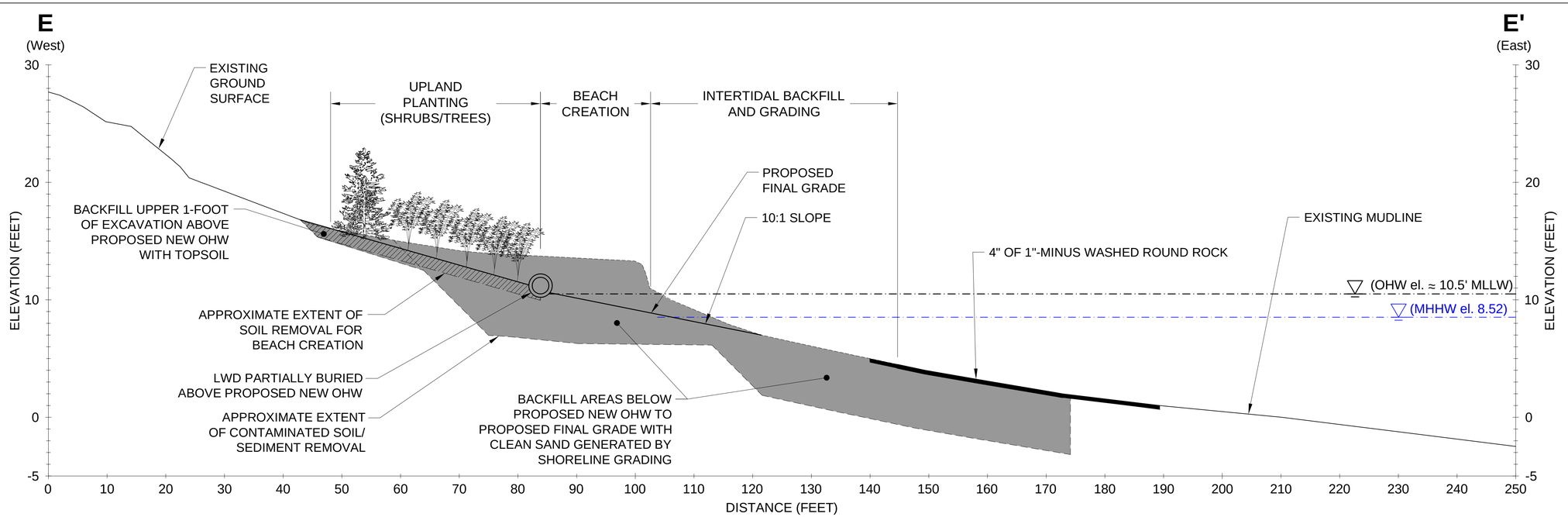

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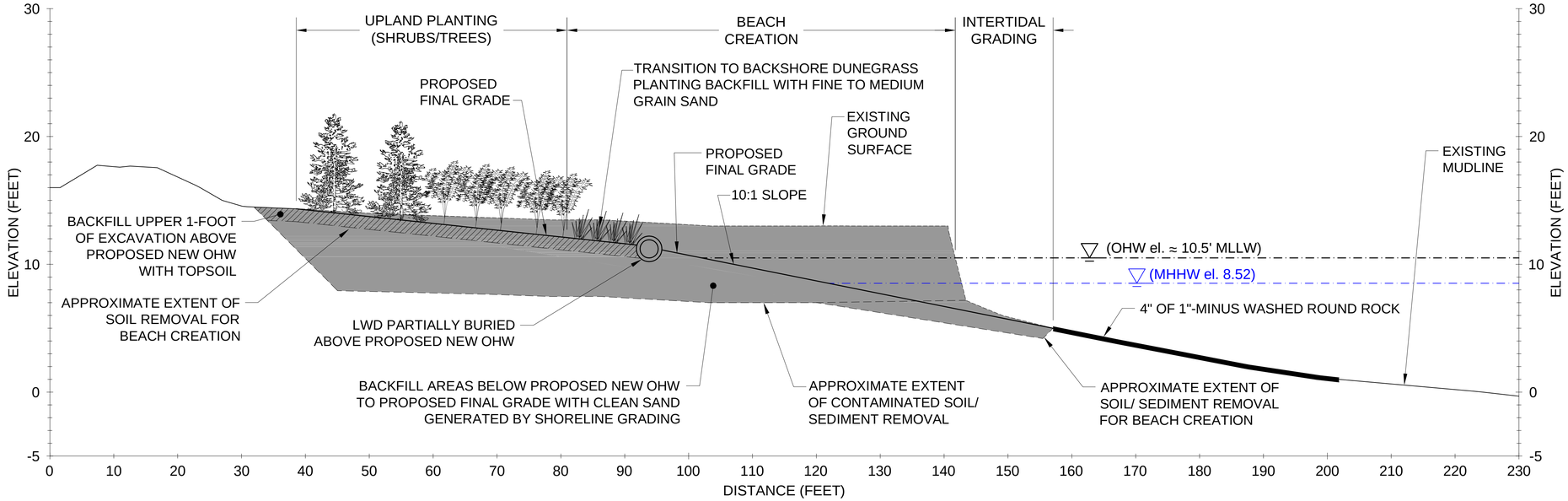

SITE GRADING SECTION

SCALE: 1"=10'
VERTICAL EXAGGERATION = 2X

F
C3.1

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SITE GRADING SECTIONS

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DESIGN: CLB	SCALE:
CHECKED: DAC	DATE: 8/31/11
SHEET NO.	C3.6

100-PERCENT DESIGN

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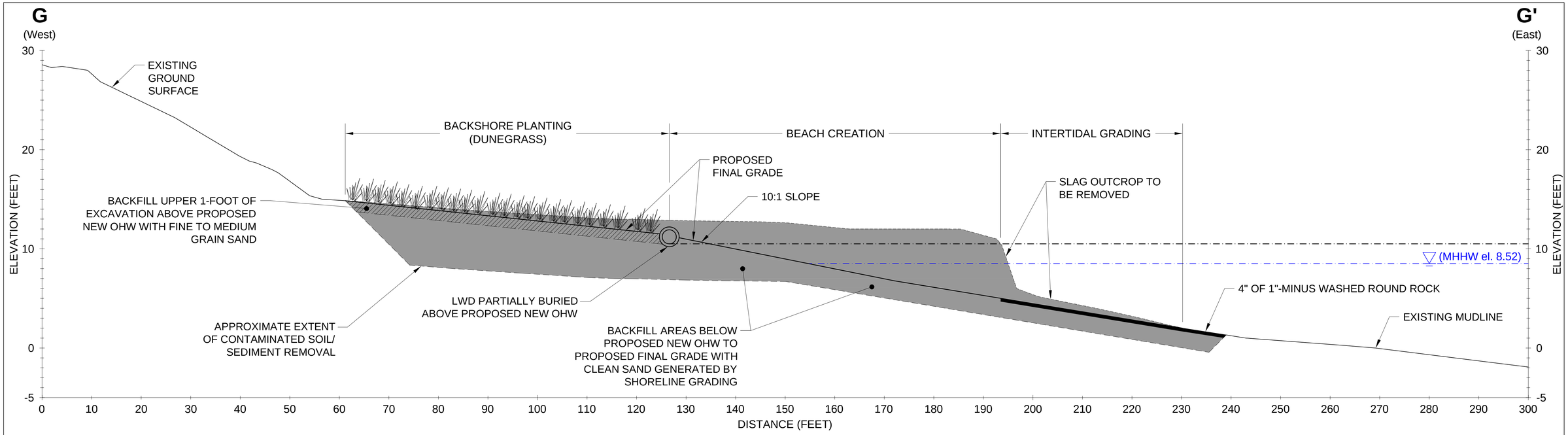

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VERTICAL EXAGGERATION = 2X

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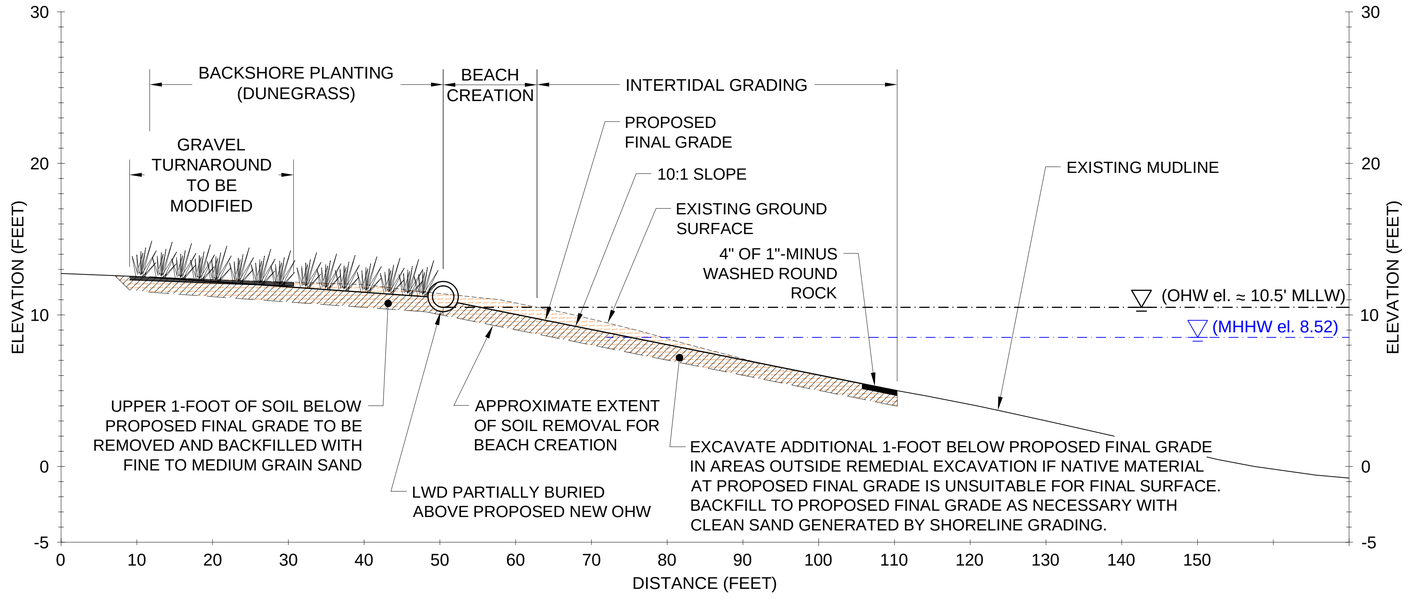

SITE GRADING SECTION

SCALE: 1"=10'
VERTICAL EXAGGERATION = 2X

H
C3.1

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SITE GRADING SECTIONS

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DESIGN:	CLB	SCALE:	
CHECKED:	DAC	DATE:	8/31/11
SHEET NO.			

C3.7

100-PERCENT DESIGN

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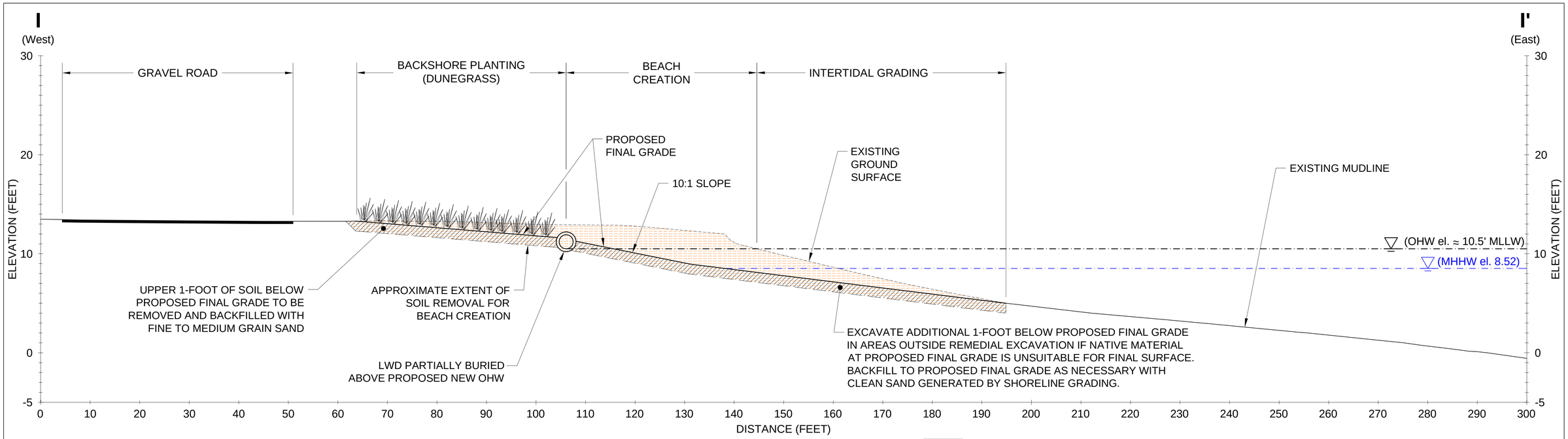
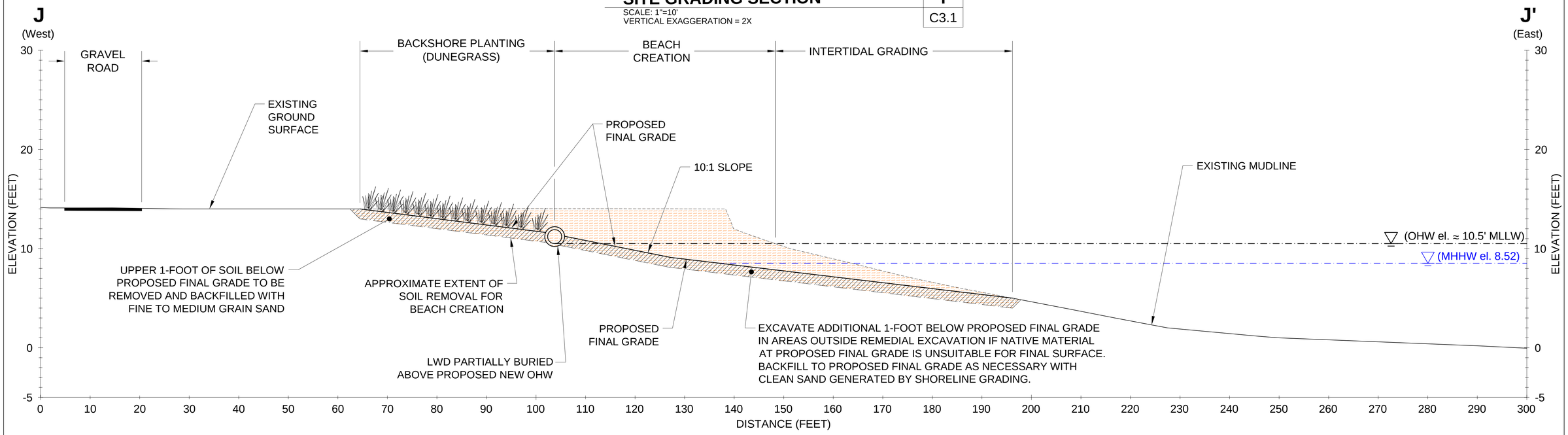


SITE GRADING SECTION

SCALE: 1"=10'
VERTICAL EXAGGERATION = 2X

I
C3.1



SITE GRADING SECTION

SCALE: 1"=10'
VERTICAL EXAGGERATION = 2X

J
C3.1

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SITE GRADING SECTIONS

DRAWN:	TJM	PROJECT NO.:	50404201
DESIGN:	CLB	SCALE:	
CHECKED:	DAC	DATE:	8/31/11

SHEET NO.
C3.8

100-PERCENT DESIGN

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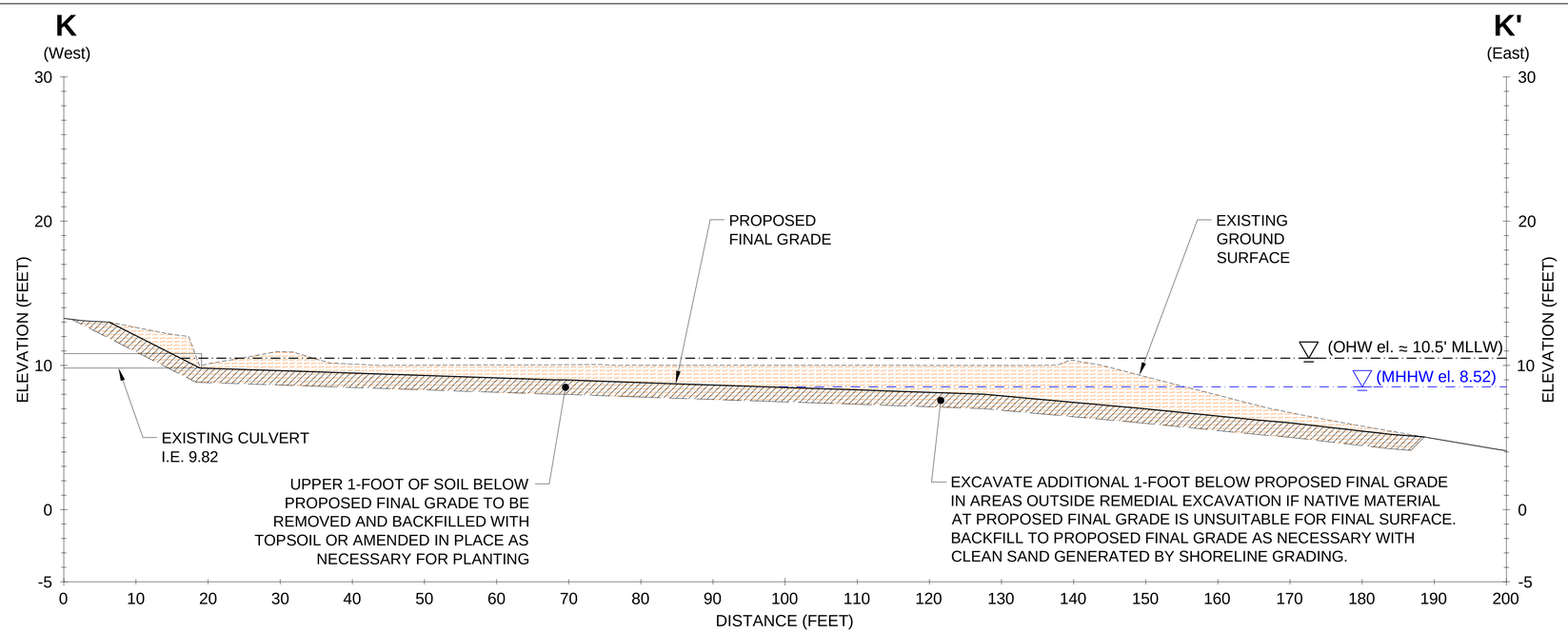
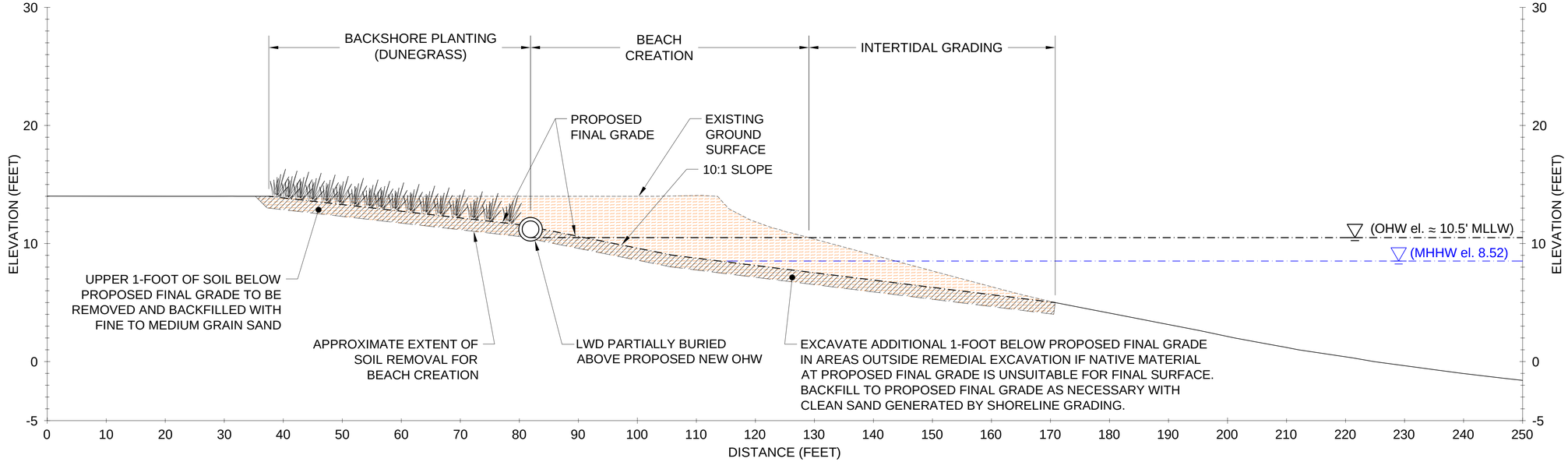


SITE GRADING SECTION

SCALE: 1"=10'
VERTICAL EXAGGERATION = 2X

K
C3.2



SITE GRADING SECTION

SCALE: 1"=10'
VERTICAL EXAGGERATION = 2X

L
C3.2

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SITE GRADING SECTIONS

DRAWN: TJM	PROJECT NO.: 50404201
DESIGN: CLB	SCALE:
CHECKED: DAC	DATE: 8/31/11
SHEET NO. C3.9	

100-PERCENT DESIGN

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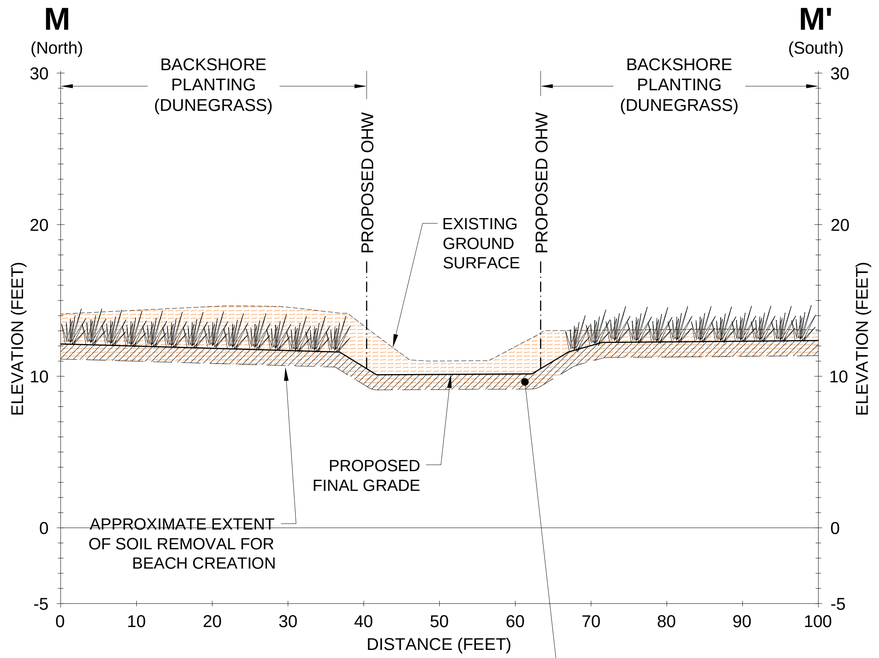
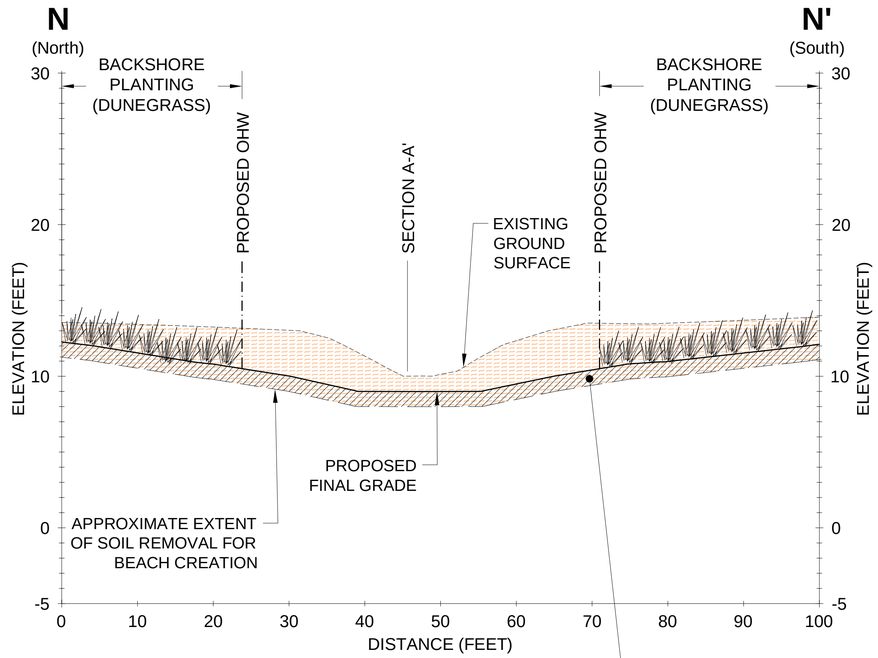


EXCAVATE ADDITIONAL 1-FOOT BELOW PROPOSED FINAL GRADE IN AREAS OUTSIDE REMEDIAL EXCAVATION IF NATIVE MATERIAL AT PROPOSED FINAL GRADE IS UNSUITABLE FOR FINAL SURFACE. BACKFILL TO PROPOSED FINAL GRADE AS NECESSARY WITH CLEAN SAND GENERATED BY SHORELINE GRADING.

SITE GRADING SECTION M

SCALE: 1"=10'
VERTICAL EXAGGERATION = 2X

C3.2



EXCAVATE ADDITIONAL 1-FOOT BELOW PROPOSED FINAL GRADE IN AREAS OUTSIDE REMEDIAL EXCAVATION IF NATIVE MATERIAL AT PROPOSED FINAL GRADE IS UNSUITABLE FOR FINAL SURFACE. BACKFILL TO PROPOSED FINAL GRADE AS NECESSARY WITH CLEAN SAND GENERATED BY SHORELINE GRADING.

SITE GRADING SECTION N

SCALE: 1"=10'
VERTICAL EXAGGERATION = 2X

C3.2

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Plaza 600 Building
600 Stewart Street, Suite 1700
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F: 206-728-2731

CHRISTOPHER LEWIS BAILEY STATE OF WASHINGTON 39963 REGISTERED PROFESSIONAL ENGINEER 5/21/12

NO.	DATE	BY	REVISION
1	3/23/12	CLB	UPDATE DRAWINGS FOR 2012 RE-BID

Irondale Iron and Steel Plant Cleanup Action

Washington State Department of Ecology

SITE GRADING SECTIONS

DRAWN:	TJM	PROJECT NO.:	50404201
DESIGN:	CLB	SCALE:	
CHECKED:	DAC	DATE:	8/31/11

SHEET NO.

C3.10

100-PERCENT DESIGN

P:\10\50404210\CAD\SHEET\CLEANUP ACTION SHEETS\50404201 SHEET C3.4_10 SITE GRADING SECTIONS.DWG\TAB:C3.10 MODIFIED BY TMICHAUD ON MAY 02, 2012 - 16:12

PLANTING PLAN 1 / P1.0
SCALE: 1"=100'

PLANTING NOTES

1. NO PLANTING SHALL BE PREFORMED PRIOR TO APPROVAL OF GRADING BY ECOLOGY. PLANTING LAYOUT TO BE APPROVED BY ECOLOGY.
2. FOR BACKSHORE DUNEGRASS PLANTING AREAS, SUBSTRATE SHOULD BE CLEAN, FINE TO MEDIUM GRAIN SAND OR SUITABLE NATIVE MATERIAL.
3. DUNEGRASS, TREE AND SHRUB PLANTINGS SHOULD BE SPACED ACCORDING TO ON-CENTER SPACINGS PROVIDED IN SHEET P1.1.
4. DUNEGRASS MAY BE SALVAGED FROM PROJECT AREA WITH APPROVAL OF LANDOWNER AND PROJECT BIOLOGIST.
5. A MINIMUM OF 4 INCHES OF ORGANIC MULCH IS REQUIRED AT THE BASE OF ALL TREES AND SHRUBS.
6. ADD UP TO ONE-FOOT OF TOPSOIL IN TREE AND SHRUB PLANTING AREAS. THE TOP 18" OF SUBSTRATE SHOULD BE A MIX OF SAND AND TOPSOIL (ONE THIRD SAND AND TWO THIRDS TOPSOIL.)
7. PLANT SUBSTITUTIONS SHALL BE APPROVED BY THE PROJECT BIOLOGIST.
8. PLANTS SHALL BE MAINTAINED BY CONTRACTOR AS NECESSARY, INCLUDING REGULAR WATERING DURING THE FIRST TWO YEARS.
9. IF SIGNS OF STRESS ARE OBSERVED, ADDITIONAL MEASURES SHOULD BE TAKEN TO INCREASE PLANT SURVIVAL.
10. PLANTING SUCCESS WILL BE DETERMINED BY THE PROJECT BIOLOGIST. IF SURVIVAL RATE IS LESS THAN 100% IN THE FIRST YEAR, THE CONTRACTOR WILL BE REQUIRED TO REPLANT DEAD PLANTS.

LEGEND

- BACKSHORE DUNEGRASS PLANTING AREA
- SHORELINE TREE AND SHRUB PLANTING AREA
- UPLAND CAP SHRUB PLANTING AREA
- LARGE WOODY DEBRIS (AT PROPOSED NEW OHW)
- FINAL GRADE CONTOURS
- PROPOSED MHHW

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CHRISTOPHER LEWIS BAILEY STATE OF WASHINGTON 39963 REGISTERED PROFESSIONAL ENGINEER 5/2/12

NO.	DATE	BY	REVISION
1	3/23/12	CLB	UPDATE DRAWINGS FOR 2012 RE-BID

Irondale Iron and Steel Plant Cleanup Action

Washington State Department of Ecology

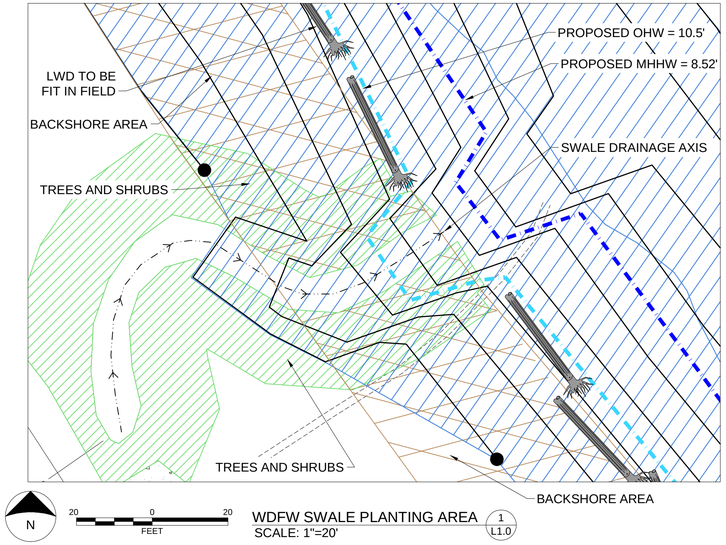
LANDSCAPING AND RESTORATION PLAN

DRAWN:	MGF	PROJECT NO.:	50404201
DESIGN:	CLB	SCALE:	NOTED
CHECKED:	DAC	DATE:	8/31/11

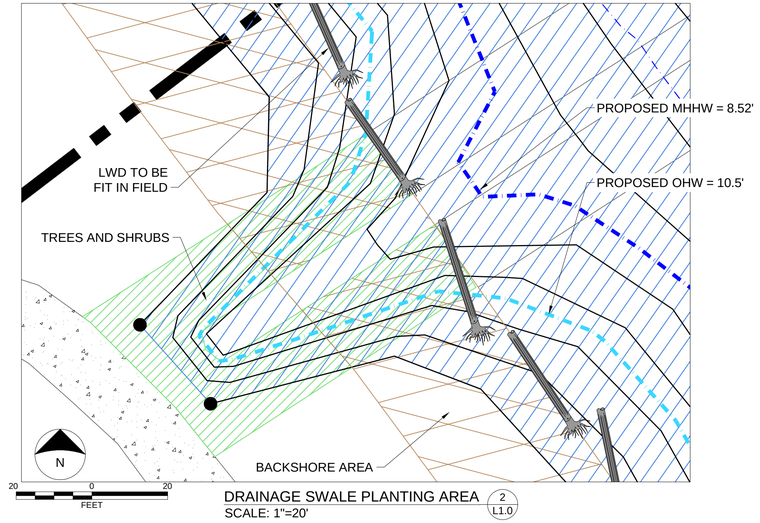
SHEET NO.
L1.0

100-PERCENT DESIGN

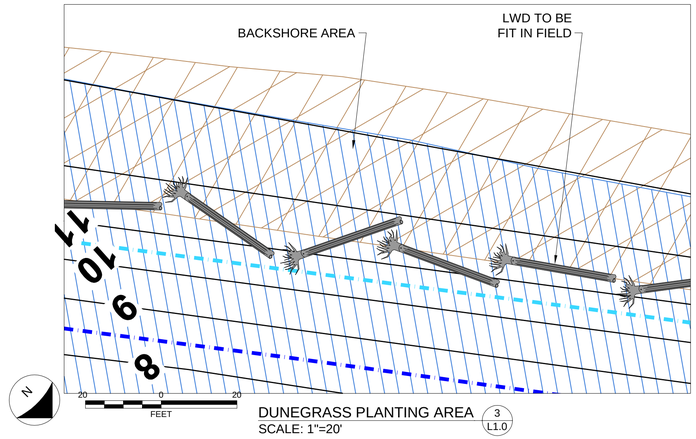
P:\01\0504042\01\CAD\SHEET\CLEANUP ACTION SHEETS\0504042-01 SHEET L1.0 PLANTING PLAN OVERVIEW.DWG\TAB:L1.0 MODIFIED BY TMICHAUD ON MAY 02, 2012 - 15:46



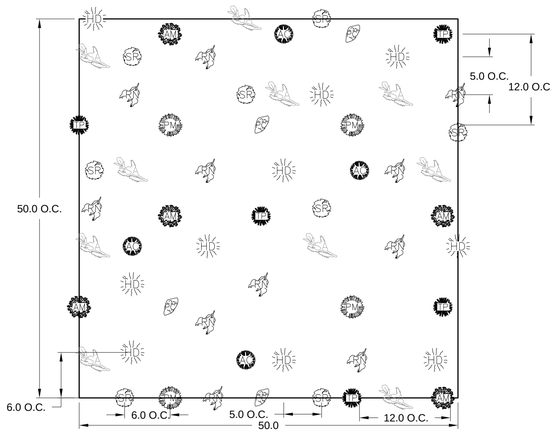
WDFW SWALE PLANTING AREA (1 / L1.0)
SCALE: 1"=20'



DRAINAGE SWALE PLANTING AREA (2 / L1.0)
SCALE: 1"=20'



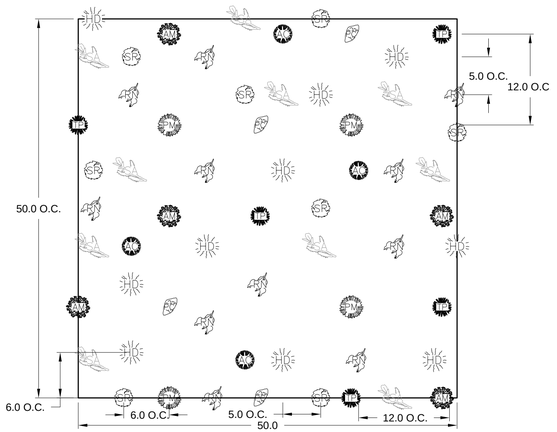
DUNEGRASS PLANTING AREA (3 / L1.0)
SCALE: 1"=20'



TREE AND SHRUB PLANTING AREA TYPICAL LAYOUT
SCALE: 1"=10'

TYPICAL TREE & SHRUB PLANTING ZONE TABLE

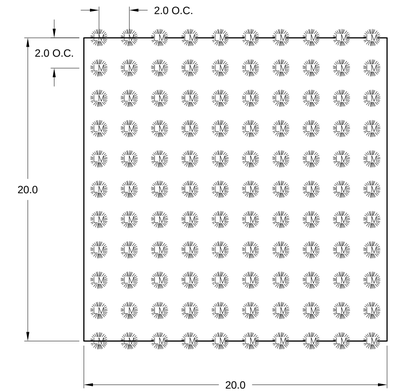
Symbol	Plant Species		Quantity	On Center Spacing (ft)
	Scientific Name	Common Name		
TYPICAL TREES				
PSM	*Pseudotsuga menziesii*	Douglas fir	31	12
PC	*Pinus contorta*	Shore pine	31	12
TPL	*Thuja plicata*	Western red cedar	46	12
ACM	*Acer macrophyllum*	Big-leaf maple	46	12
TYPICAL SHRUBS				
SR	*Rosa nutkana*	Nootka Rose	262	5
HD	*Holodiscus discolor*	Oceanspray	175	5
AC	*Acer circinatum*	Vine maple	61	6
SR	*Sambucus racemosa*	Red elderberry	121	6
SP	*Smyphoricarpos albus*	Snowberry	175	5



TREE AND SHRUB PLANTING AREA TYPICAL LAYOUT
SCALE: 1"=10'

TYPICAL TREE & SHRUB PLANTING ZONE TABLE

Symbol	Plant Species		Quantity	On Center Spacing (ft)
	Scientific Name	Common Name		
TYPICAL TREES				
PSM	*Pseudotsuga menziesii*	Douglas fir	31	12
PC	*Pinus contorta*	Shore pine	31	12
TPL	*Thuja plicata*	Western red cedar	46	12
ACM	*Acer macrophyllum*	Big-leaf maple	46	12
TYPICAL SHRUBS				
SR	*Rosa nutkana*	Nootka Rose	262	5
HD	*Holodiscus discolor*	Oceanspray	175	5
AC	*Acer circinatum*	Vine maple	61	6
SR	*Sambucus racemosa*	Red elderberry	121	6
SP	*Smyphoricarpos albus*	Snowberry	175	5



DUNEGRASS PLANTING AREA TYPICAL LAYOUT
SCALE: 1"=5'

TYPICAL DUNEGRASS PLANTING ZONE TABLE

Symbol	Plant Species		Quantity	On Center Spacing (ft)
	Scientific Name	Common Name		
LM	*Leymus Mollis*	Dunegrass	10890	2

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NO.	DATE	BY	REVISION
1	3/23/12	CLB	UPDATE DRAWINGS FOR 2012 RE-BID

Irondale Iron and Steel Plant Cleanup Action

Washington State Department of Ecology

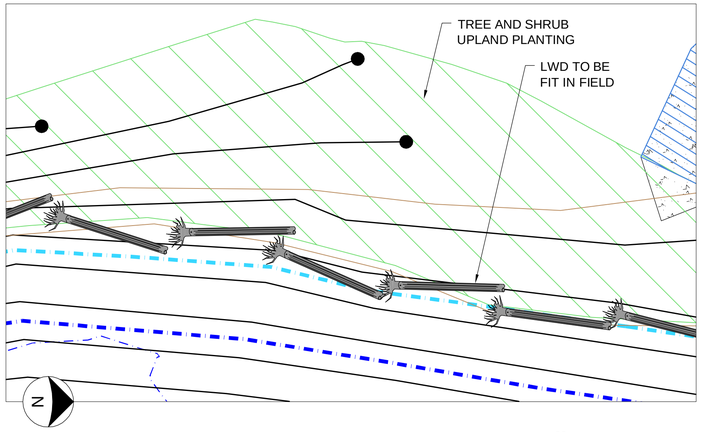
LANDSCAPE AND RESTORATION DETAILS

DRAWN:	CMV	PROJECT NO.:	50404201
DESIGN:	CLB	SCALE:	NOTED
CHECKED:	DAC	DATE:	8/31/11

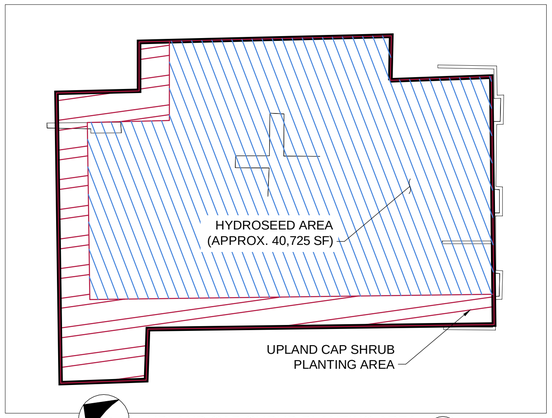
SHEET NO.
L1.1

100-PERCENT DESIGN

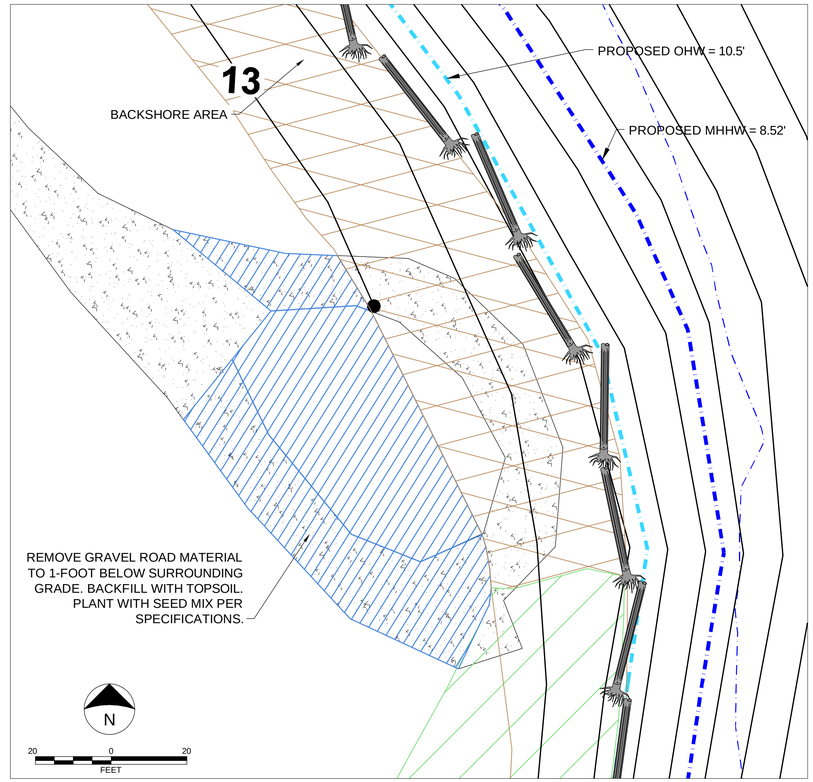
P:\01\0504042\01\CAD\SHEET\CLEANUP ACTION SHEETS\0504042-01 SHEET L1.1-L1.2 PLANTING PLAN DETAILS.DWG\TAB:SHEET L1.1 MODIFIED BY TMICHAUD ON MAY 02, 2012 - 15:49



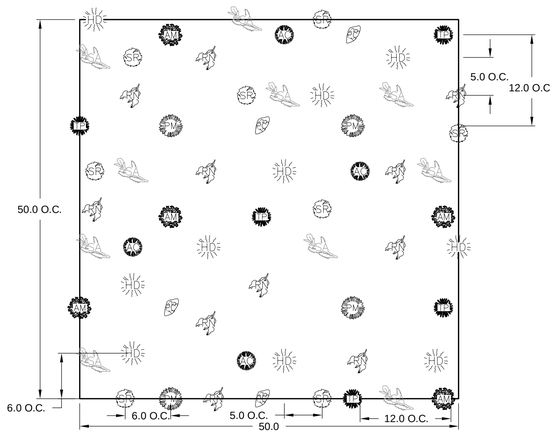
SHORELINE TREE AND SHRUB PLANTING AREA (4 / L1.0)
SCALE: 1"=20'



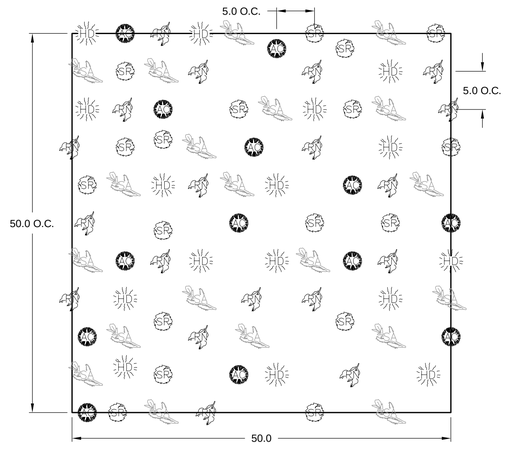
UPLAND CAP SHRUB PLANTING AREA (5 / L1.0)
SCALE: 1"=50'



ACCESS ROAD RESTORATION DETAIL PLANTING AREA (6 / L1.0)
SCALE: 1"=20'



SHORELINE TREE AND SHRUB PLANTING AREA TYPICAL LAYOUT
SCALE: 1"=10'



UPLAND CAP SHRUB PLANTING AREA TYPICAL LAYOUT
SCALE: 1"=10'

TYPICAL TREE & SHRUB PLANTING ZONE TABLE

Symbol	Plant Species		Quantity	On Center Spacing (ft)
	Scientific Name	Common Name		
TYPICAL TREES				
PSM	*Pseudotsuga menziesii*	Douglas fir	31	12
PCO	*Pinus contorta*	Shore pine	31	12
TPL	*Thuja plicata*	Western red cedar	46	12
ACM	*Acer macrophyllum*	Big-leaf maple	46	12
TYPICAL SHRUBS				
RNU	*Rosa nutkana*	Nootka Rose	262	5
HDI	*Holodiscus discolor*	Oceanspray	175	5
ACI	*Acer circinatum*	Vine maple	61	6
SRA	*Sambucus racemosa*	Red elderberry	121	6
SAL	*Smyphoricarpos albus*	Snowberry	175	5

TYPICAL SHRUB PLANTING ZONE TABLE

Symbol	Plant Species		Quantity	On Center Spacing (ft)
	Scientific Name	Common Name		
TYPICAL SHRUBS				
RNU	*Rosa nutkana*	Nootka Rose	75	5
HDI	*Holodiscus discolor*	Oceanspray	175	5
ACI	*Acer circinatum*	Vine maple	75	6
SRA	*Sambucus racemosa*	Red elderberry	121	6
SAL	*Smyphoricarpos albus*	Snowberry	75	5

EROSION CONTROL SEED MIX

Variety of Seed in Mixture	Percent by Weight (%)	Minimum Percent Pure Seed (%)	Minimum Percent Germination (%)
Red Creeping Fescue	40	98	90
Perennial Ryegrass	40	98	90
White Sweetclover (Melilotus Alba)	10	98	90
Highland Colonial Bentgrass	10	98	90

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Irondale Iron and Steel Plant Cleanup Action

Washington State Department of Ecology

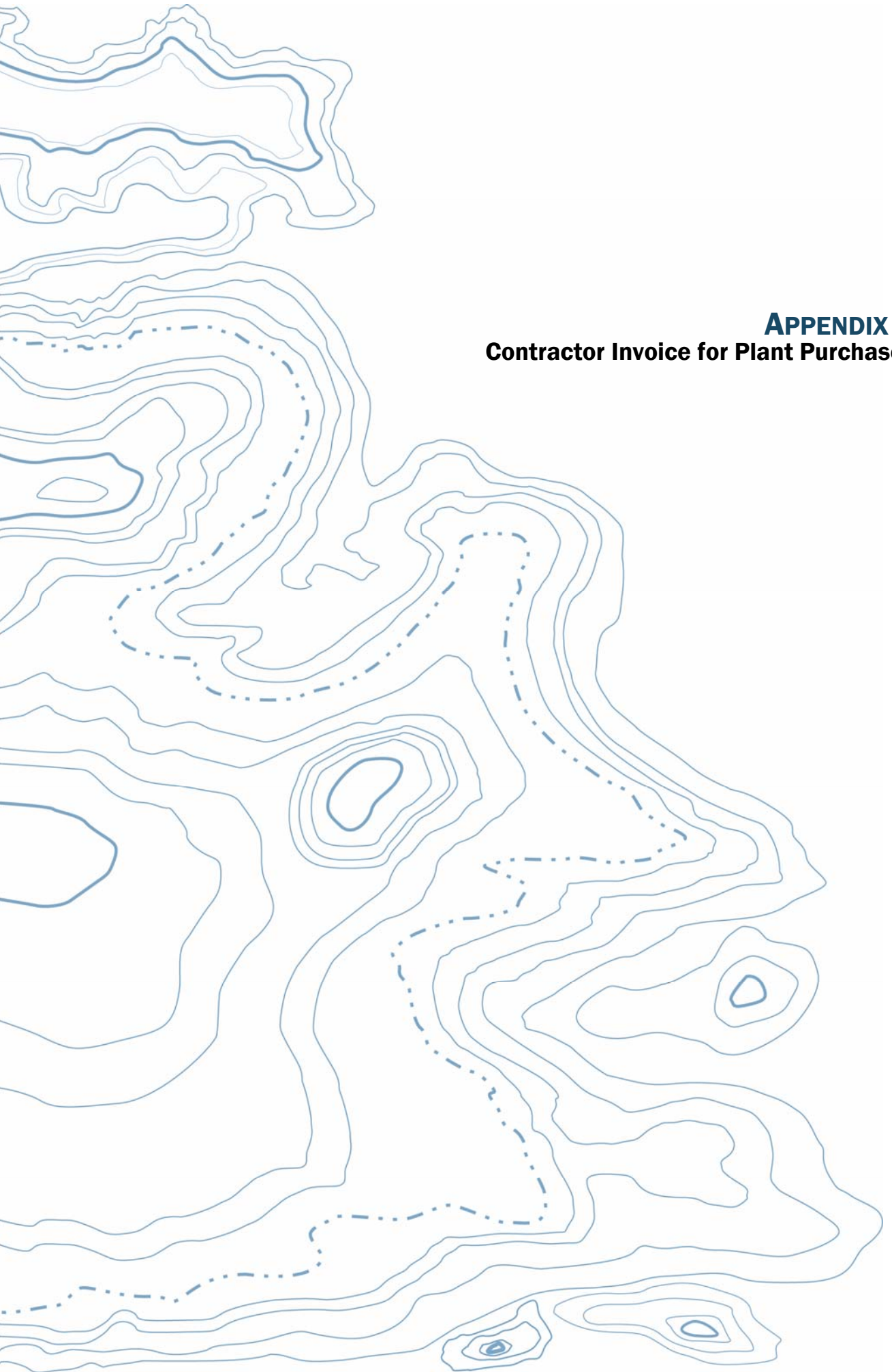
LANDSCAPE AND RESTORATION DETAILS

DRAWN:	CMV	PROJECT NO.:	50404201
DESIGN:	CLB	SCALE:	NOTED
CHECKED:	DAC	DATE:	8/31/11

SHEET NO. L1.2

100-PERCENT DESIGN

W:\SEATTLE\PROJECTS\0\0504042\0\CAD\SHEET\CLEANUP ACTION SHEETS\0504042-01 SHEET L1.1-L1.2 PLANTING PLAN DETAILS.DWG\TAB:SHEET L1.2 MODIFIED BY CVANSLYKE ON OCT 04, 2012 - 15:33



APPENDIX C
Contractor Invoice for Plant Purchases

Storm Lake Growers, Inc.

Invoice

18510 SR 203
Monroe, WA 98272
360-794-4842 Phone
360-794-8323 Fax

Date	Invoice #
12/11/2012	12-1002

PAID 12/13/2012

Bill To	Ship To
Killdeer Landscape	543 E. Moore St Port Hadlock/Irondale Steve 360-301-3194

P.O. Number	Terms	Rep	Ship	Via	F.O.B.	Project
	COD		12/11/2012	SL Truck		

Quantity	Item Code	Description	Price Each	Amount
11	PSEME1	Douglas Fir 1 gal	3.00	33.00
11	PINCO1	Shore Pine 1 gal	3.00	33.00
16	THUPL1	Cedar 1 gal	3.00	48.00
237	HOLDI1	Oceanspray 1 gal	3.00	711.00
97	ACECI1	Vine Maple 1 gal	3.00	291.00
164	SAMRA1	Red Elderberry 1 gal	3.00	492.00
169	ROSNU1	Nootka Rose 1 gal	3.00	507.00
137	SYMAL1	Snowberry 1 gal	3.00	411.00
1	DELIV	Delivery Charge	150.00	150.00
2	FERR	Ferry Charge	40.25	80.50
		Sales Tax	8.00%	0.00

Total $2,756.50

Have we delivered World Class Client Service?

Please let us know by visiting **www.geoengineers.com/feedback**.

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