

November 20, 2014

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


Attention: Steve Teel

Subject: Year-One Post-Construction Monitoring Report  
Shoreline Habitat Restoration  
Irondale Iron and Steel Plant  
Irondale, Washington  
File No. 0504-042-02

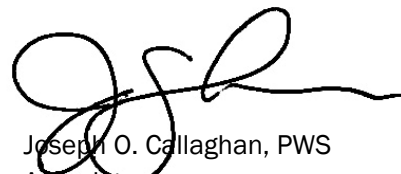
Thank you for choosing GeoEngineers, Inc. to provide this year-one post-construction monitoring report for the Irondale Iron and Steel Plant Habitat Enhancement, in Irondale, Jefferson County, Washington. Enclosed please find the report entitled "Year-One Post-Construction Monitoring Report, Irondale 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.



Shawn M. Mahugh  
Senior Biologist



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Enclosure:

Year-One Post-Construction Monitoring Report, Irondale Iron and Steel Plant Shoreline Habitat Restoration, Jefferson County, Washington



**Year-One Post-Construction  
Monitoring Report**

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

*for*

**Washington Department of Ecology**

November 20, 2014



**Year-One Post-Construction  
Monitoring Report**

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

*for*

**Washington Department of Ecology**

November 20, 2014



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**Year-One Monitoring Report**  
**Irondale Iron and Steel Plant**  
**Shoreline Habitat Restoration**  
**Jefferson County, Washington**

**File No. 0504-042-02**

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Prepared for:

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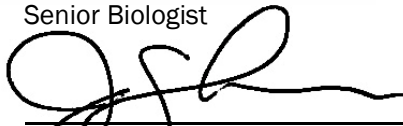
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## 1.0 INTRODUCTION

GeoEngineers, Inc. (GeoEngineers) has prepared this year-one post-construction monitoring report for Washington State Department of Ecology (Ecology) to document the progress of 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 a 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). Cleanup activities included the placement of two earthen caps in the western portion of the site.

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 year-one post-construction conditions of the shoreline habitat restoration and upland soil caps to evaluate restoration conditions as compared to the “as-built” conditions, which are described in the November 17, 2014 As-Built Report (GeoEngineers, 2014).

## 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 Chimaquum 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 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 by smaller diameter logs driven vertically on the waterward side of the LWD structures. Installed LWD was a minimum of 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*) has 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 trees. Shrubs and trees had 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 were installed on site (Figure 2). Monitoring locations were chosen to provide representations of the various conditions within restoration planting areas. Monitoring Station 1 is located in the shrub-planted area at the southwest corner of the large upland cap. Observations of the condition of the two upland caps are also included in the Monitoring Station 1 results. 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 year-one monitoring event, an 11.8-foot line was secured to the t-posts that mark the stations and rotated 360 degrees to define the circular sampling plots. Areal coverage was estimated for the tree, shrub and herbaceous vegetation layers. Coverage for a vegetative layer is the sum of the areal cover of all species in that layer. Total areal 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 document survival as compared to the baseline monitoring event. 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 areal coverage within each vegetative stratum in the monitoring stations.
- Cumulative areal 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, areal coverage and invasive species presence. Evidence of wildlife use and general plant health will be noted during each monitoring event. This year-one monitoring event was required to monitor the success of the restoration efforts (Ecology, 2012).



## 5.0 YEAR-ONE MONITORING RESULTS

GeoEngineers biologists visited the restoration site on November 19, 2013 to assess the conditions of the habitat restoration areas. In December 2012, the plants were installed in general accordance to the design drawing located in Appendix B. The As-Built Monitoring Event was conducted February 18, 2013 to document post-construction conditions (GeoEngineers, 2014). 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 installed plants 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	<i>Pseudotsuga menziesii</i>	1 Gallon	12	11
Western red cedar	<i>Thuja plicata</i>	1 Gallon	12	16
Shore pine	<i>Pinus contorta</i>	1 Gallon	12	11
Oceanspray	<i>Holodius discolor</i>	1 Gallon	5	237
Nootka rose	<i>Rosa nutkana</i>	1 Gallon	5	169
Vine maple	<i>Acer circinatum</i>	1 Gallon	6	97
Red elderberry	<i>Sambucus racemosa</i>	1 Gallon	6	164
Snowberry	<i>Symphocarpus albus</i>	1 Gallon	5	137
Dunegrass	<i>Leymus mollis</i>	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	<i>Festuca rubra</i>	40	98	90
Perennial ryegrass	<i>Lolium perenne</i>	40	98	90
White sweetclover	<i>Melilotus alba</i>	10	98	90
Highland colonial bentgrass	<i>Agrostis capillaris</i>	10	98	90

Tables 3 through 12 in this section present the plant species and quantities and areal cover values for Monitoring Stations 1 through 5. Table 13 in Section 6 summarizes how each monitoring station performed as compared to the performance standards presented in Section 4.

## 5.1. Upland Soil Cap

The main surface of each upland cap was hydroseeded rather than planted with shrubs. The cap areas were observed to be intact, with no visible signs of erosion or sloughing. The riprap armored edges of the caps were observed to be intact and no geotextile fabric was visible. The hydroseed had germinated throughout both cap areas and grass coverage was estimated to be 95 percent. Several small areas contained approximately 50 percent coverage with grasses; however, additional seed was observed to have recently been placed in these areas to encourage additional grass growth. The grass areas had been recently mowed, which may have contributed to the lower coverage levels of grass in several areas. Also, 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 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 areal cover values in Table 4.

Plant health was observed to be good at Monitoring Station 1 with vigorous growth observed on the oceanspray (*Holodiscus discolor*). Six fewer vine maple (*Acer circinatum*) were observed during the year-one monitoring event as compared to the as-built monitoring event. No indications of these plants were found and appeared to have been intentionally removed. However, the high quantities of new volunteer red alder (*Alnus rubra*) and big leaf maple (*Acer macrophyllum*) will provide adequate vegetation of this portion of the restoration area. No invasive species were observed at this monitoring station.

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

Species	Canopy Layer	Status <sup>1</sup>	As-Built Year-Zero	Year-One	Apparent Health
Oceanspray ( <i>Holodiscus discolor</i> )	Shrub	P	12	12	Robust new growth.
Vine maple ( <i>Acer circinatum</i> )	Shrub	P	9	3	Healthy in appearance. Six apparently stolen.
Red alder ( <i>Alnus rubra</i> )	Tree	V	0	TNTC	Healthy in appearance.
Big leaf maple ( <i>Acer macrophyllum</i> )	Tree	V	0	TNTC	Healthy in appearance.

Note:

<sup>1</sup>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
As-Built (Year Zero)	0	5	2	0	93	0
Year-One	10	10	80	0	5	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 areas. This created a more natural beach slope angle and reduced erosion of the previous fill materials into the upper intertidal zone. 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. The monitoring station is not marked with a metal t-post, it is centered on the well monument for Monitoring Well 6. 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 areal cover values in Table 6.

Monitoring Station 2 is located in an area with significant moisture, likely originating from hillside seeps and perched groundwater. The installed plants were observed to be healthy and new growth was visible on several plants. Herbaceous ground cover has become established within the sample plot, consisting primarily of creeping buttercup (*Ranunculus repens*). Few invasive species were observed at Monitoring Station 2; however, Himalayan blackberry and English Ivy were observed outside the sample plot, which will require removal to prevent reestablishment of these species.

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

Species	Canopy Layer	Status <sup>1</sup>	As-Built Year-Zero	Year-One	Apparent Health
Nootka rose ( <i>Rosa nootkana</i> )	Shrub	P	15	13	Healthy in appearance.
Snowberry ( <i>Symphoricarpos albus</i> )	Shrub	P	7	7	Healthy in appearance.

Note:

<sup>1</sup>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
As-Built (Year Zero)	0	5	2	0	93	0
Year-One	0	6	80	5	15	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 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 areal cover values in Table 8.

The installed plants were observed to be healthy with new buds visible on several plants. One western red cedar (*Thuja plicata*) and one shore pine (*Pinus contorta*) were missing during the year-one monitoring event and appeared to have been intentionally removed. Herbaceous ground cover increased substantially at Monitoring Station 3 and included native species such as white clover (*Trifolium repens*). Two volunteer red alder have also become established within the sampling plot. Invasive species occupied approximately 5 percent of the sampling plot and included common dandelion (*Taraxacum officinale*) and American vetch (*Vicia americana*). Seagulls were observed in this portion of the site.

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

Species	Canopy Layer	Status <sup>1</sup>	As-Built Year-Zero	Year-One	Apparent Health
Oceanspray ( <i>Holodiscus discolor</i> )	Shrub	P	2	2	Healthy in appearance.
Vine maple ( <i>Acer circinatum</i> )	Shrub	P	5	6	Healthy in appearance.
Western red cedar ( <i>Thuja plicata</i> )	Tree	P	5	4	Healthy in appearance. One apparently stolen.
Shore pine ( <i>Pinus contorta</i> )	Tree	P	2	1	Healthy in appearance. One apparently stolen.
Douglas fir ( <i>Pseudotsuga menziesii</i> )	Tree	P	1	1	Healthy in appearance.
Red elderberry ( <i>Sambucus racemosa</i> )	Shrub	P	15	15	Healthy in appearance.
Red alder ( <i>Alnus rubra</i> )	Tree	V	0	2	Healthy in appearance.

Note:

<sup>1</sup>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
As-Built (Year Zero)	0	5	0	0	95	0
Year-One	0	6	70	5	25	0

### 5.2.3. Monitoring Station 4

Monitoring Station 4 is located on the south side of the southern drainage swale to the 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 areal cover values in Table 10.

Installed plants were observed to be healthy in appearance and numerous volunteer species have established within the sampling plot, including white and red clover (*Trifolium pretense*). Invasive species are becoming reestablished in this area with species including Scot's broom (*Cytisus scoparius*) and Himalayan blackberry (*Rubus armeniacus*). This drainage was previously dominated by Himalayan blackberry, which was removed prior to planting. Continued removal of invasive species is recommended to allow installed native plants to become established. Seagulls and crows were active in this area.

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

Species	Canopy Layer	Status <sup>1</sup>	As-Built Year-Zero	Year-One	Apparent Health
Oceanspray ( <i>Holodiscus discolor</i> )	Shrub	P	6	6	Healthy in appearance.
Vine maple ( <i>Acer circinatum</i> )	Shrub	P	2	2	Healthy in appearance.
Red Elderberry ( <i>Sambucus racemosa</i> )	Shrub	P	1	1	Healthy in appearance.
Dunegrass ( <i>Leymus mollis</i> )	Herbaceous	P	19	19	Healthy in appearance.

Note:

<sup>1</sup>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
As-Built (Year Zero)	0	5	5	0	90	0
Year-One	0	10	80	5	5	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 dunegrass 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 areal cover values in Table 12.

Installed plants appeared healthy and the dunegrass was observed to be actively spreading via rhizomes. This drainage was also previously dominated by Himalayan blackberry, which has been removed, preserving large patches of native rose and emergent vegetation. However, Himalayan blackberry is aggressively reestablishing in this portion of the site and will require frequent removal to allow native plants to become established. Seagulls and a red-tailed hawk were active in this area during the monitoring event.

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

Species	Canopy Layer	Status <sup>1</sup>	As-Built Year-Zero	Year-One	Apparent Health
Oceanspray ( <i>Holodiscus discolor</i> )	Shrub	P	16	14	Healthy in appearance.
Dune grass ( <i>Leymus mollis</i> )	Herbaceous	P	26	36	Healthy in appearance.

Note:

<sup>1</sup>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
As-Built (Year Zero)	0	5	5	0	90	0
Year-One	0	6	80	15	5	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 59 logs were observed along OHW during the year-one monitoring event. Overall the wood appeared to be firmly in place and performing as expected. The increase of nine pieces of LWD during the year-one monitoring event is attributed to recruitment of additional wood during extreme high tide events with easterly winds.

## 6.0 SUMMARY

Observations made during the year-one monitoring event revealed that the installed plant species appeared to be healthy with no signs of disease or insect damage. Several plants were missing and believed to have been removed intentionally. LWD shoreline protection was observed in place and functioning properly and the two soil cap areas were observed to be intact with no visible signs of erosion or sloughing.

GeoEngineers scientists observed a high survival rate of planted species and minimal presence by invasive species, which is generally consistent with the performance standards identified in this report. The following table (Table 13) identifies the how each monitoring station performed as compared to the performance standards.

**TABLE 13. SUMMARY OF PERFORMANCE STANDARDS EVALUATION**

Performance Standard <sup>1</sup>	Station 1	Station 2	Station 3	Station 4	Station 5
<b>80 Percent Survival</b>	See discussion	✓	✓	✓	✓
<b>Invasive Areal Cover &lt; 15%</b>	✓	✓	✓	✓	✓
<b>Native Areal Cover &gt; 20%</b>	✓	✓	✓	✓	✓

<sup>1</sup> A check mark indicates that the performance standard was met.

Monitoring Station 1 did not meet the performance standard for 80-percent survival because we did not observe six of the vine maples that were recorded during the February 18, 2013 as-built inventory. Because there were no dead vine maples at Monitoring Station 1, it seems reasonable that these plants were stolen from the site. Volunteering by native tree species, such as red alder, has largely offset the loss of the six vine maples and it is our opinion that Monitoring Station 1 complies with the project performance standard for survival.

Data collected at the other monitoring stations indicate that the site is compliant with the established performance standards for the site.

Overall, the condition of the plants and habitat areas are satisfactory and many new volunteer species are becoming established at the site including red alder, big leaf maple, creeping buttercup and red and white clover. However, long-term project success will be reliant upon continued invasive species control by park volunteers while the installed native plants become established.

## 7.0 LIMITATIONS

GeoEngineers, Inc. has prepared this year-one monitoring 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 Steel Plant. Prepared for Washington State Department of Ecology. August 31, 2009.

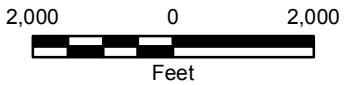
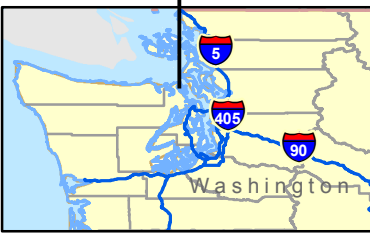
GeoEngineers, Inc. 2014. As-Built Report, Irondale Iron and Steel Plant, Shoreline Habitat Restoration, Jefferson County, Washington. Prepared for Washington State Department of Ecology. November 17, 2014.

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





Map Revised: May 2, 2011 AMM  
 Office: SEA  
 Path: W:\Seattle\Projects\010504042\GIS\01050404201 Fig1\_VM.mxd



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










<b>Vicinity Map</b>	
Irondale Iron and Steel Plant Irondale, Washington	
	<b>Figure 1</b>

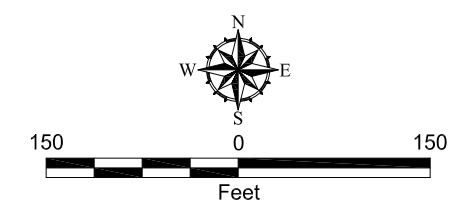
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D:\PROJECT\SEATTLE\0504042\02\CAD\050404202\_AS-BUILT\_F2.dwg\TAB\F2 modified on Feb 25, 2013 - 2:43pm



**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 NUMBER AND APPROXIMATE LOCATION



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.

<b>Landscaping As-Built Drawing</b>	
Irondale Remedial Cleanup Action Irondale, Washington	
	<b>Figure 2</b>



**APPENDIX A**  
**Site Photographs**



Photograph 1  
Northern drainage swale.



Photograph 2  
Dunegrass plantings in northern portion of restoration area.



Photograph 3  
Shoreline LWD in northern portion of restoration area looking south.



Photograph 4  
Shoreline LWD in northern portion of restoration area looking North.

### Site Photographs

Irondale Iron and Steel Plant  
Irondale, Washington



Figure A-1



Photograph 5  
Southern drainage swale.



Photograph 6  
Shoreline LWD looking south from central portion of restoration area.



Photograph 7  
Shoreline LWD and backshore dunegrass area looking south.



Photograph 8  
Shoreline LWD and backshore dunegrass area looking north.

### Site Photographs

Irondale Iron and Steel Plant  
Irondale, Washington



Figure A-2



Photograph 9  
Monitoring Station 1 looking northwest.



Photograph 10  
Monitoring Station 1 looking northeast.



Photograph 11  
Monitoring Station 1 looking southwest.



Photograph 12  
Monitoring Station 1 looking southeast.

### Site Photographs

Monitoring Station 1  
Irondale Iron and Steel Plant  
Irondale, Washington



Figure A-3





Photograph 13  
Monitoring Station 2 looking north.



Photograph 14  
Monitoring Station 2 looking east.



Photograph 15  
Monitoring Station 2 looking south.



Photograph 16  
Monitoring Station 2 looking west.

### Site Photographs

Monitoring Station 2  
Irondale Iron and Steel Plant  
Irondale, Washington



Photograph 17  
Monitoring Station 3 looking north.



Photograph 18  
Monitoring Station 3 looking east.



Photograph 19  
Monitoring Station 3 looking south.



Photograph 20  
Monitoring Station 3 looking west.

## Site Photographs

Monitoring Station 3  
Irondale Iron and Steel Plant  
Irondale, Washington



Photograph 21  
Monitoring Station 4 looking northwest.



Photograph 22  
Monitoring Station 4 looking northeast.



Photograph 23  
Monitoring Station 4 looking southwest.



Photograph 24  
Monitoring Station 4 looking southeast.

### Site Photographs

Monitoring Station 4  
Irondale Iron and Steel Plant  
Irondale, Washington



Figure A-6



Photograph 25  
Monitoring Station 5 looking northwest.



Photograph 26  
Monitoring Station 5 looking northeast.



Photograph 27  
Monitoring Station 5 looking southwest.



Photograph 28  
Monitoring Station 5 looking southeast.

### Site Photographs

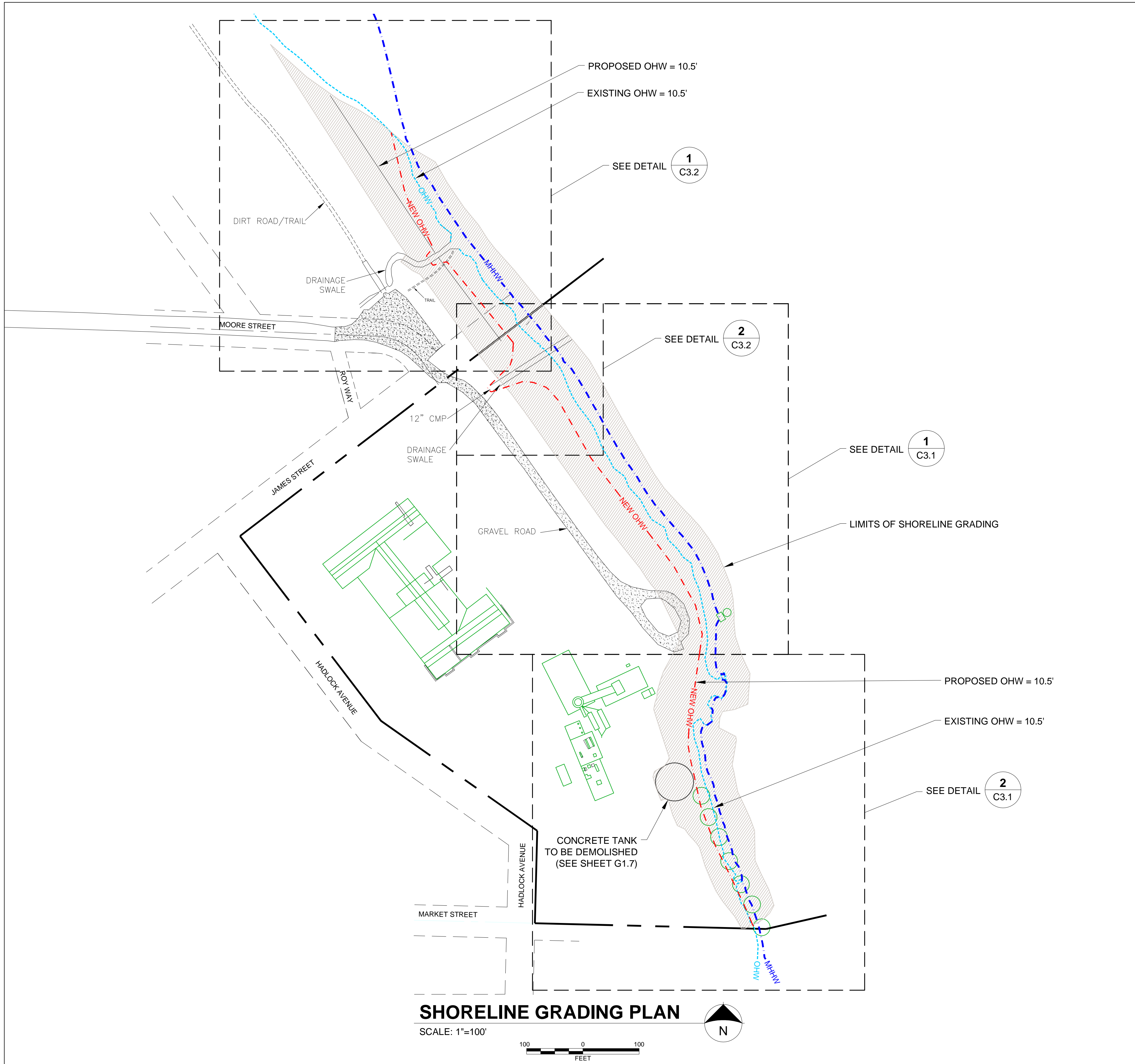
Monitoring Station 5  
Irondale Iron and Steel Plant  
Irondale, Washington



Figure A-7

**APPENDIX B**  
**100 Percent Design Drawings**

F:\10\05\04\042\01\CAD\SHEET\CLEANUP ACTION SHEETS\05\04\042-01 SHEET C3.0 SHORELINE GRADING PLAN.DWG\TABLE\LAYOUT1 MODIFIED BY TMICHAUD ON MAY 02, 2012 - 16:03



**NOTES**

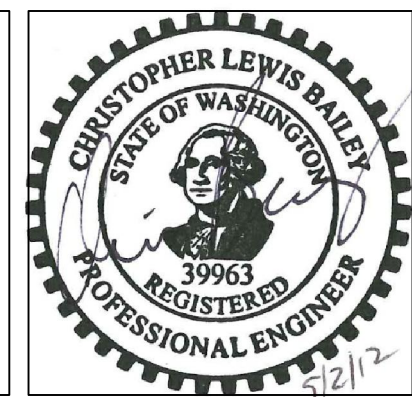
1. CONTRACTOR SHALL GRADE UPLAND SURFACE SOIL AND MARINE SEDIMENT WITHIN LIMITS SHOWN TO ACHIEVE PROPOSED GRADES AS SHOWN ON SHEETS C3.2 THROUGH C3.10.
2. ALL CONSTRUCTION VEHICLE INGRESS AND EGRESS SHALL BE PERFORMED IN ACCORDANCE WITH THE CONSTRUCTION PHASING/TRAFFIC CONTROL PLANS ON DRAWING G1.3.
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 SEPARATELY 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 Klin
- 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

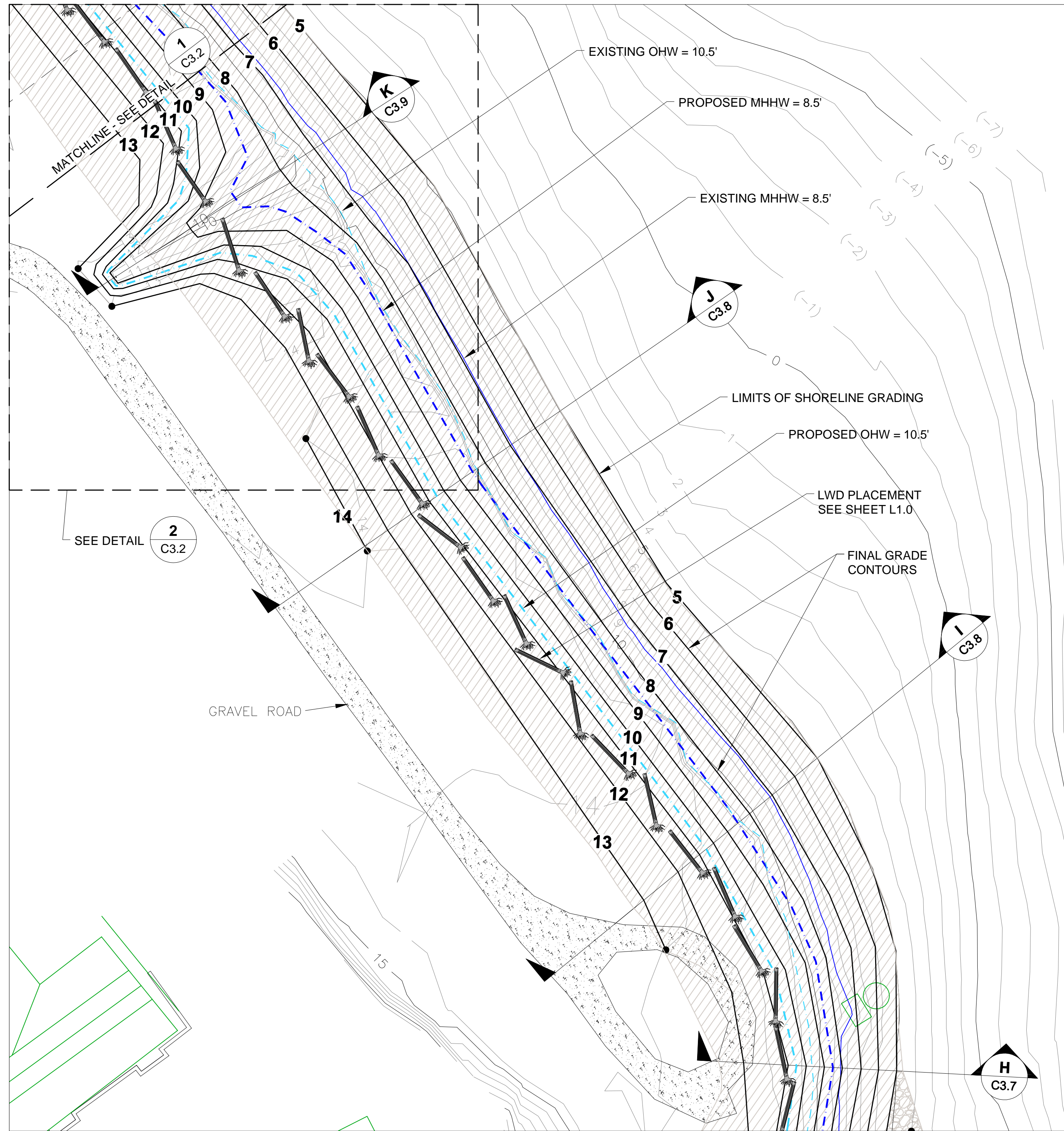
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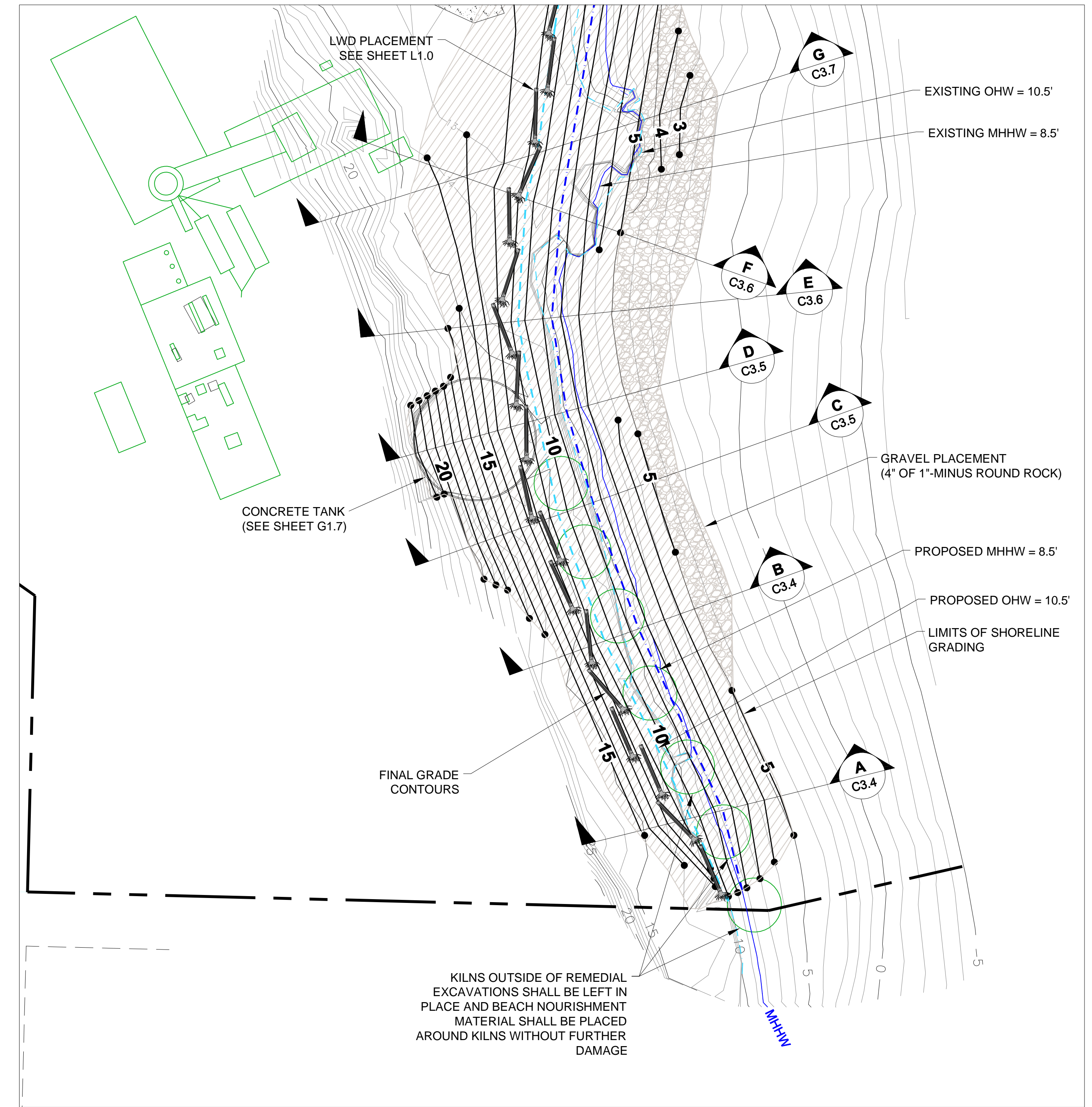
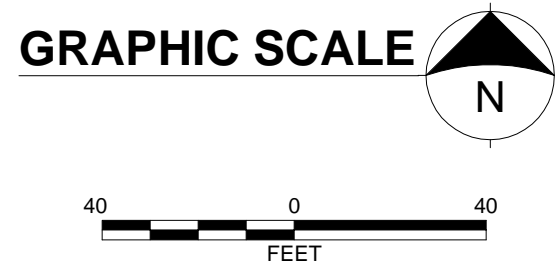
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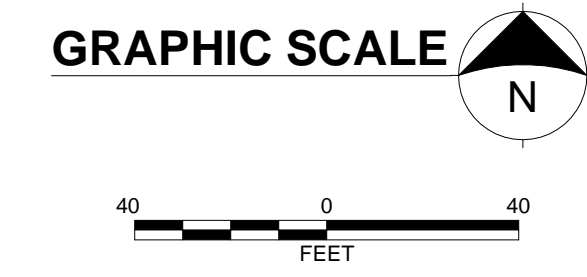
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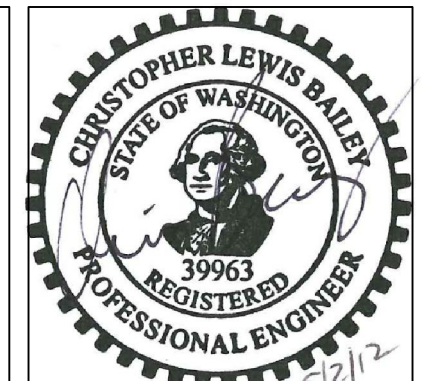


**SOUTH SHORELINE GRADING DETAILS 2**  
SCALE: 1"=40'



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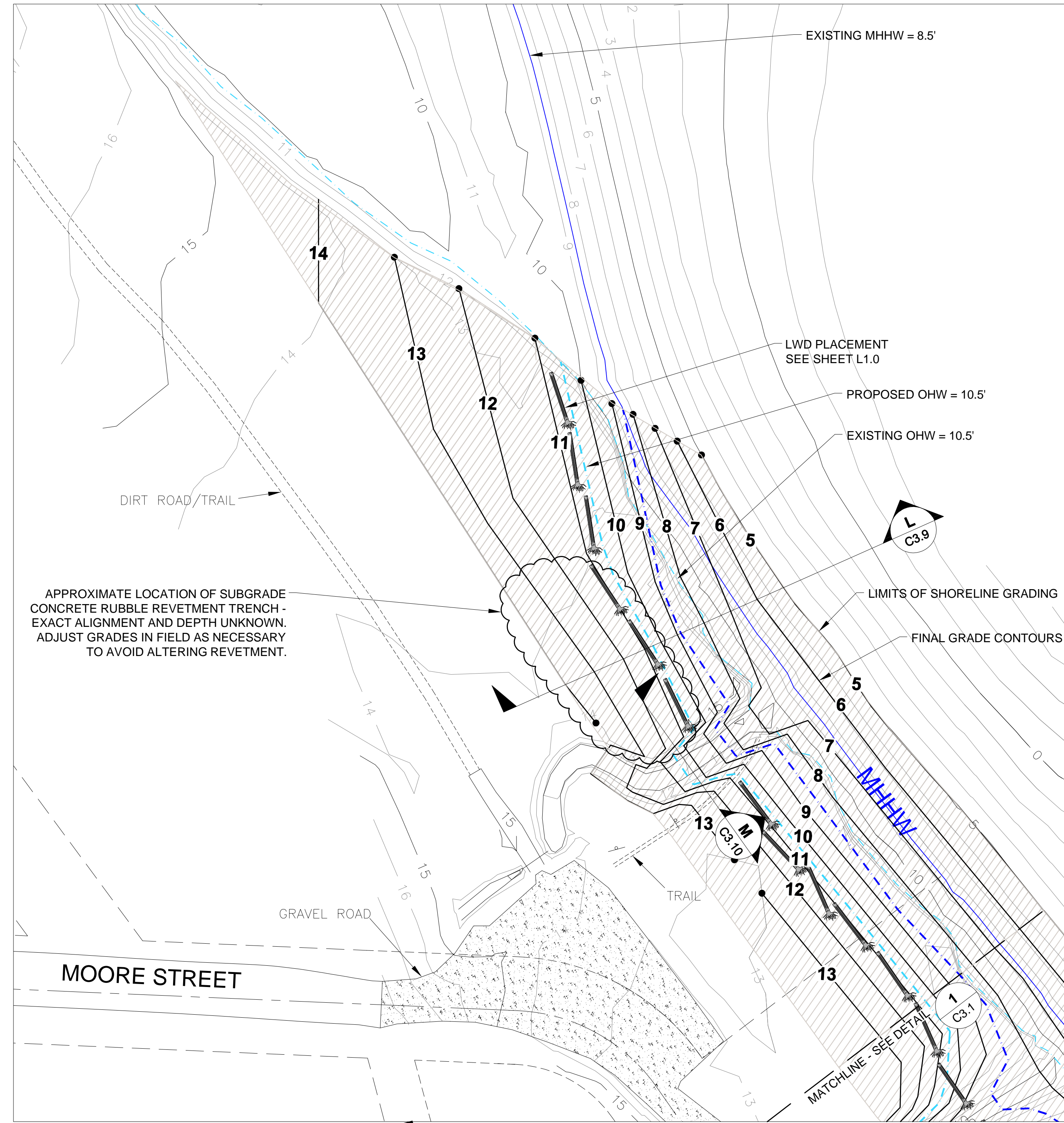
Irondale Iron and Steel Plant Cleanup Action  
Washington State Department of Ecology

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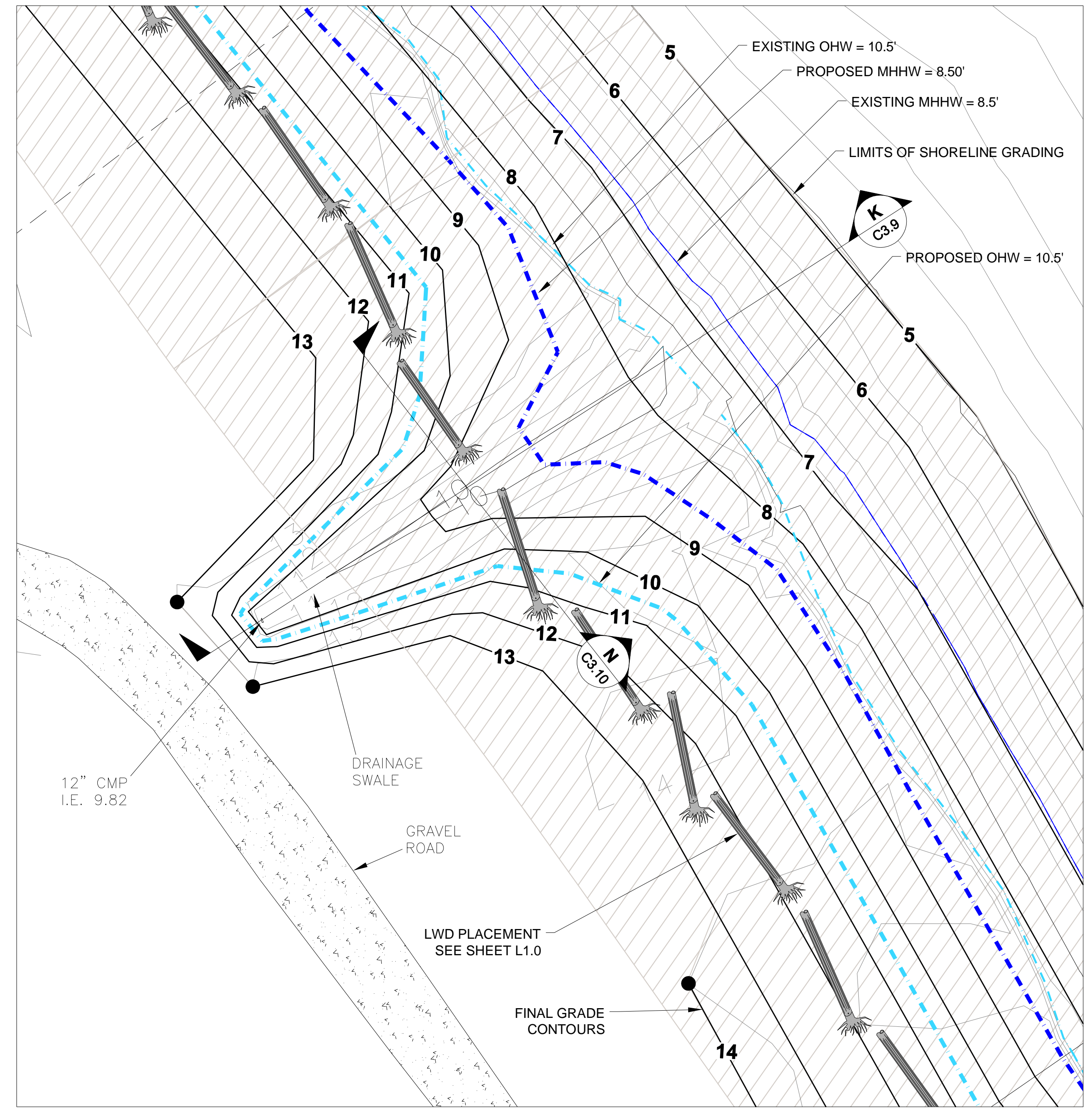
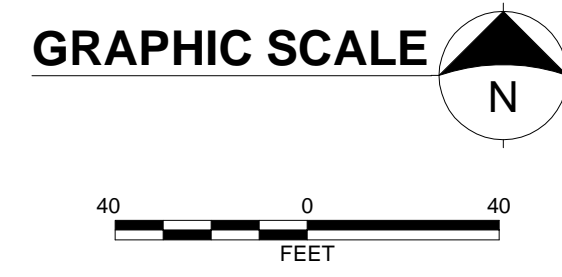
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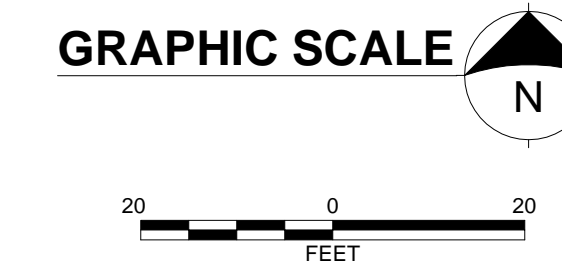
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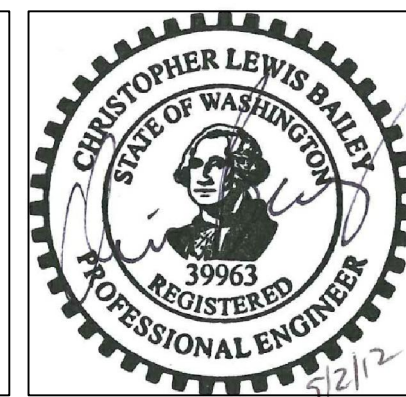
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**DRAINAGE SWALE GRADING DETAILS 2**  
SCALE: 1"=20'



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**SHORELINE GRADING DETAILS**

DRAWN: TJM PROJECT NO.: 50404201  
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SHEET NO.

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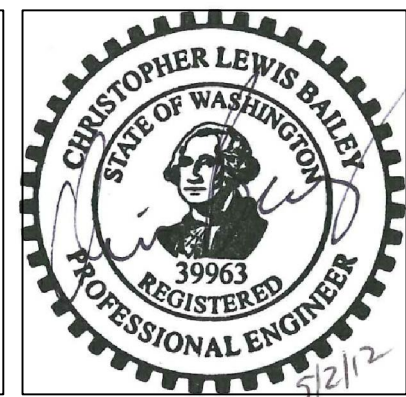
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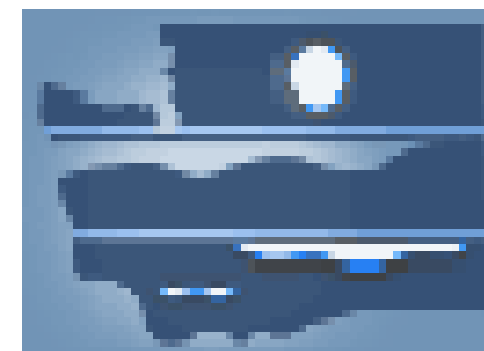
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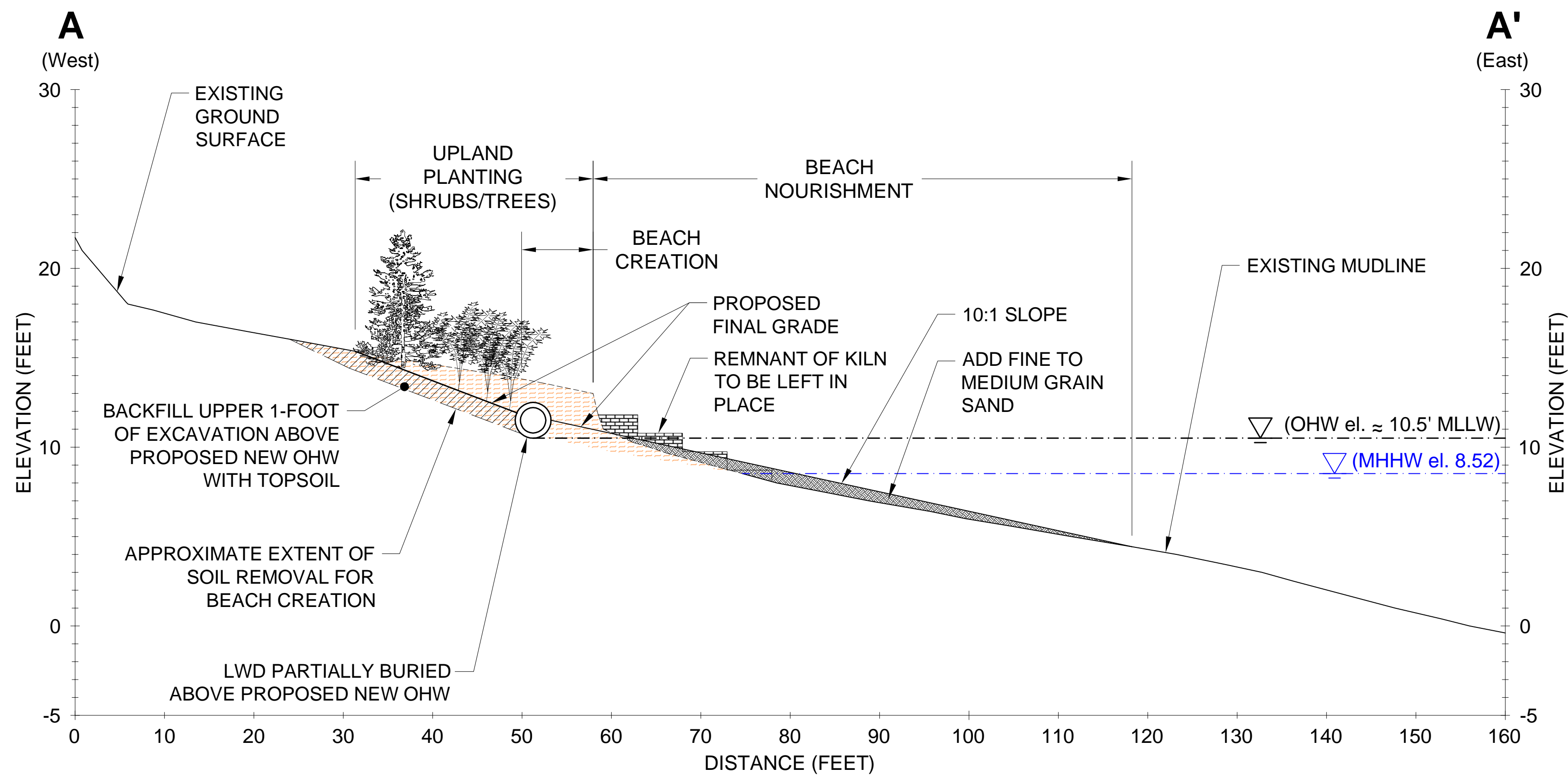
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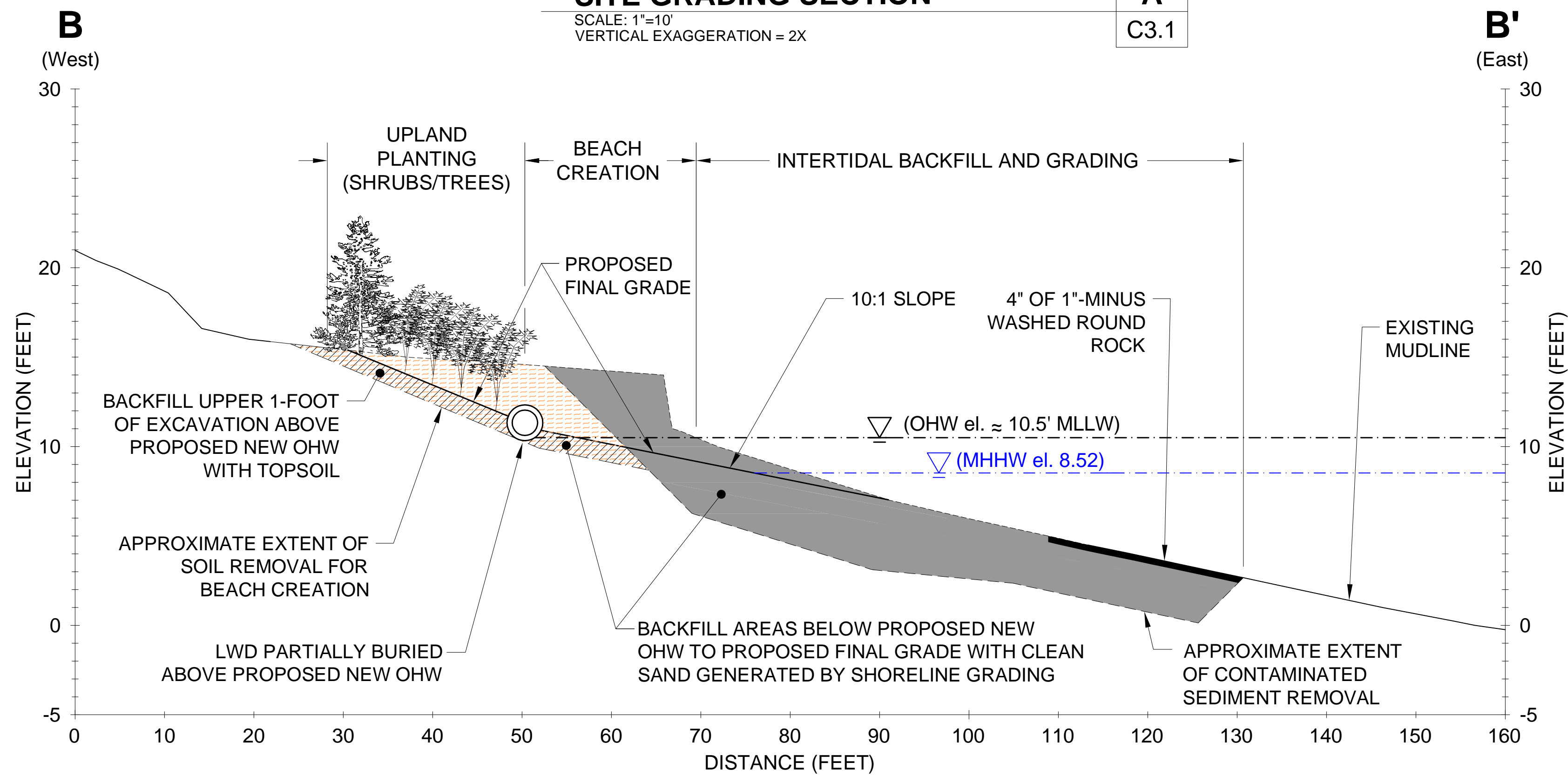
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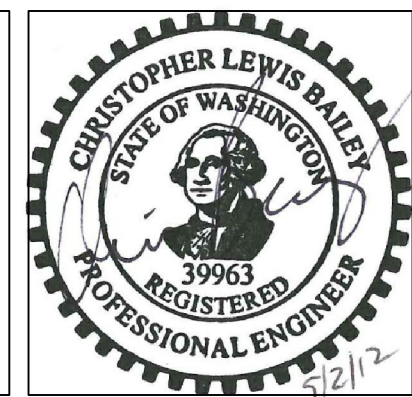
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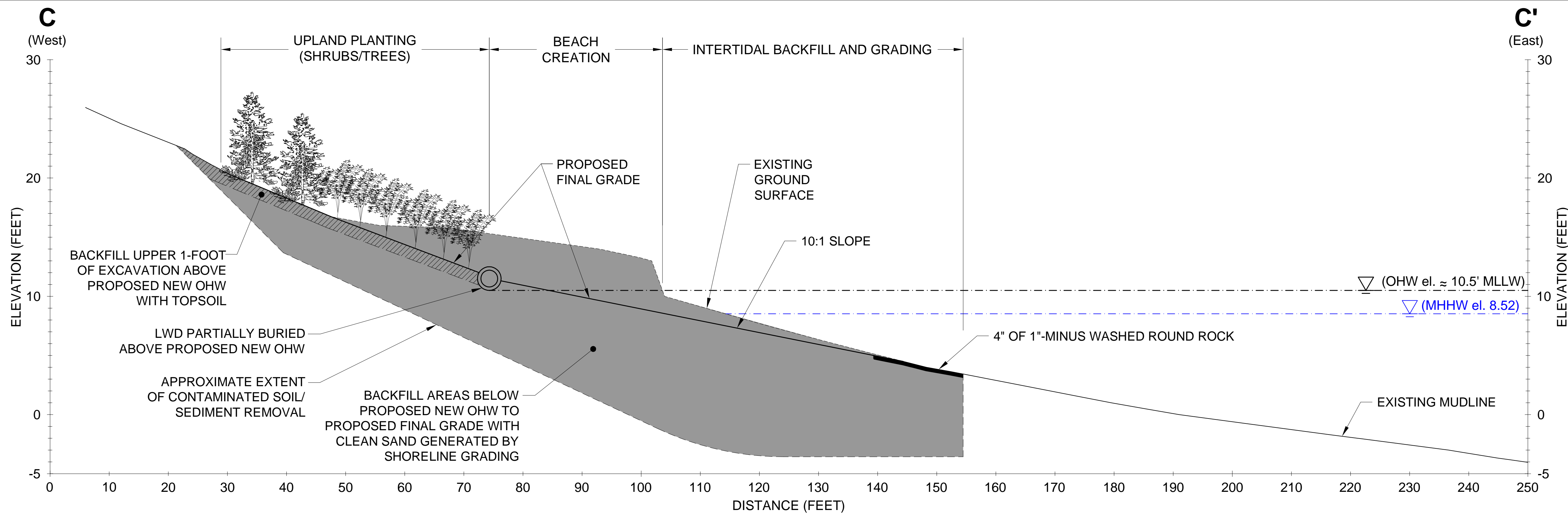
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**SITE GRADING SECTIONS**

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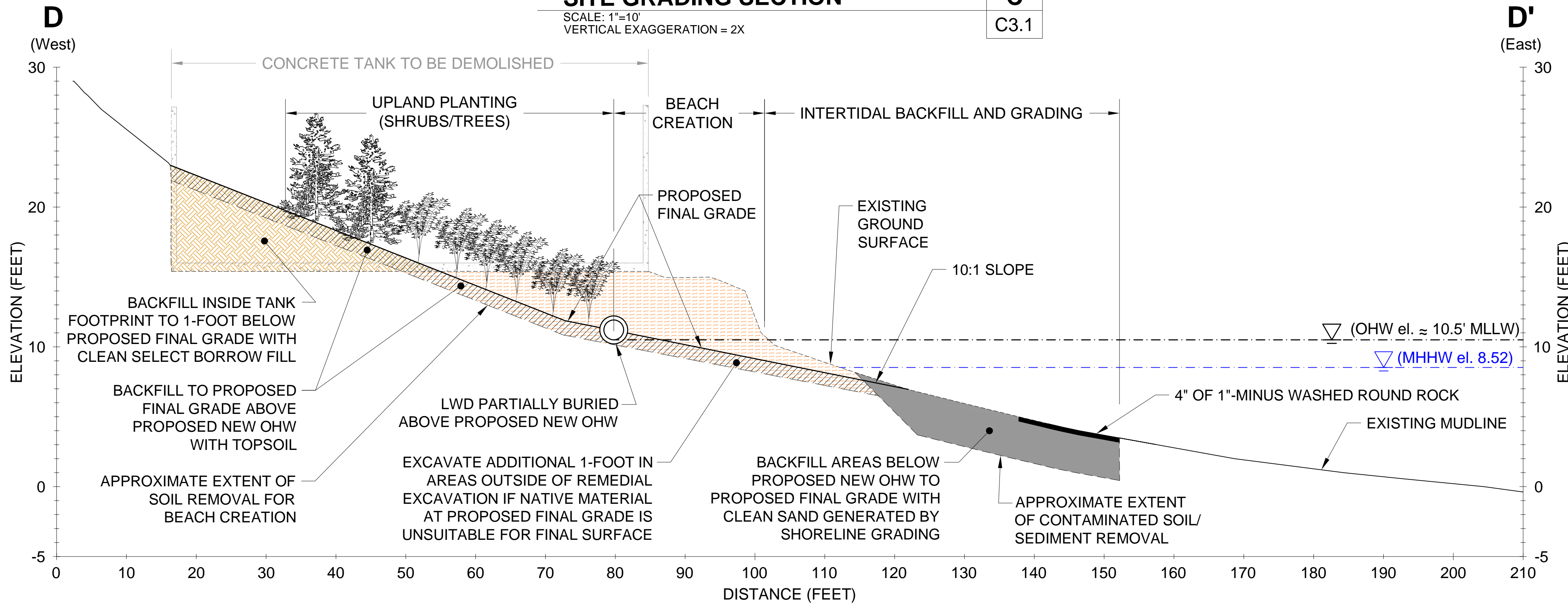
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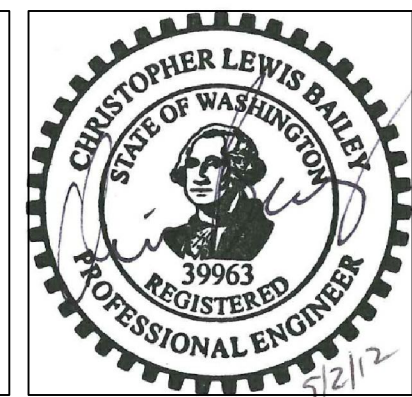
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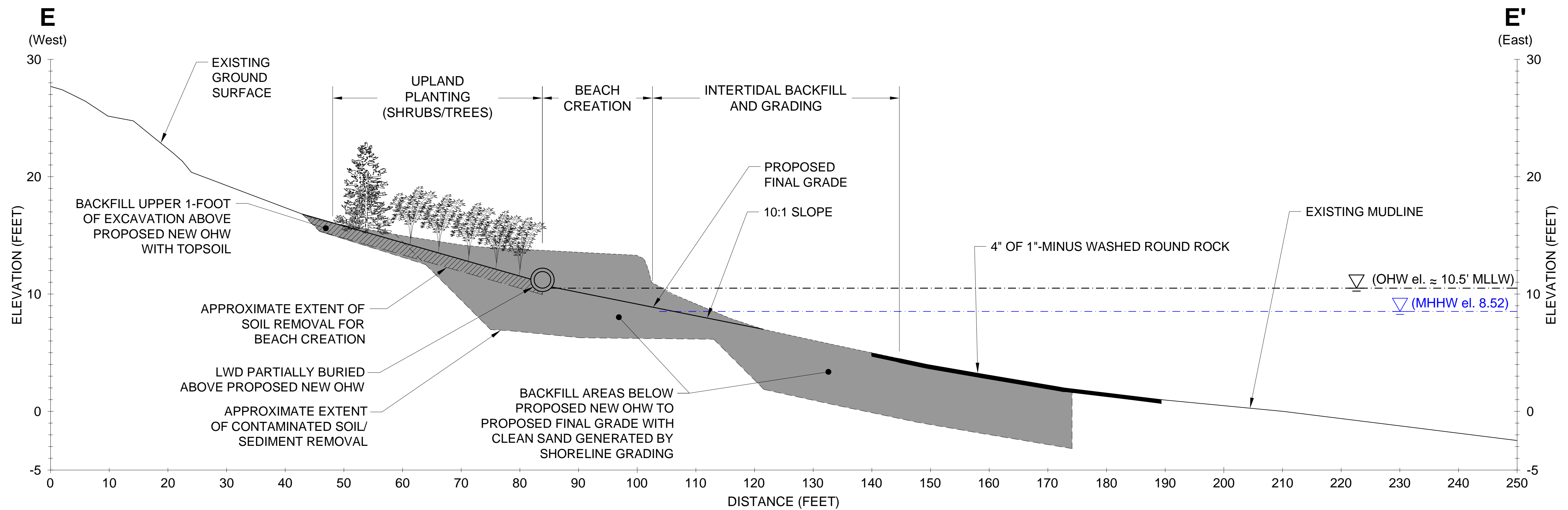
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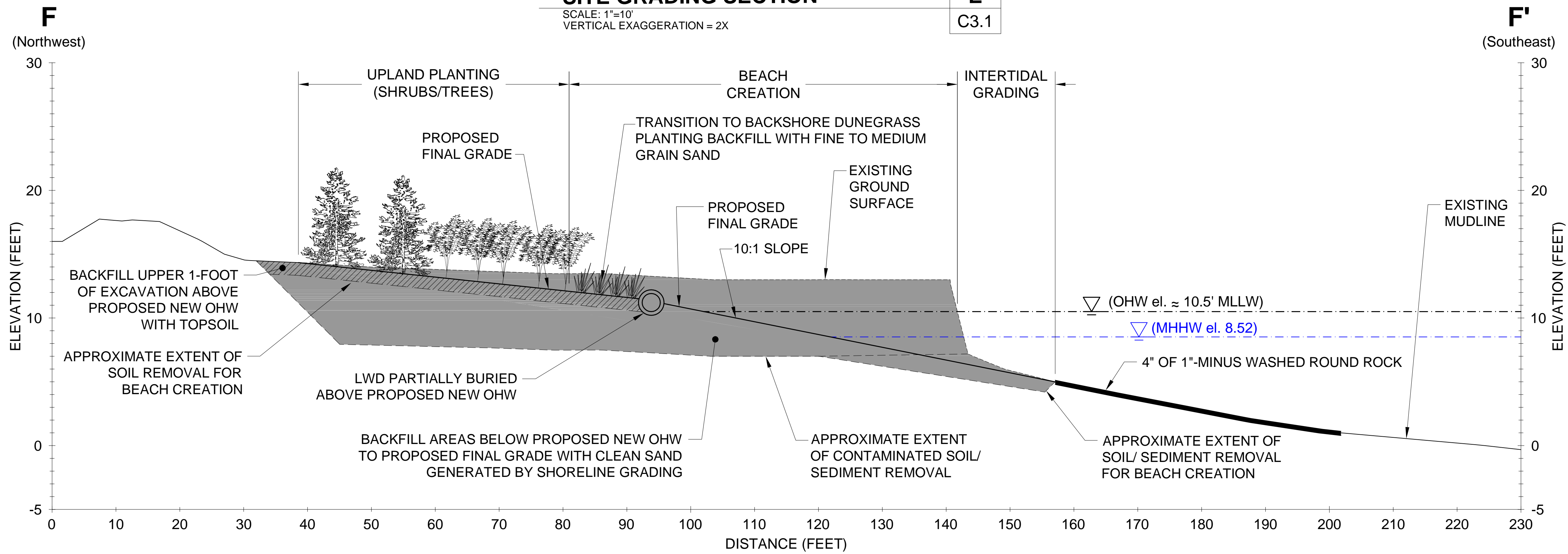
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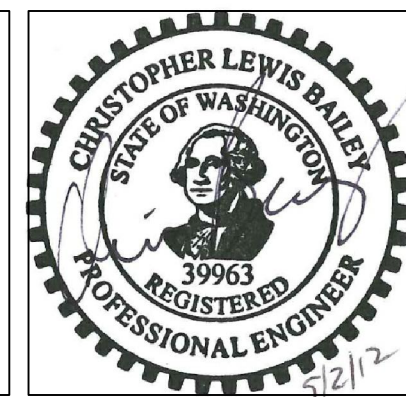
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C3.1

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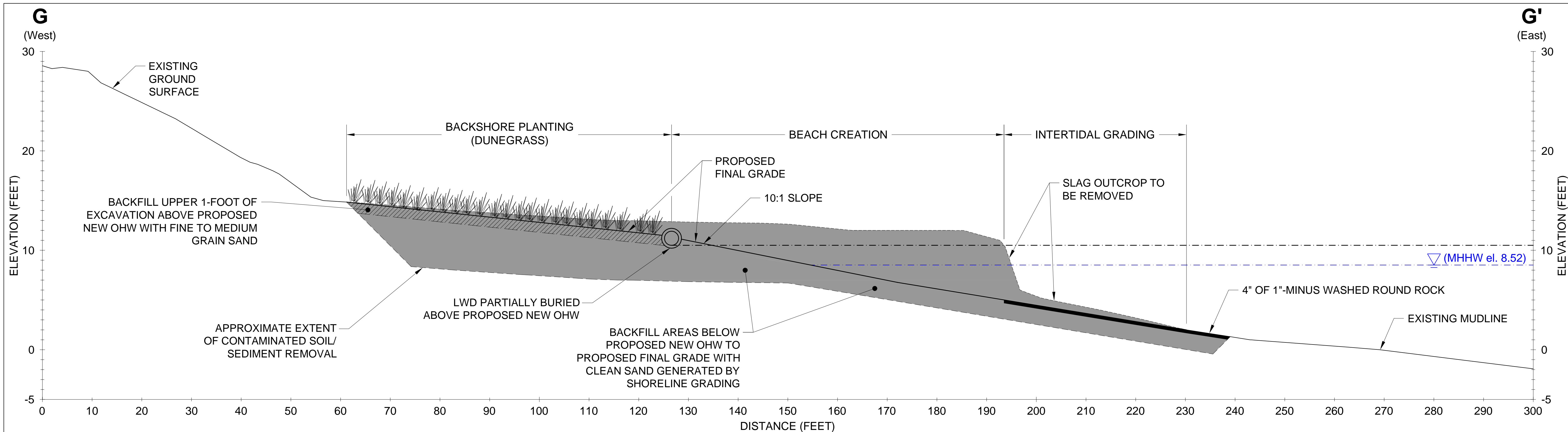
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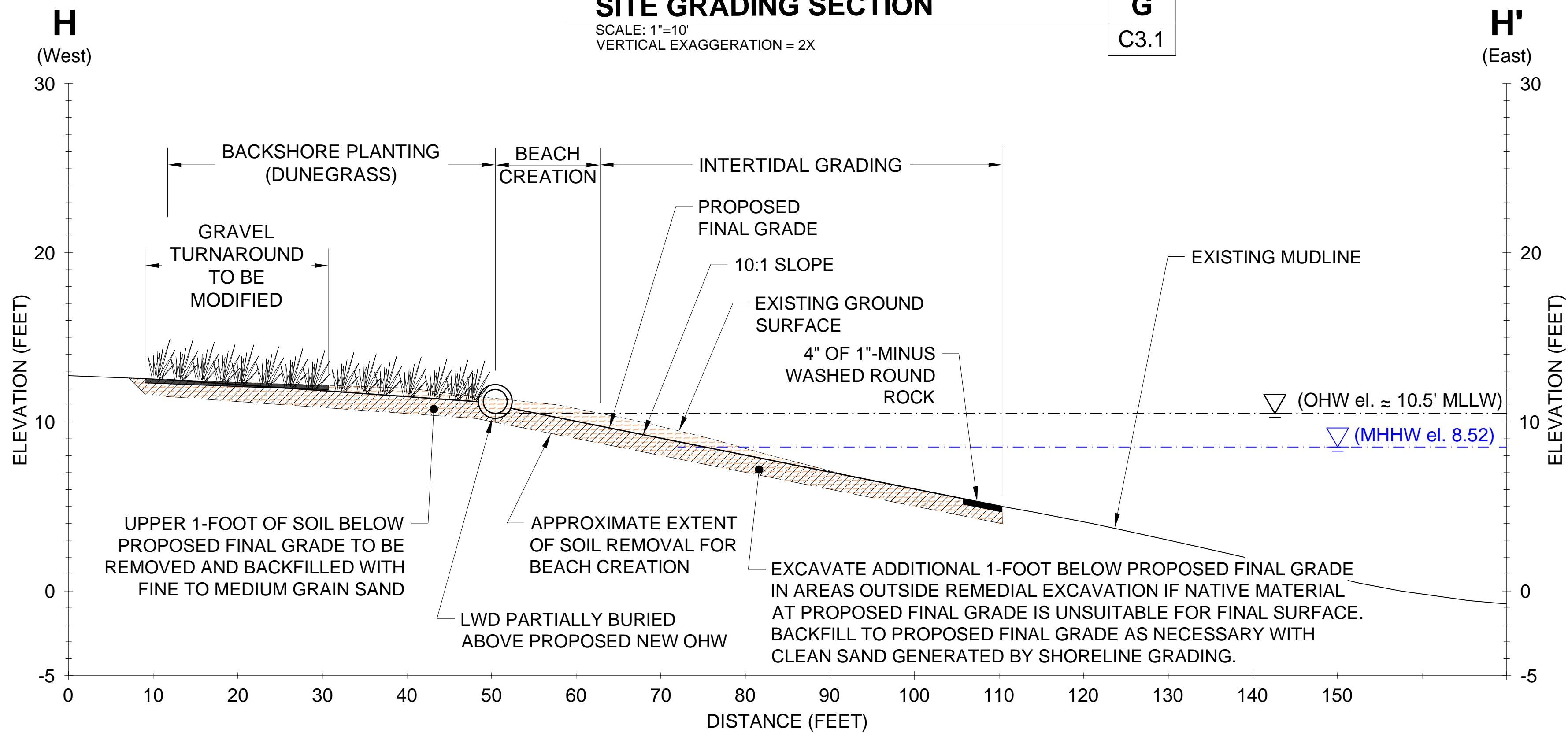
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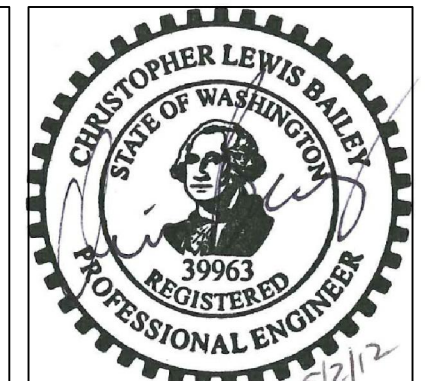
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**SITE GRADING SECTION** H  
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1	3/23/12	CLB	UPDATE DRAWINGS FOR 2012 RE-BID



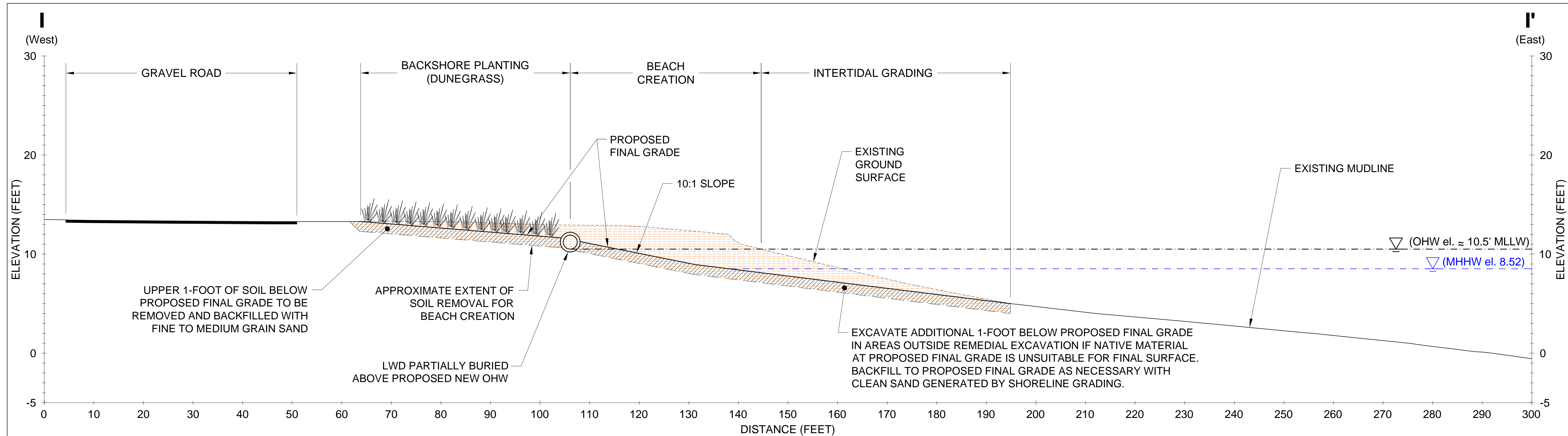
Irondale Iron and Steel Plant Cleanup Action  
 Washington State Department of Ecology

**SITE GRADING SECTIONS**

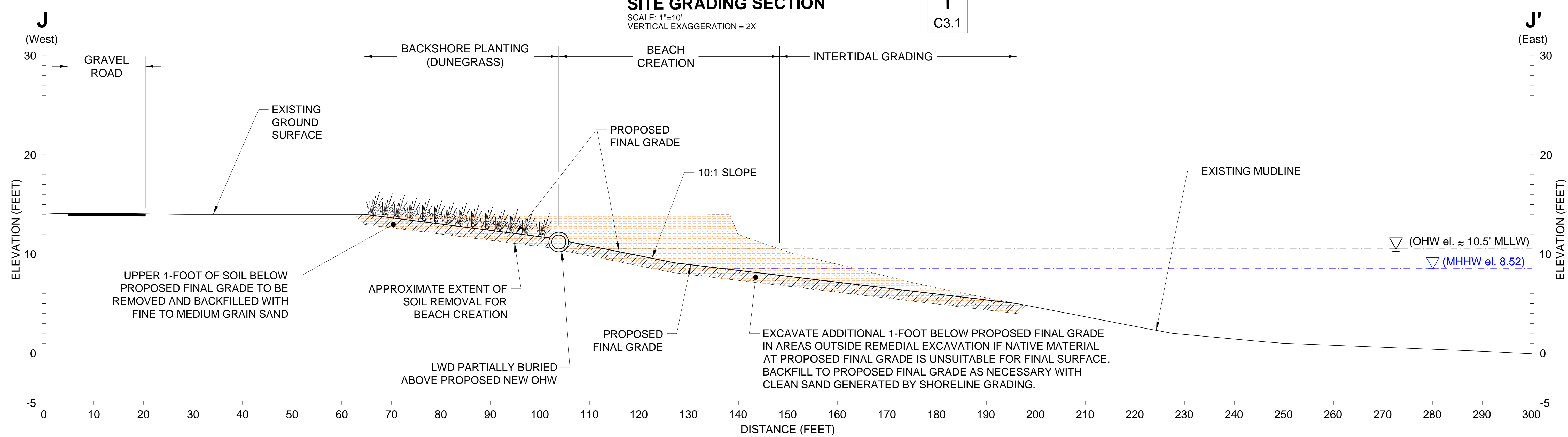
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DESIGN: CLB	SCALE:
CHECKED: DAC	DATE: 8/31/11
SHEET NO.	<b>C3.7</b>

100-PERCENT DESIGN

F:\10\05\04\04\1\CAD\SHEET\CLEANUP ACTION SHEETS\050404-01 SHEET C3.4\_10 SITE GRADING SECTIONS.DWG\TAB\C3.8 MODIFIED BY THICHAUD ON MAY 02, 2012 - 16:10



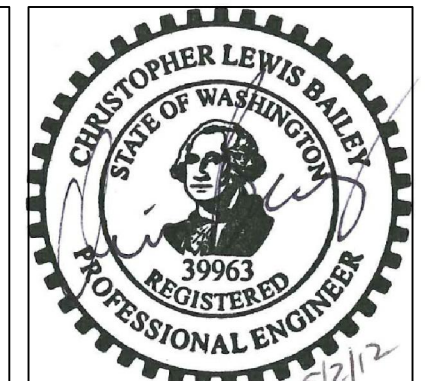
**SITE GRADING SECTION I**  
 SCALE: 1"=10'  
 VERTICAL EXAGGERATION = 2X



**SITE GRADING SECTION J**  
 SCALE: 1"=10'  
 VERTICAL EXAGGERATION = 2X

**GEOENGINEERS**

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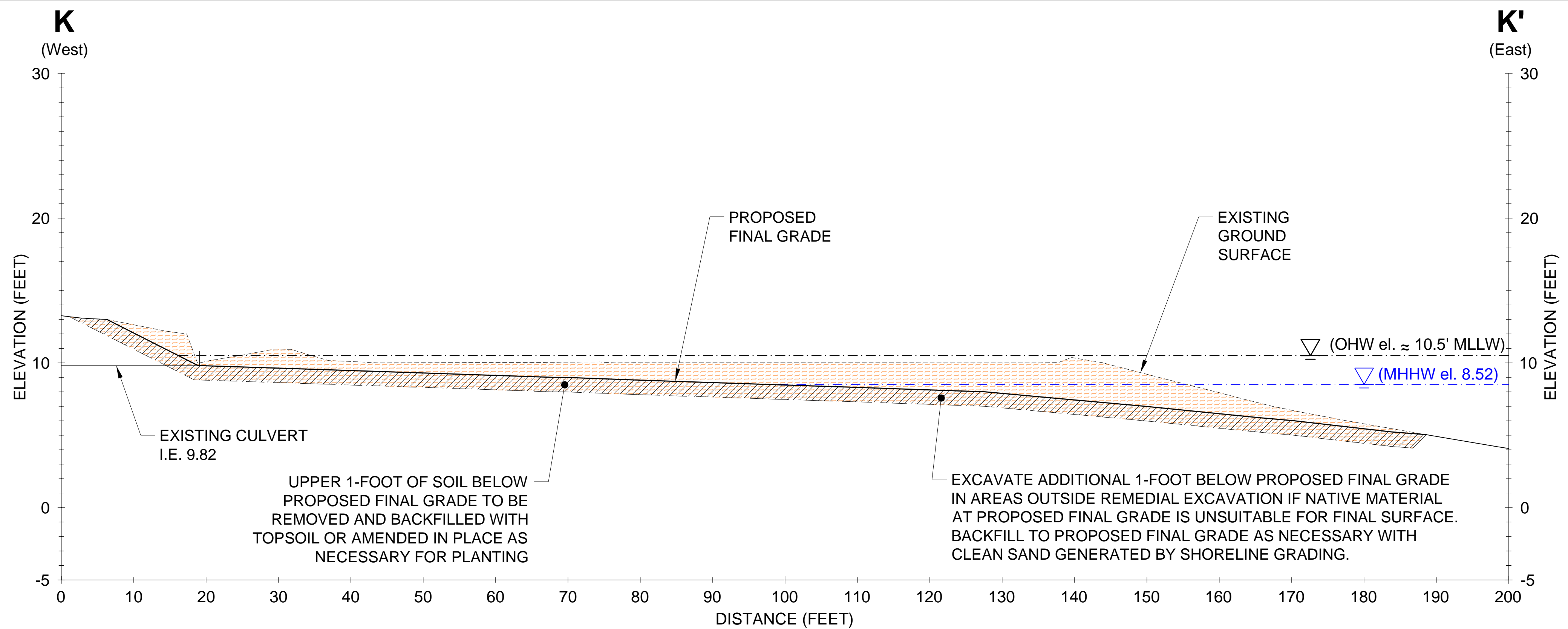
Irondale Iron and Steel Plant Cleanup Action  
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**SITE GRADING SECTIONS**

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DESIGN: CLB	SCALE:
CHECKED: DAC	DATE: 8/31/11
SHEET NO.	<b>C3.8</b>

100-PERCENT DESIGN

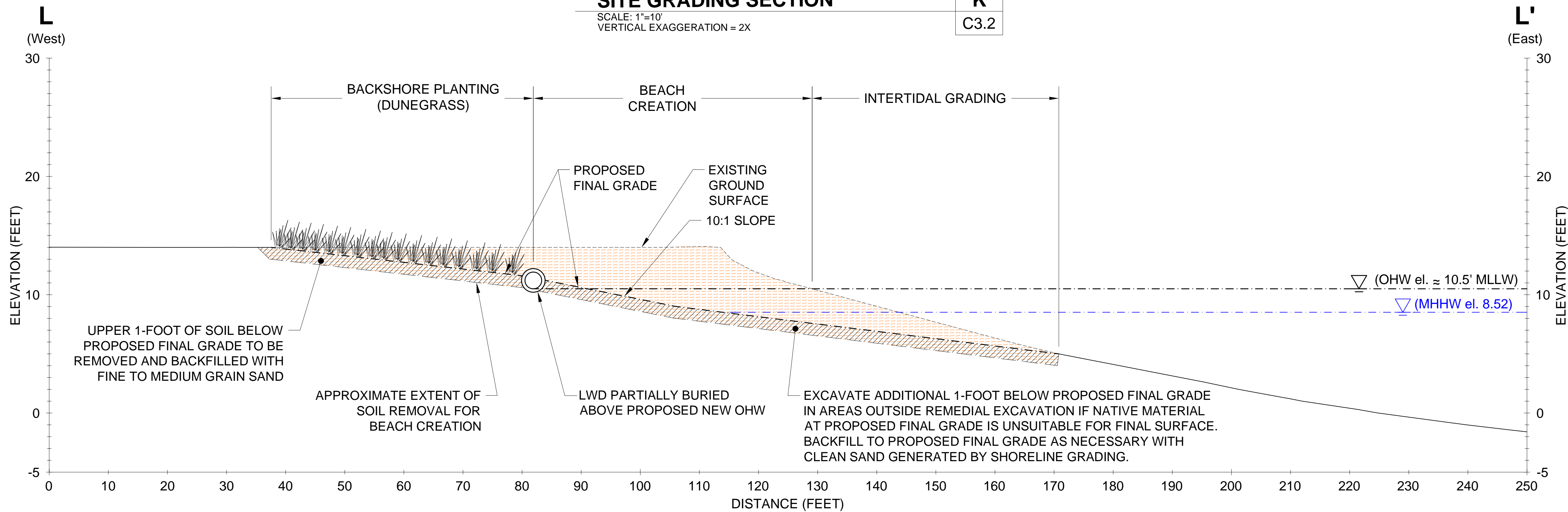
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**SITE GRADING SECTION**

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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Washington State Department of Ecology

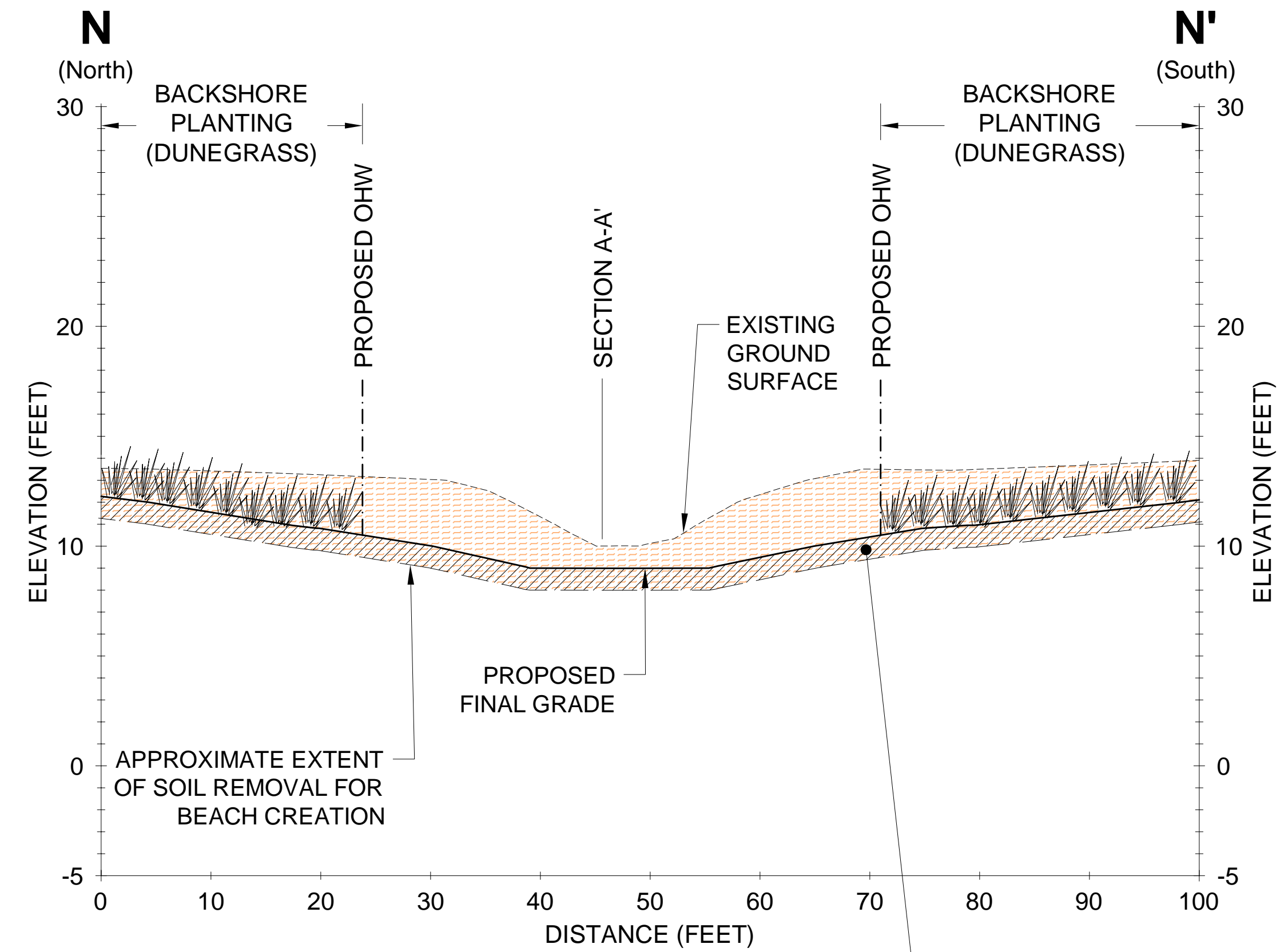
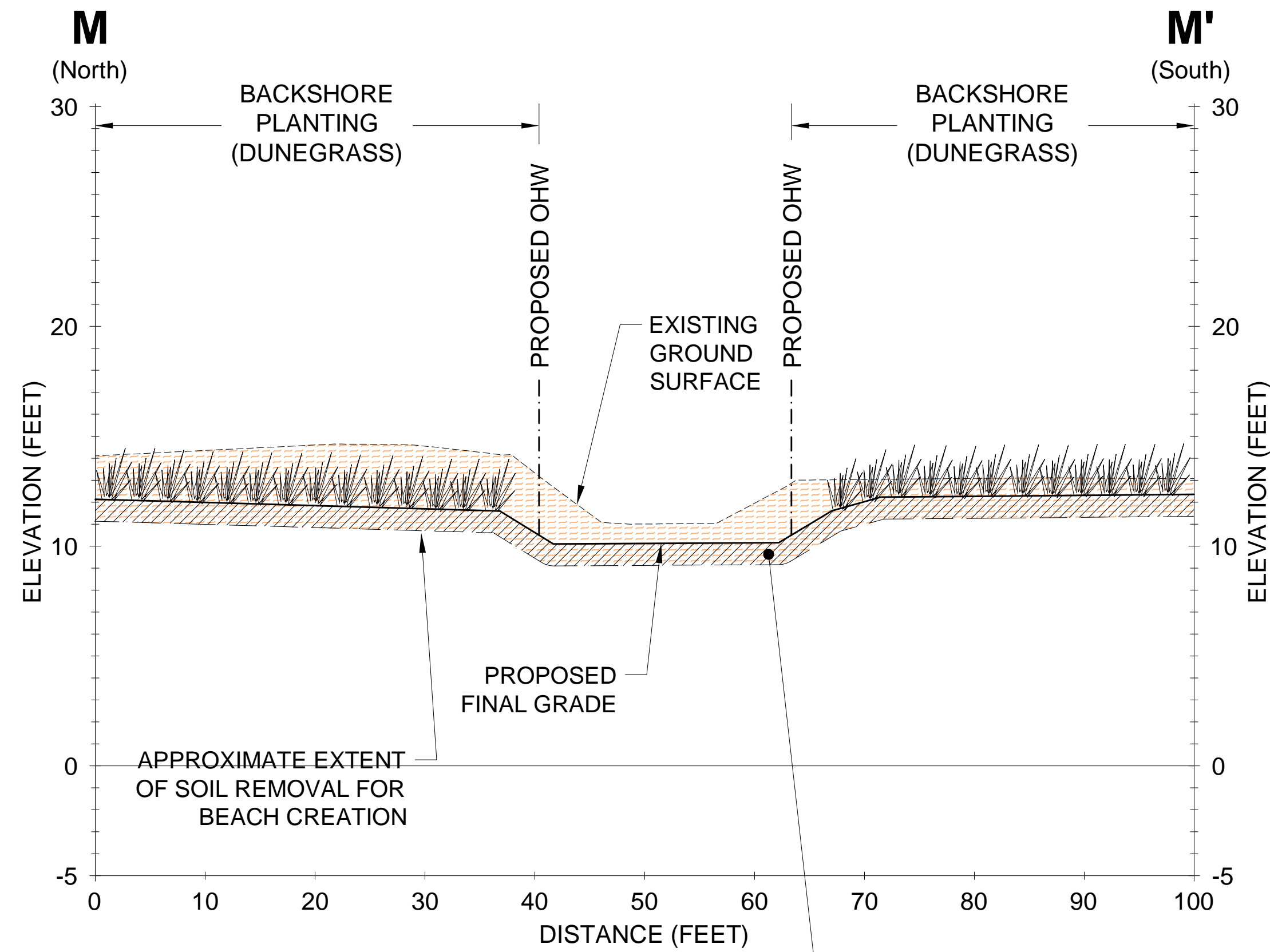
SITE GRADING SECTIONS

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

**C3.9**

100-PERCENT DESIGN

P:\10\05\04\042\1\CAD\SHEET\CLEANUP ACTION SHEETS\0504042-01 SHEET C3.4\_10 SITE GRADING SECTIONS.DWG\TAB.C3.10 MODIFIED BY TMICHAUD ON MAY 02, 2012 - 16:12



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.

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**

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

**M**  
C3.2

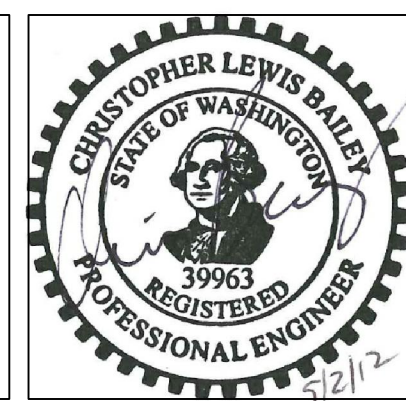
**SITE GRADING SECTION**

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

**N**  
C3.2

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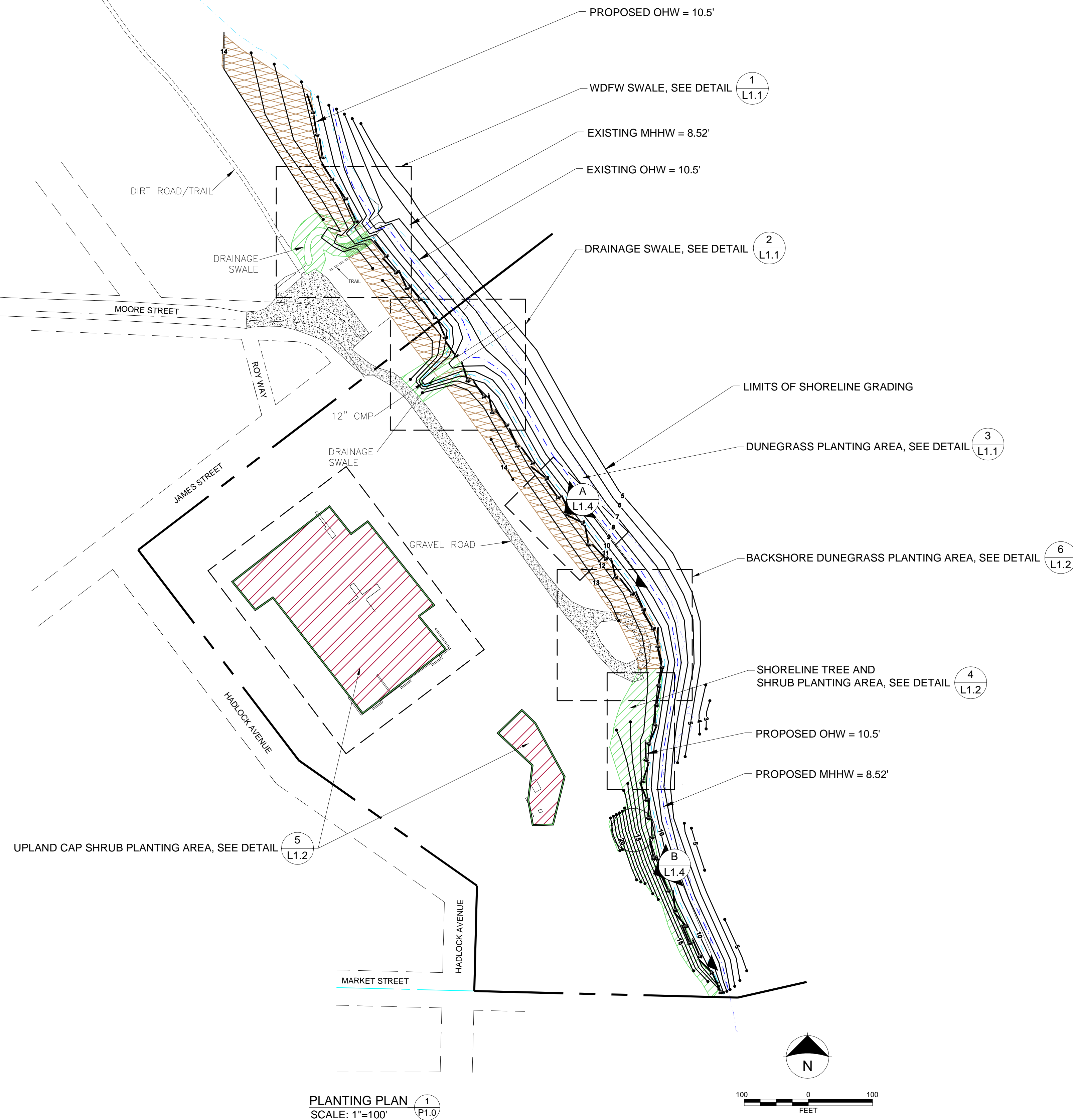
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DESIGN: CLB	SCALE:
CHECKED: DAC	DATE: 8/31/11
SHEET NO.	
<b>C3.10</b>	

100-PERCENT DESIGN



P:\10\050404\01\CAD\SHEET\CLEANUP ACTION SHEETS\050404\2-01 SHEET L1.0 PLANTING PLAN OVERVIEW.DWG\TAB:L1.0 MODIFIED BY TMICHAUD ON MAY 02, 2012 - 15:46



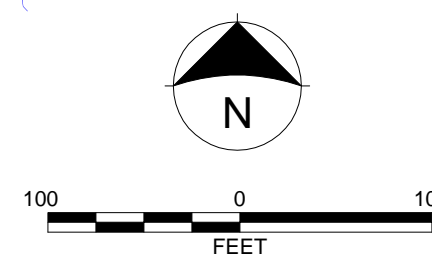
**PLANTING NOTES**

1. NO PLANTING SHALL BE PERFORMED 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**

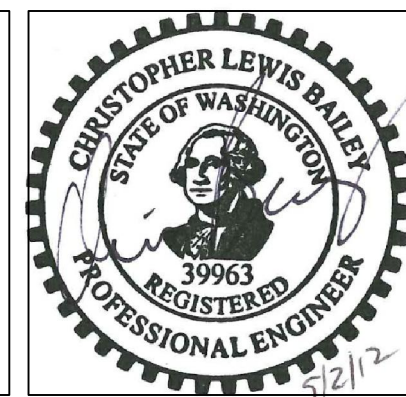
- BACKSHORE DUNEGRASS PLANTING AREA
- SHORELINE TREE AND SHRUB PLANTING AREA
- UPLAND CAP SHRUB PLANTING AREA
- LARGE WOODY DEBRIS (AT PROPOSED NEW OHW)
- FINAL GRADE CONTOURS
- PROPOSED MHHW

PLANTING PLAN  
SCALE: 1"=100'



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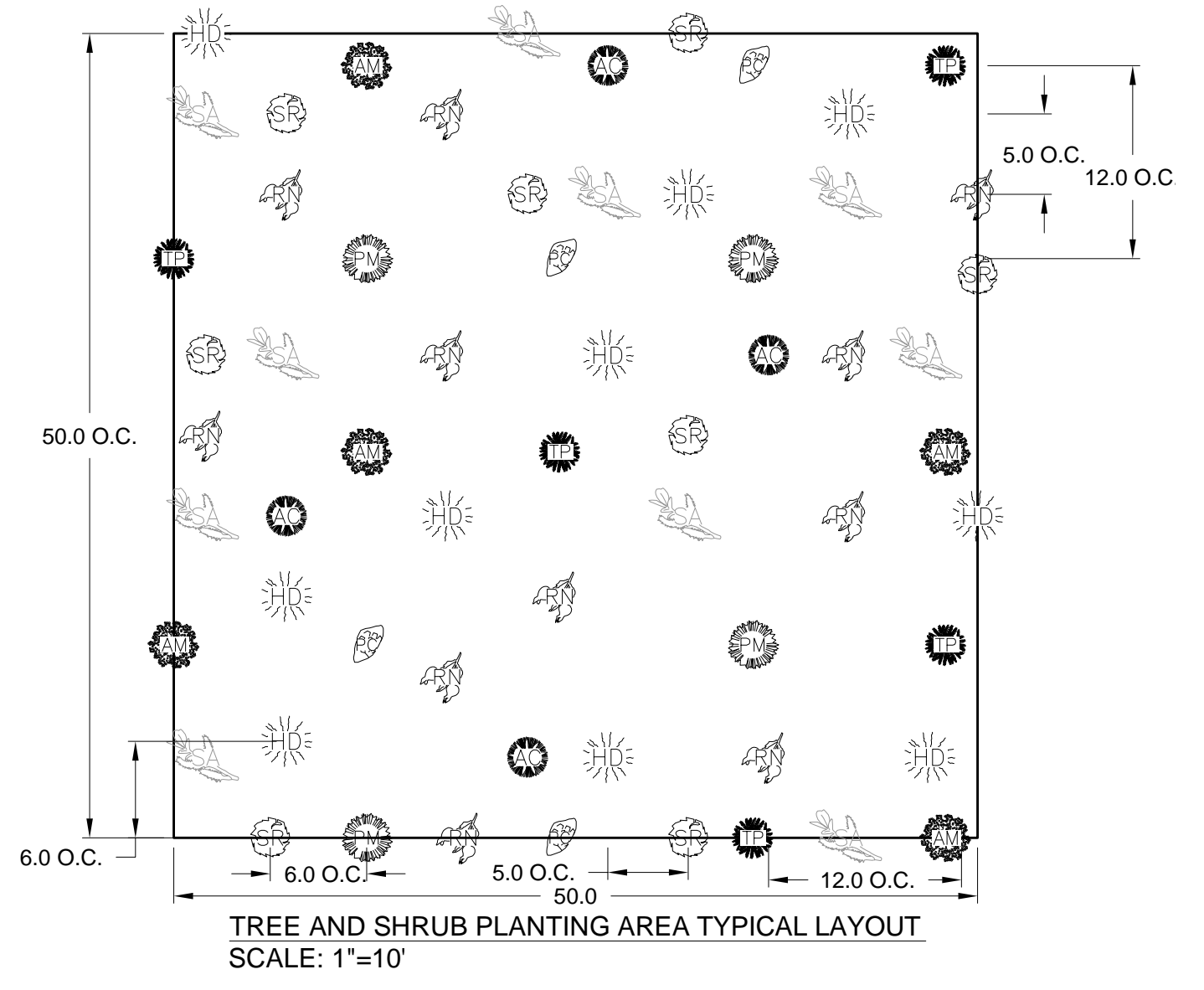
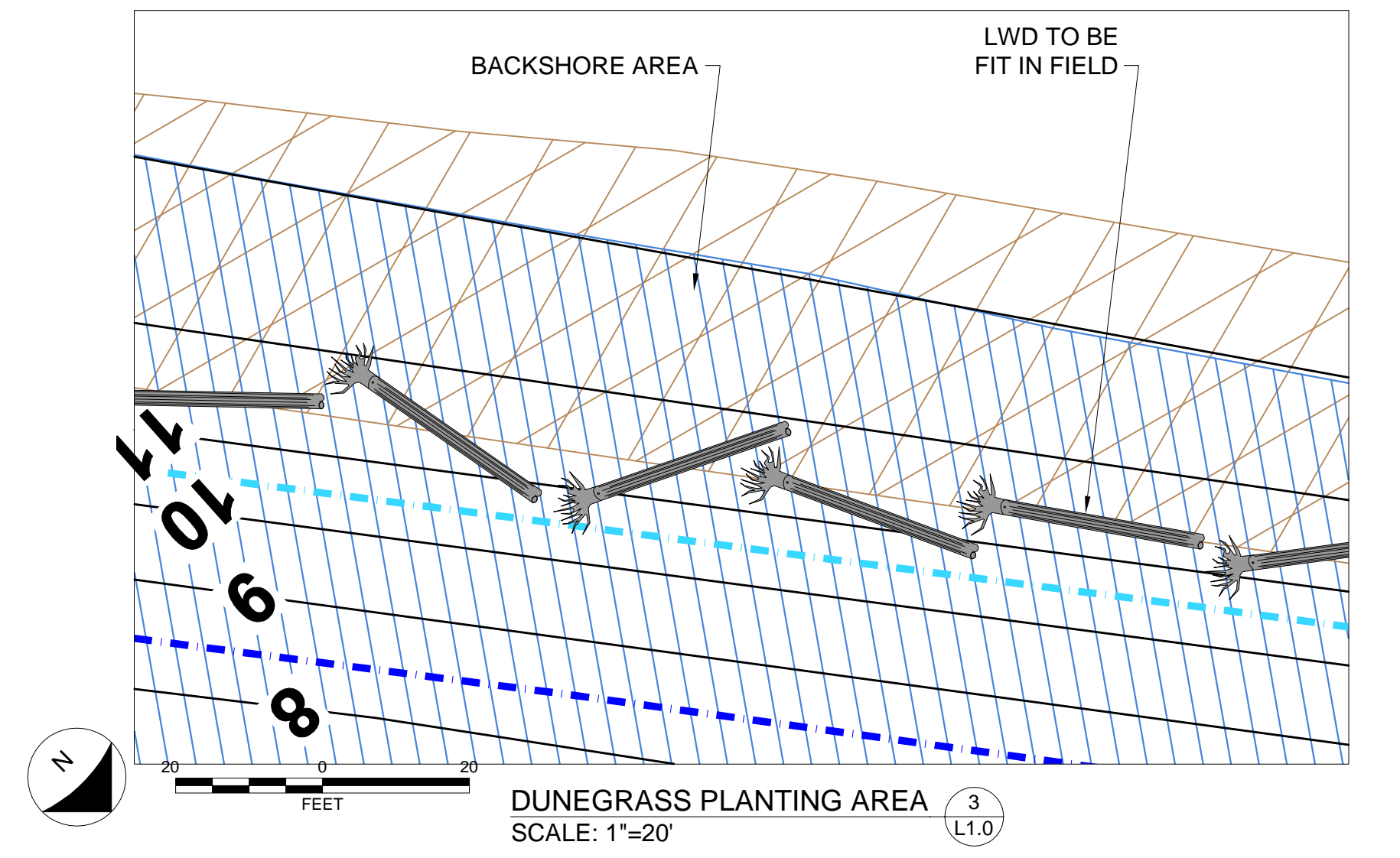
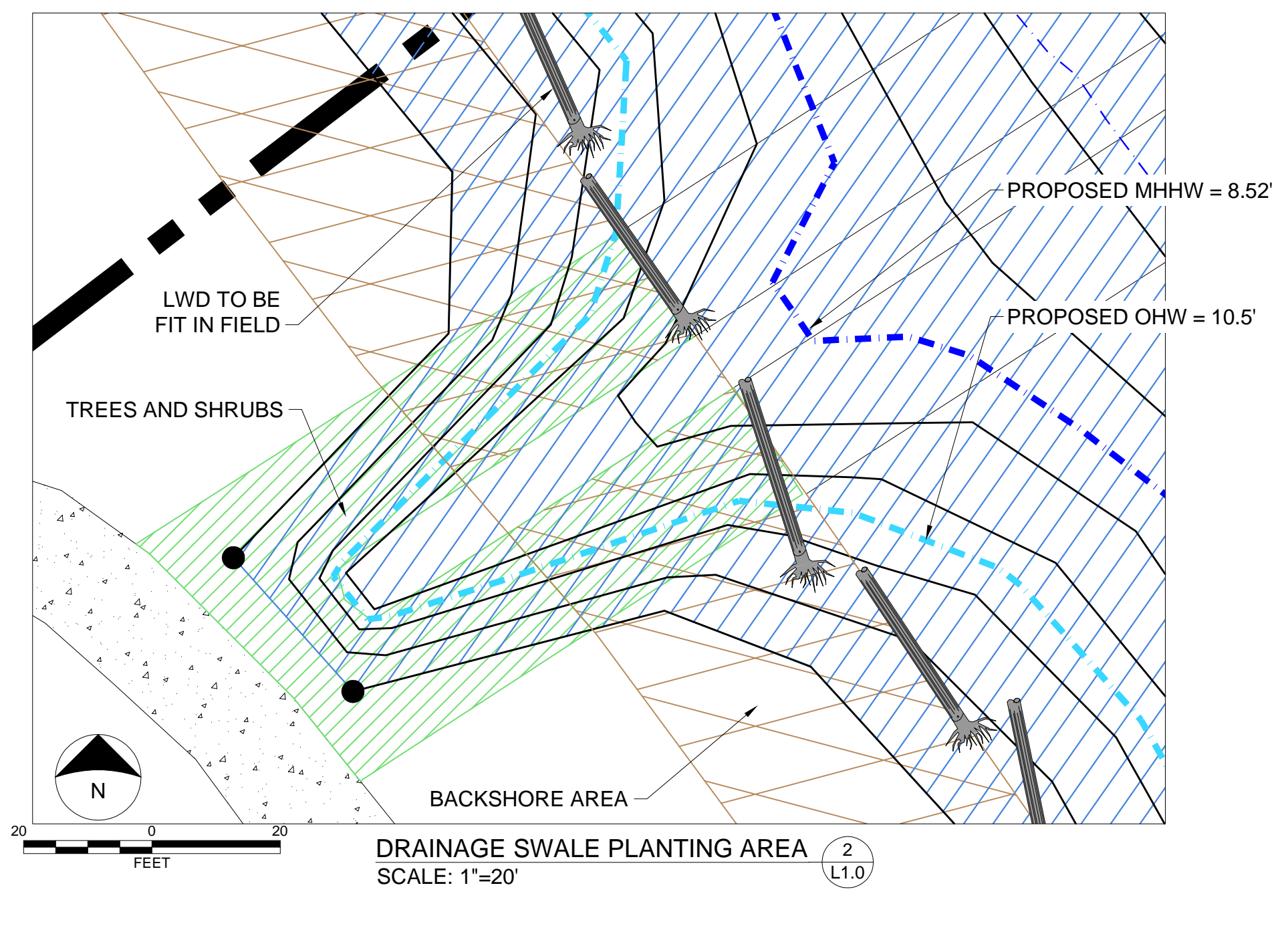
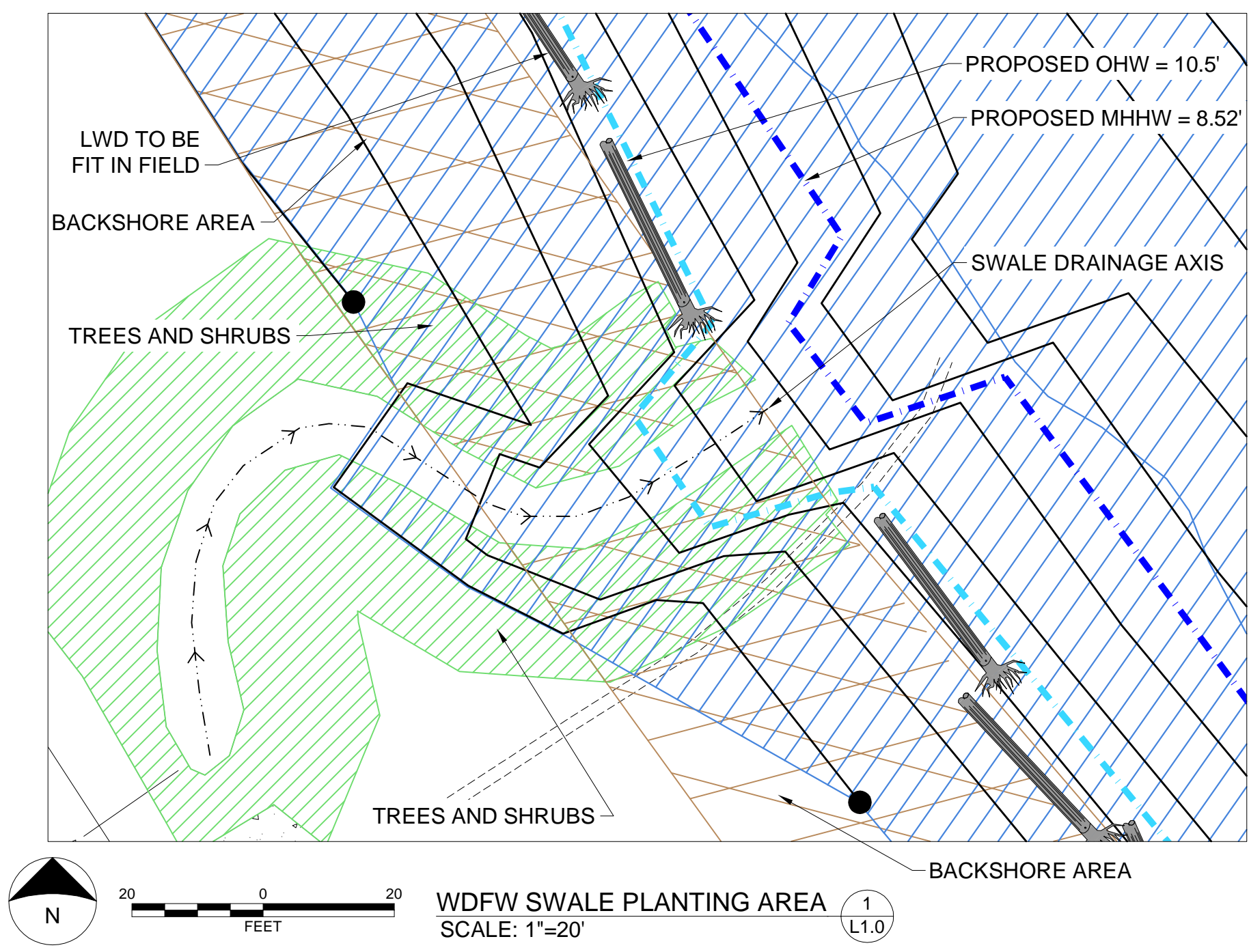
**LANDSCAPING AND RESTORATION PLAN**

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

**L1.0**

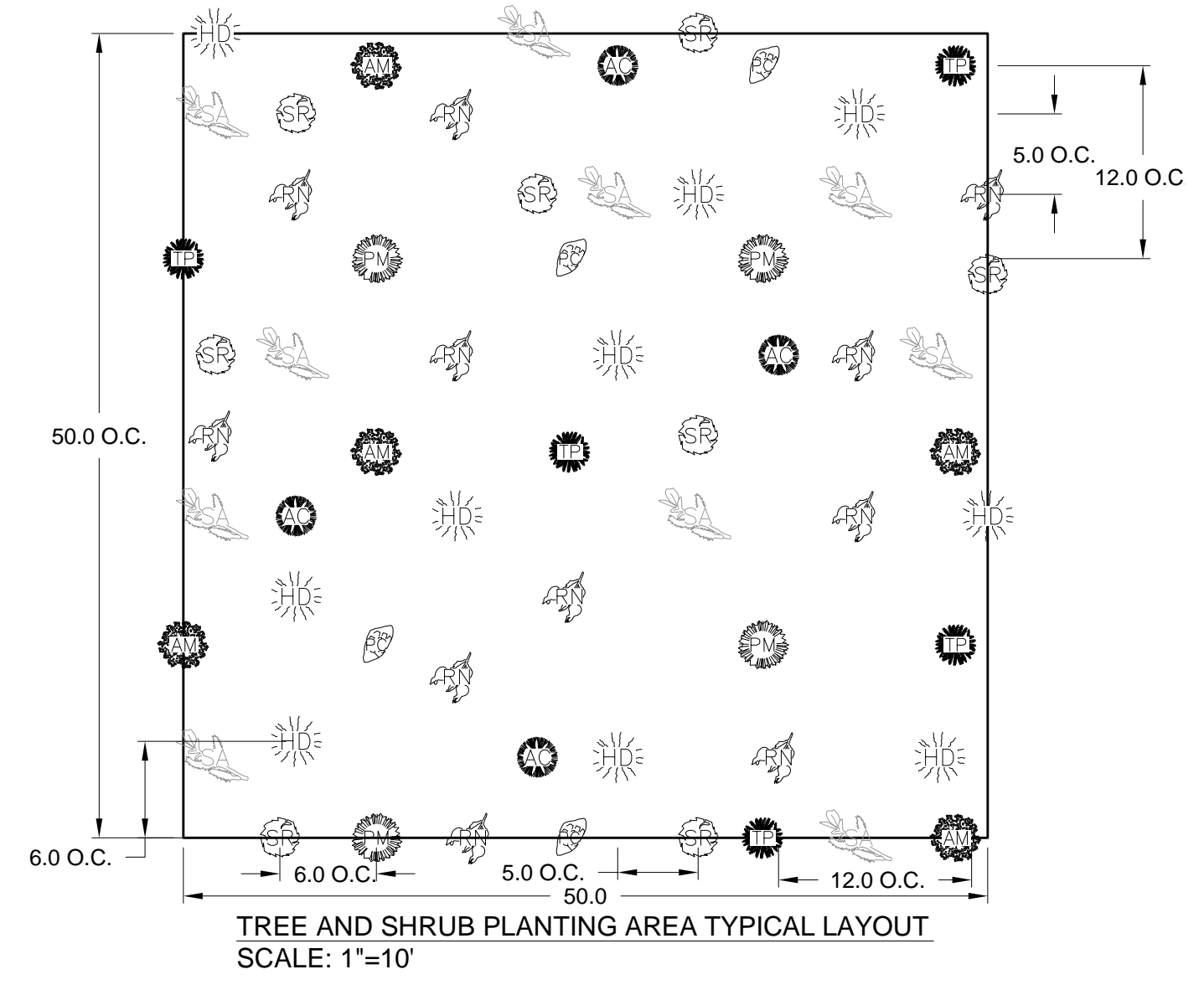
100-PERCENT DESIGN

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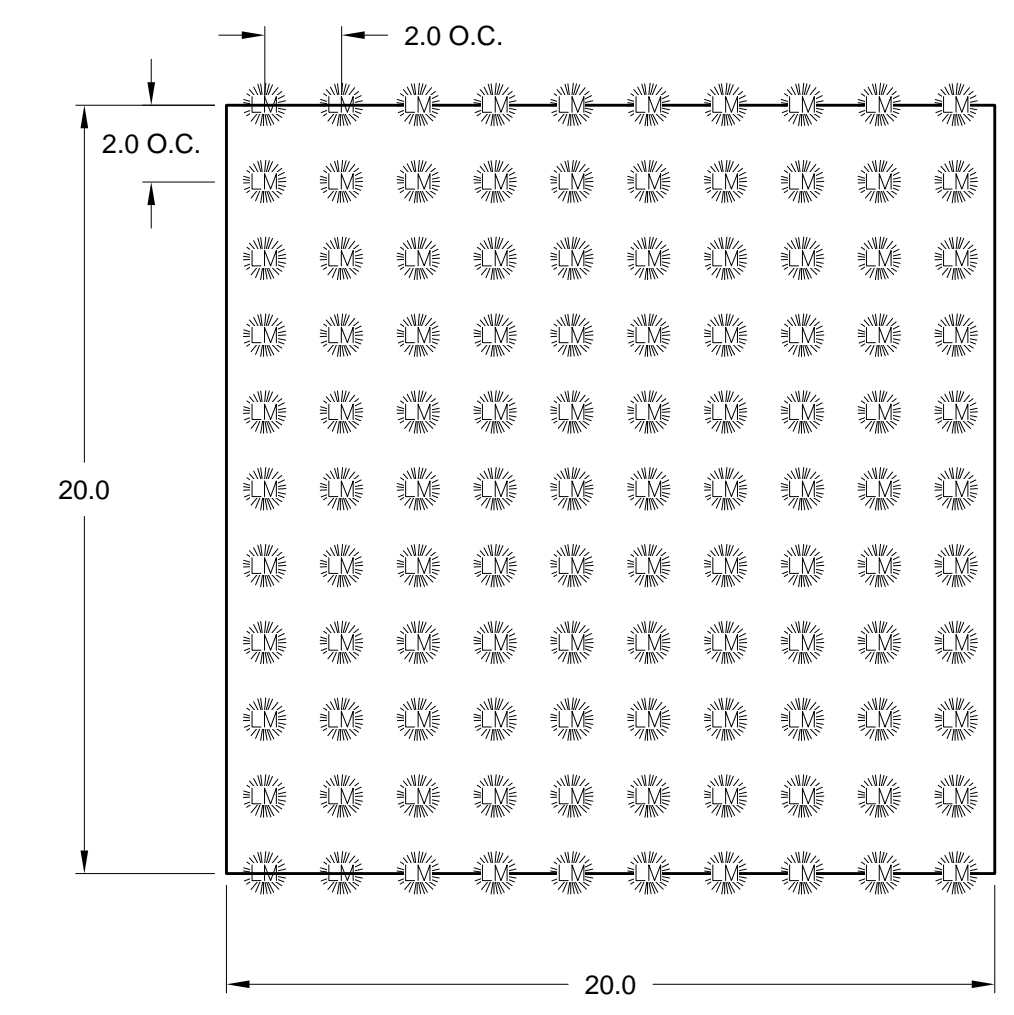
TREE AND SHRUB PLANTING AREA TYPICAL LAYOUT  
SCALE: 1"=10'

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



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

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

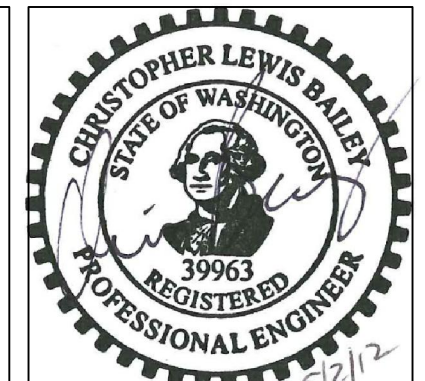


DUNEGRASS PLANTING AREA TYPICAL LAYOUT  
SCALE: 1"=5'

Symbol	Plant Species		Quantity	On Center Spacing (ft)
	Scientific Name	Common Name		
	<i>Leymus Mollis</i>	Dunegrass	10890	2

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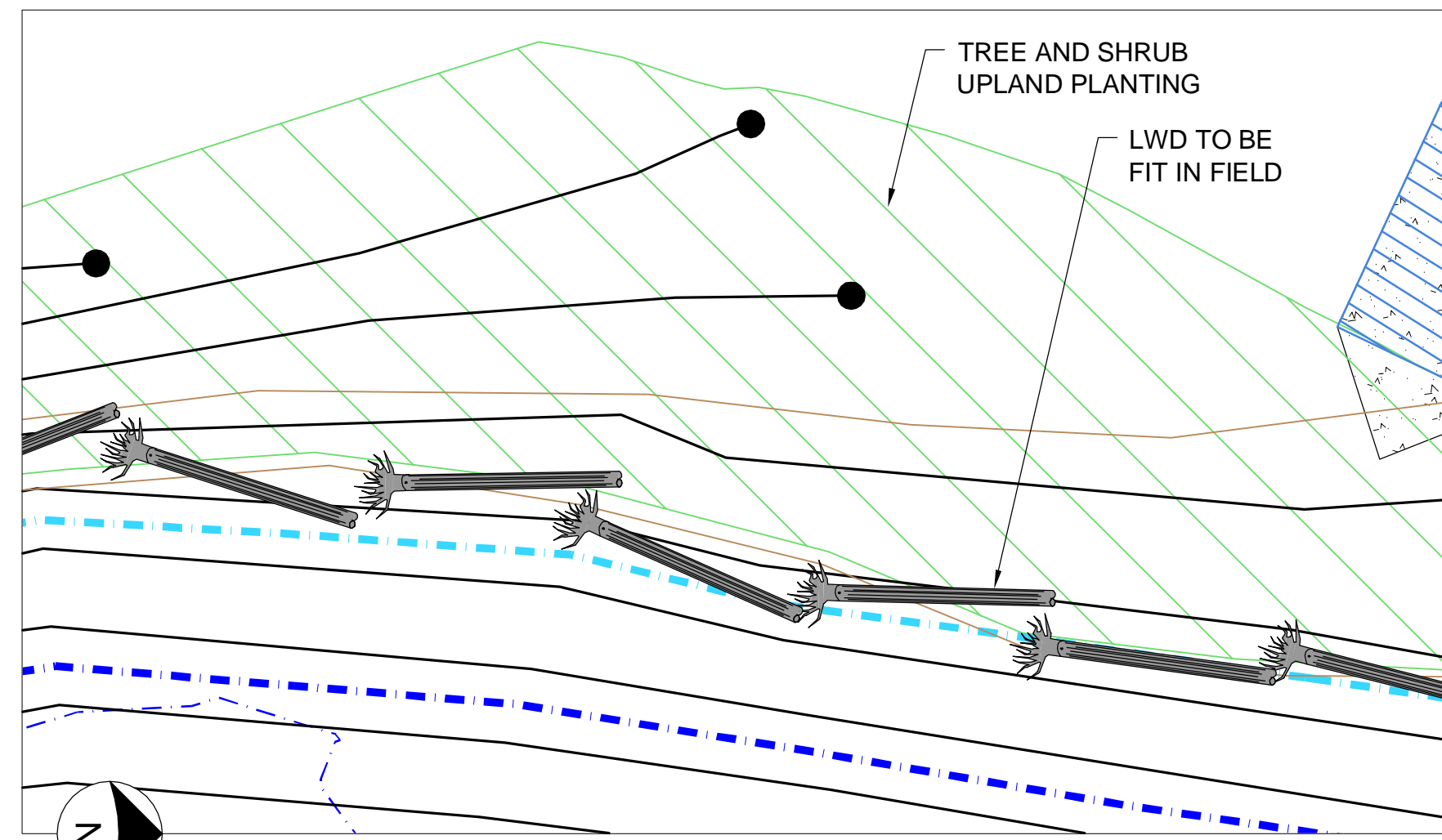
Irondale Iron and Steel Plant Cleanup Action  
Washington State Department of Ecology

**LANDSCAPE AND RESTORATION DETAILS**

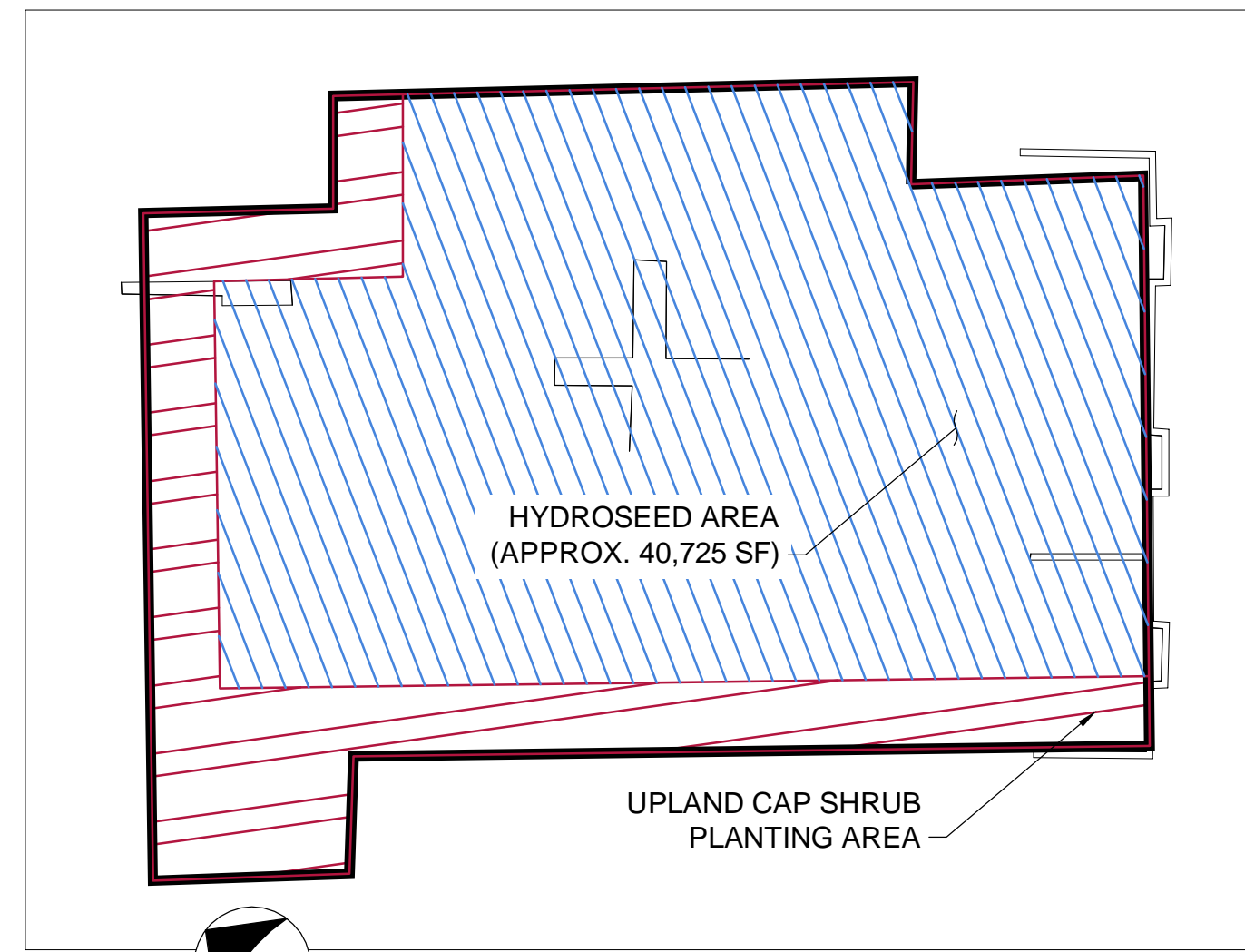
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DESIGN: CLB	SCALE: NOTED
CHECKED: DAC	DATE: 8/31/11
SHEET NO.	<b>L1.1</b>

100-PERCENT DESIGN

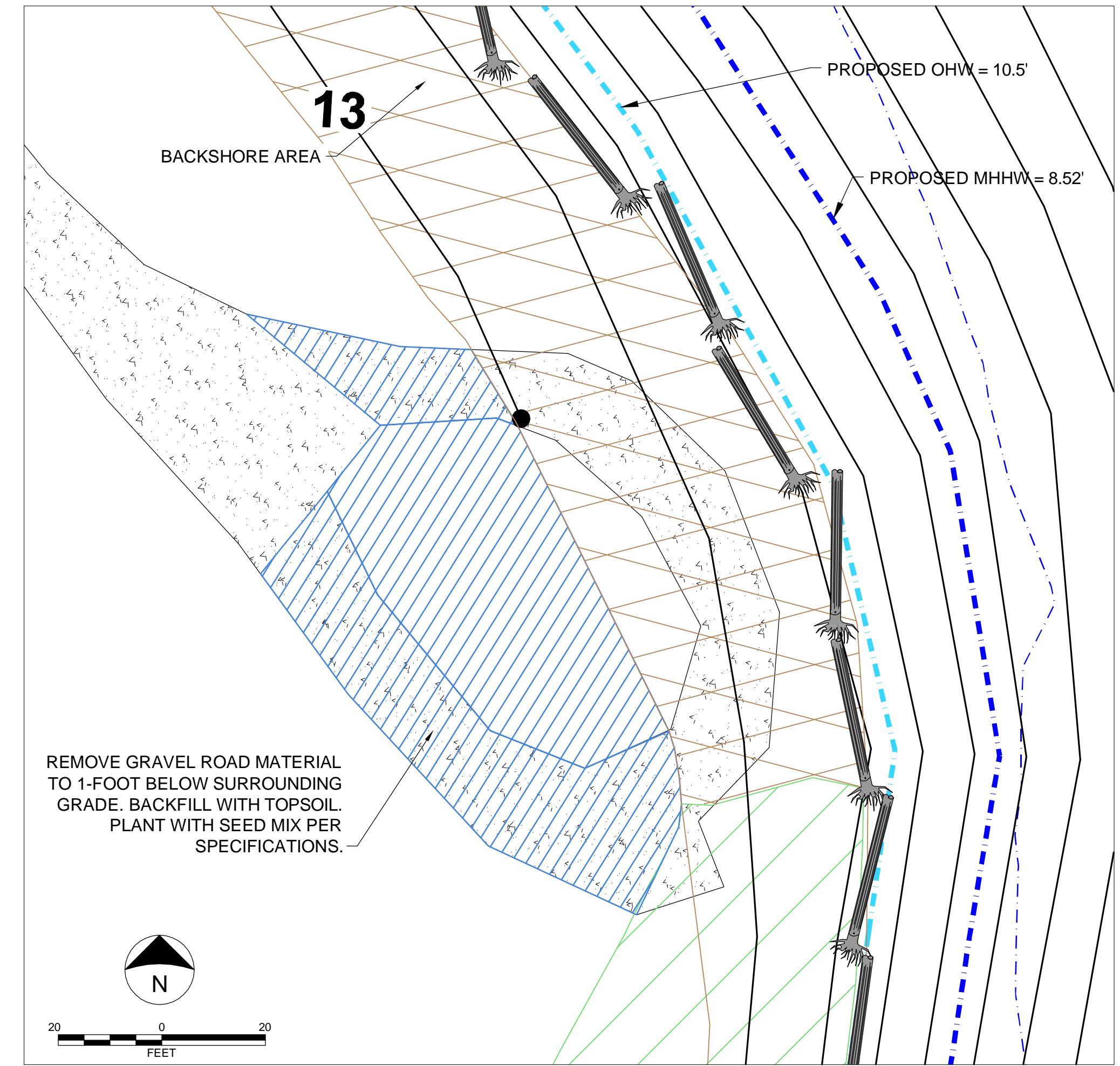
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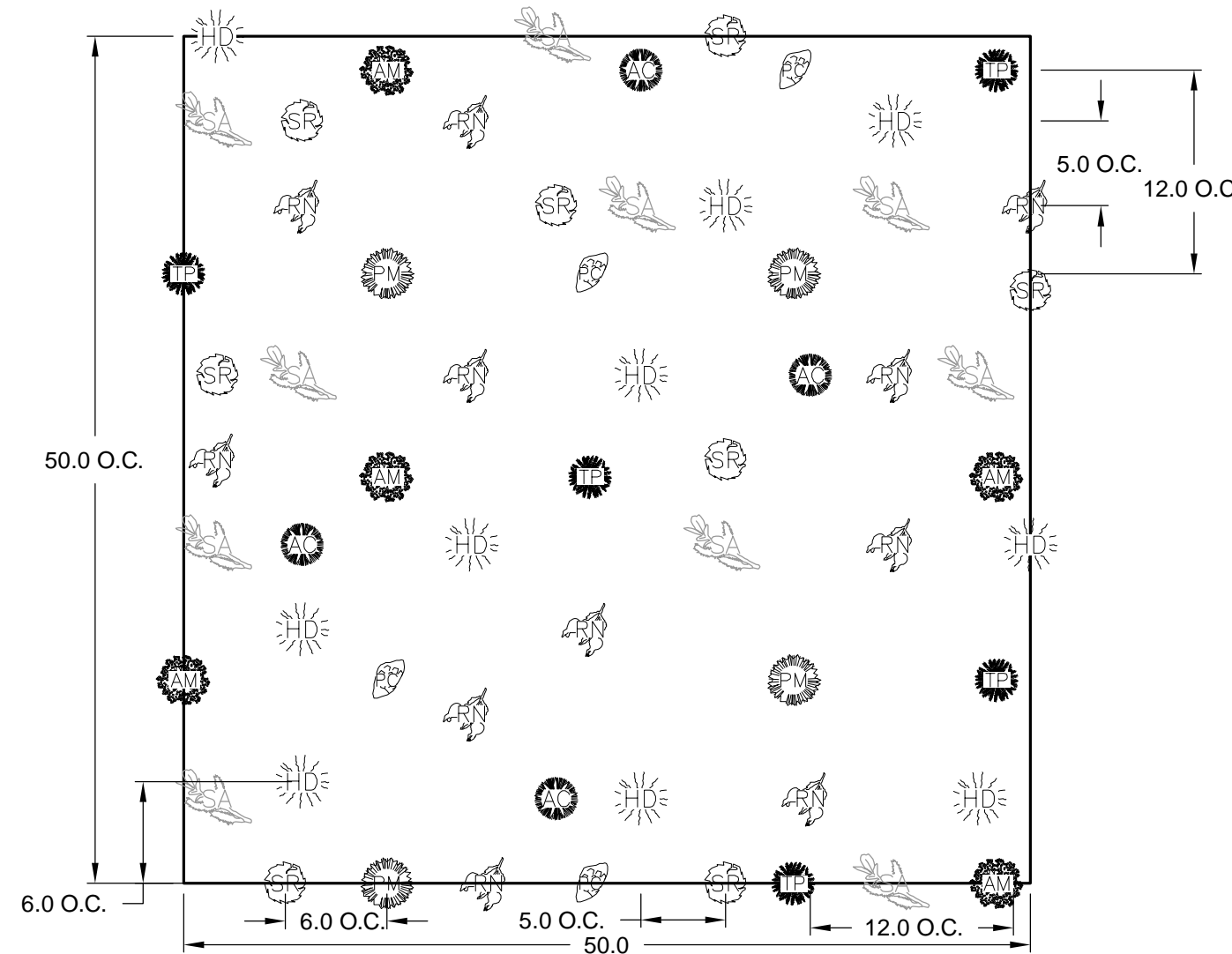
SHORELINE TREE AND SHRUB PLANTING AREA  
SCALE: 1"=20'



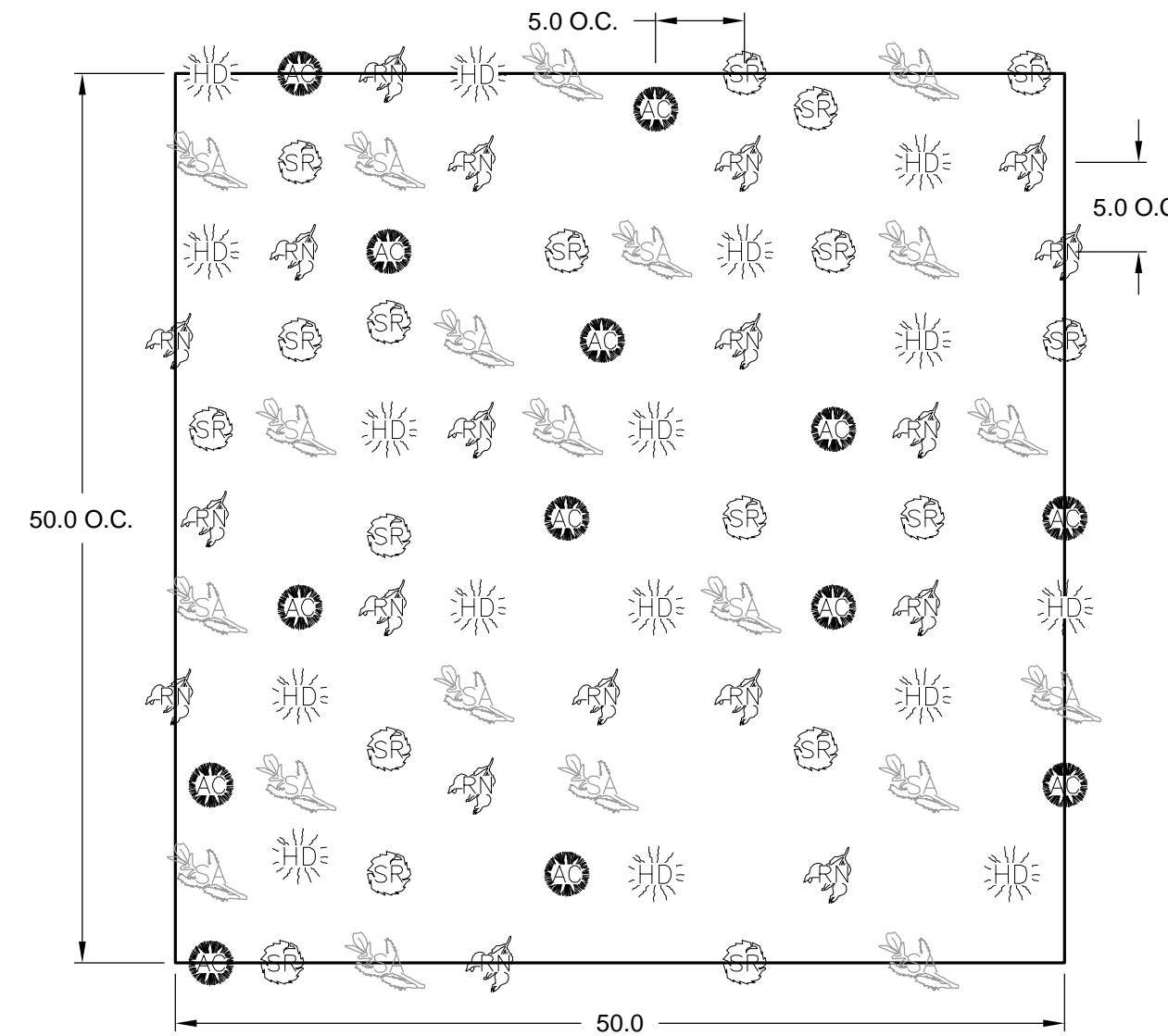
UPLAND CAP SHRUB PLANTING AREA  
SCALE: 1"=50'



ACCESS ROAD RESTORATION DETAIL PLANTING AREA  
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		
<b>TYPICAL TREES</b>				
	<i>Pseudotsuga menziesii</i>	Douglas fir	31	12
	<i>Pinus contorta</i>	Shore pine	31	12
	<i>Thuja plicata</i>	Western red cedar	46	12
	<i>Acer macrophyllum</i>	Big-leaf maple	46	12
<b>TYPICAL SHRUBS</b>				
	<i>Rosa nutkana</i>	Nootka Rose	262	5
	<i>Holodiscus discolor</i>	Oceanspray	175	5
	<i>Acer circinatum</i>	Vine maple	61	6
	<i>Sambucus racemosa</i>	Red elderberry	121	6
	<i>Smyphoricarpus albus</i>	Snowberry	175	5

**TYPICAL SHRUB PLANTING ZONE TABLE**

Symbol	Plant Species		Quantity	On Center Spacing (ft)
	Scientific Name	Common Name		
<b>TYPICAL SHRUBS</b>				
	<i>Rosa nutkana</i>	Nootka Rose	75	5
	<i>Holodiscus discolor</i>	Oceanspray	175	5
	<i>Acer circinatum</i>	Vine maple	75	6
	<i>Sambucus racemosa</i>	Red elderberry	121	6
	<i>Smyphoricarpus albus</i>	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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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

**APPENDIX C**  
**Contractor Invoice for Plant Purchases**

**Storm Lake Growers, Inc.**

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

# Invoice

Date	Invoice #
12/11/2012	12-1002

Bill To
Killdeer Landscape

**PAID**  
**12/13/2012**

Ship To
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

			<b>Total</b>	\$2,756.50
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