CITY OF West Linn

PLANNING MANAGER DECISION

DATE: October 7, 2021

FILE NO.: WAP-21-01/WRG-21-01/MIS-21-02

REQUEST: Request for a Water Resource Area permit, a Willamette River Greenway permit, and a Flood Management Area permit to mitigate impacts from the I-205 Project from 10th Street to the Willamette River

PLANNER: Darren Wyss, Planning Manager

__JRW__ Community Development Director

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GENERAL INFORMATION

APPLICANT/ OWNER:	Mandy Putney Oregon Dept. of Transportation 123 NW Flanders Street Portland, OR 97209
CONSULTANT:	HDR, Inc. Brian Bauman 1050 SW 6th Avenue, Suite 1800 Portland, OR 97204
SITE LOCATION:	ODOT Right-of-Way: Clackamas County Assessor Maps 21E35C, 21E36D, 22E31BB, 22E31, 22E31BA, 22E30CD, 22E30DC, 22E30DB
SITE SIZE:	n/a
LEGAL DESCRIPTION:	ODOT Right-of-Way: Clackamas County Assessor Maps 21E35C, 21E36D, 22E31BB, 22E31, 22E31BA, 22E30CD, 22E30DC, 22E30DB
COMP PLAN DESIGNATION:	n/a
ZONING:	n/a
APPROVAL CRITERIA:	Community Development Code (CDC) Chapter 27, 28, 32, and 99
120-DAY RULE:	The application was declared complete on August 10, 2021. The 120-day period ends on December 8, 2021.
PUBLIC NOTICE:	Notice was mailed to property owners within 500 feet of the project boundary, to all Neighborhood Associations, and to the Dept. of State Lands and Army Corps of Engineers on August 20, 2021 and posted on the City's website on August 17, 2021. Four signs were placed on the property on August 30, 2021. Therefore, public notice requirements of CDC Chapter 99 have been met.

EXECUTIVE SUMMARY

The Oregon Department of Transportation (ODOT) has received approval and funding to widen I-205 from 10th Street to the Willamette River in West Linn and complete seismic upgrades to the Abernethy Bridge. The project is critical to ensure the State designated north-south lifeline (I-205) is operational in the event a magnitude 8+ earthquake occurs. The I-205 route will provide supplies and services to the region after such an event.

Portions of the I-205 widening/seismic upgrade project will impact water resource areas associated with wetlands and streams, will impact the 100-year floodplain with the new Abernethy Bridge piers, and will impact the Willamette River Greenway in West Linn. These impacts are required by the West Linn Community Development Code (CDC) to be reviewed and mitigated per Chapters 27, 28, and 32. The review and decision-making authority is found in CDC Chapter 99.060.A(o,r,t).

<u>Public comment:</u>

Public comment (see Exhibit PD-2) was submitted by Ed Schwarz on behalf of the Savanna Oaks Neighborhood Association. The comments did not identify any code criteria alleged to have not been met. The comment was directed to City Council and requested the Council send the proposal for a decision from the Planning Commission.

Staff Response: The West Linn Community Development Code (CDC) Chapter 99.060.A.1(o,r,t) clearly authorizes the Planning Director to approve, deny, or approve with conditions an application for a Flood Management Area Permit, Water Resource Area Permit, and Willamette River Greenway Permit. CDC Chapter 99 does not grant the Planning Commission or City Council the authority to remove the decision-making authority from the Planning Director. CDC Chapter 99 only grants the City Council the authority to call up a decision from the Planning Director for review (see Exhibit PD-3).

DECISION

The Planning Manager (designee) approves this application (WAP-21-01/WRG-21-01/MISC-21-02), based on: 1) the findings submitted by the applicant, which are incorporated by this reference, 2) supplementary staff findings included in the Addendum below, and 3) the addition of conditions of approval below. With these findings, the applicable approval criteria are met. The conditions are as follows:

1. **<u>Site Plan, Elevations, and Narrative</u>. With the exception of modifications required by these conditions, the project shall conform to the submitted plans, elevations, and narrative submitted in Exhibit PD-1.**

2. **Engineering Standards. All public improvements and facilities associated with the approved site design, including but not limited to street improvements, driveway approaches, curb cuts, utilities, grading, onsite and offsite stormwater, street lighting, easements, easement locations, and connections for future extension of utilities are subject to conformance with the City Municipal Code and Community Development Code. The City may partner with the applicant to fund additional improvements as part of the project.**

3. **Balanced Cut/Fill Report. The applicant shall provide the City with a stamped report from a certified professional engineer that documents the cubic yards of fill and its location versus the cubic yards of cut and its location. (Staff Finding 1)**

4. **Watercourse Alterations Notification. The City of West Linn shall notify the Oregon Department of Land Conservation and Development, the City of Oregon City, the City of Lake Oswego, and Clackamas County of the proposed alterations. The applicant shall not proceed until the City submits evidence of the notifications to the Federal Insurance Administration. (Staff Finding 10)**

5. **McLean Creek Restoration Report. The applicant shall submit a final report documenting the restoration of the creek to pre-construction conditions. (Staff Finding 11)**

6. **Metro HCA Map Revision. The West Linn Planning Director shall submit the HCA Map Revisions, found in Exhibit PD-1, Attachment L, page 569, to Metro within 90 days of approval of the project. (Staff Finding 14)**

7. **Public Access Easement and Trail. The applicant shall construct a ten-foot wide, pervious asphalt trail from Territorial Drive to River Street and provide a twenty-foot public access easement centered on the trail where it crosses the ODOT right-of-way, unless found technically infeasible by the Community Development Director. The trail shall be completed prior to City approval of final mitigation and restoration activities. (Staff Finding 26)**

8. **Riparian Area Fencing. The applicant shall install an anchored chain link fence at the perimeter of the McLean Creek riparian area for protection of the resource that is not proposed to have direct impacts from the project. The fence shall be installed prior to grading or development and shall remain for the duration of the project. (Staff Finding 38)**

9. **Erosion Control Measures. Full erosion control measures shall be in place prior to any grading, development, or site clearing. (Staff Finding 39)**

10. **Riparian Area Restoration. The applicant shall submit a final report documenting the restoration of the riparian areas below OHW to pre-construction conditions per Condition of Approval 10. (Staff Finding 40)**

11. **Revegetation Plan. The applicant shall submit a final report documenting the revegetation of water resource areas and HCA per the revegetation plan, found in Exhibit PD-1, Attachment W, page 702. (Staff Finding 41)**

12. **Mitigation Plan. The applicant shall submit a final report documenting the mitigation of non-PDA water resource areas per the mitigation plan found in Exhibit PD-1, Attachment K, page 563. (Staff Finding 81)**

13. **Mitigation Financial Surety/Monitoring Report. The applicant shall submit a financial surety to ensure successful mitigation and follow with a monitoring report within three years of completion. The financial surety will be released upon acceptance of the monitoring report by the City. (Staff Finding 87)**

14. **Mitigation Plant Mulching. The applicant shall mulch new plantings a minimum of three inches in depth and 18 inches in diameter. (Staff Finding 95)**

15. **Mitigation Plant Watering. The applicant shall water new plantings one inch per week between June 15th and October 15th for three years following planting. (Staff Finding 95)**

16. **Mitigation Plant Maintenance. The applicant shall remove or control non-native or noxious vegetation throughout the maintenance period. (Staff Finding 95)**

17. **Mitigation Planting Windows. The applicant shall plant bare root trees between December 1st and February 28th and potted plants between October 15th and April 30th, or as guided by industry best practices. (Staff Finding 95)**

18. **Plant Protection Fencing/Sleeves. The applicant shall use plant sleeves or fencing to protect trees and shrubs against damage to plants, guided by industry best practices. (Staff Finding 95)**

The provisions of the Community Development Code Chapter 99 have been met.

________________________________ October 7, 2021

Darren Wyss, Planning Manager DATE

Appeals to this decision must be filed with the West Linn Planning Department within 14 days of the mailing date listed below. The cost of an appeal is $400. The appeal must be filed by an individual who has established standing by submitting comments prior to the date identified in the public notice. Appeals will be heard by City Council.

Mailed this 8th day of October, 2021.

Therefore, the 14-day appeal period ends at 5 p.m., on October 22, 2021.

ADDENDUM
APPROVAL CRITERIA AND FINDINGS
WAP-21-01/WRG-21-01/MISC-21-02

CHAPTER 27, FLOOD MANAGEMENT AREAS
27.060 Approval Criteria
A. Development, excavation, and fill shall be performed in a manner to maintain or increase flood storage and conveyance capacity and not increase design flood elevations.
B. No net fill increase in any floodplain is allowed. All fill placed in a floodplain shall be balanced with an equal amount of soil material removal. Excavation areas shall not exceed fill areas by more than 50 percent of the square footage. Any excavation below the ordinary high water line shall not count toward compensating for fill.
C. Excavation to balance a fill shall be located on the same lot or parcel as the fill unless it is not reasonable or practicable to do so. In such cases, the excavation shall be located in the same drainage basin and as close as possible to the fill site, so long as the proposed excavation and fill will not increase flood impacts for surrounding properties as determined through hydrologic and hydraulic analysis.

Staff Finding 1: The applicant has proposed a balanced fill/cut to maintain flood storage and conveyance capacity and not increase design flood elevations. The applicant proposes 120 cubic yards of fill associated with the new Abernethy Bridge piers. The applicant proposed a cut of 120 cubic yards above the ordinary high water line of 30 feet elevation near Pier 8. The excavation to balance the fill is located adjacent to the enlarged bridge piers and there will be no increase in flood impacts per the analysis found in Exhibit PD-1, Attachment F. The applicant shall submit a final report confirming the balanced fill/cut per Condition of Approval 3. Subject to the Conditions of Approval, the criteria are met.

D. Minimum finished floor elevations must be at least one foot above the design flood height or highest flood of record, whichever is higher, for new habitable structures in the flood area.
E. Temporary fills permitted during construction shall be removed.

Staff Finding 2: No habitable structures are proposed in the flood management area. All permitted temporary fills will be removed after construction has been completed. The criteria are met.

F. Prohibit encroachments, including fill, new construction, substantial improvements, and other development in floodways unless certification by a professional civil engineer licensed to practice in the State of Oregon is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.
G. All proposed improvements to the floodplain or floodway which might impact the flood-carrying capacity of the river shall be designed by a professional civil engineer licensed to practice in the State of Oregon.

Staff Finding 3: Staff adopts applicant findings found in Exhibit PD-1. The criteria are met.

Applicant Response: The Applicant has prepared a No-Rise Memorandum (Attachment F) to demonstrate there will not be an increase in flood levels.
Applicant Response: All proposed work within the floodplain has been designed by professional civil engineers licensed in Oregon.

H. New culverts, stream crossings, and transportation projects shall be designed as balanced cut and fill projects or designed not to significantly raise the design flood elevation. Such projects shall be designed to minimize the area of fill in flood management areas and to minimize erosive velocities. Stream crossings shall be as close to perpendicular to the stream as practicable. Bridges shall be used instead of culverts wherever practicable.
I. Excavation and fill required for the construction of detention facilities or structures, and other facilities, such as levees, specifically shall be designed to reduce or mitigate flood impacts and improve water quality. Levees shall not be used to create vacant buildable land.

Staff Finding 4: Staff adopts applicant findings found in Exhibit PD-1. No levees are proposed to create vacant buildable land. The criteria are met.

Applicant Response: No new stream crossings are proposed. All bridge work is replacing or removing existing bridges in the same locations. No new culverts are proposed. See Attachment E for proposed balanced cut/fill work within the floodplain.

Applicant Response: To meet stormwater design criteria, water quality facilities and detention facilities are proposed along the length of the proposed project. The Preliminary Stormwater Design Report, provided as Attachment G, describes the design criteria and analysis used to determine the appropriate design for water quality and stormwater facilities associated with the project.

J. The applicant shall provide evidence that all necessary permits have been obtained from those federal, State, or local governmental agencies from which prior approval is required.

Staff Finding 5: The applicant has submitted documentation of necessary permits from Oregon Department of State Lands, Oregon Department of Environmental Quality, and the Army Corps of Engineers. Please see Exhibit PD-1, Attachment H (page 510). The criteria are met.

27.070 Construction Materials and Methods
A. All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage using methods and practices that minimize flood damage.
B. Electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

C. New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.
D. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters.
E. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.
F. All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure.

Staff Finding 6: Staff adopts applicant findings found in Exhibit PD-1, page 13. The criteria are met.

Applicant Response: The transportation improvements will be constructed with materials and utility equipment resistant to flood damage. The temporary work bridge will be constructed above the typical 2-year flow elevation and will be constructed to withstand high water flows. Mobile equipment will be required to be staged at least 150 feet from the ordinary high water elevation. Should high flows be anticipated, the contractor will relocate equipment above the anticipated flood elevation.

Applicant Response: No service facilities are included in the proposal.

Applicant Response: The existing water supply system traversing the Abernethy Bridge will be maintained during construction. It is currently designed to eliminate infiltration of flood waters.

Applicant Response: No new or replacement sanitary sewage systems are proposed.

Applicant Response: No waste disposal systems will be constructed as part of the proposed development. Managing construction waste will be the responsibility of the construction contractor. The Applicant would require the construction contractor to locate temporary waste collection areas to avoid impairment to them or contamination from them during flooding.

Applicant Response: The new facilities are designed to withstand major seismic events and flooding. Structural elements subject to water flow are designed for purposes of maintaining their integrity during high flood events.

27.090 NON-RESIDENTIAL CONSTRUCTION
New construction and substantial improvement of any commercial, industrial, or other non-residential structure shall either have the lowest floor, including basement, elevated to at least one foot above the level of the base flood elevation; or, together with attendant utility and sanitary facilities, shall:
A. Be flood-proofed so that below the base flood level the structure is watertight with walls impermeable to the passage of water;

B. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;
C. Be certified by a professional civil engineer licensed to practice in the State of Oregon that the design and methods of construction shall prevent seepage, collapse or cracking of basement walls, prevent buckling of basement floors, prevent backup of water from sewer lines, and have all openings located one foot above the base flood elevation. In addition, all protective features must operate automatically without human intervention;
D. Non-residential construction that is elevated, but not flood-proofed (i.e., the foundation is not at least one foot above the 100-year flood elevation) shall also comply with the standards set forth in CDC 27.080.

Staff Finding 7: Staff adopts applicant findings found in Exhibit PD-1, page 14. The criteria are met.

Applicant Response: The proposed construction is a transportation facility that does not include walls. There is no expectation the transportation surfaces and related facilities would be water tight.

Applicant Response: The new facilities are designed to withstand major seismic events and flooding. Structural elements subject to water flow are designed for purposes of maintaining their integrity during high flood events.

Applicant Response: All proposed work has been designed by professional civil engineers licensed in Oregon. No structures are proposed that would have basements, floors, or sewer lines.

Applicant Response: This section is not applicable. The Applicant's proposal does not include construction that would require flood-proofing.

27.120 ALTERATION OF WATERCOURSES
A. The applicant shall meet the requirements of Chapter 28 CDC, Willamette and Tualatin River Protection, or Chapter 32 CDC, Water Resource Area Protection, as applicable, in addition to this chapter's requirements.

Staff Finding 8: Please see Staff Findings 12 to 97. The criteria are met.

B. A comparison by a professional civil engineer licensed to practice in the State of Oregon shall be made between the existing channel capacity and the proposed capacity and the changes assessed. The alteration or modification must maintain the carrying capacity of the watercourse and not increase the base flood elevation.

Staff Finding 9: Staff adopts applicant findings found in Exhibit PD-1, page 15. The name of the creek is McLean Creek, not McLoughlin Creek. The criteria are met.

Applicant Response: Piers 5, 6, 7, and 8 of the Abernethy Bridge, which are in the flood management area of the Willamette River, will be replaced, each with two new columns. The footing for Abernethy Bridge Pier 10 that extends under McLoughlin Creek will be retrofitted to allow the bridge to meet seismic standards. A professional civil engineer licensed to practice in the State of Oregon has compared the existing channel capacity of the Willamette River and McLoughlin Creek to the proposed project changes in these watercourses and determined that their carrying capacities will be maintained and the base flood elevation will not increase. In the case of the Willamette River, the No-rise Memorandum in Attachment F and the cut/fill memo in Attachment E provide detailed descriptions of the proposed project and the means of avoiding an increase in base flood elevation and maintaining the river's carrying capacity. To minimize impacts to McLoughlin Creek the project will temporarily relocate the creek during construction. The temporary alteration of McLoughlin Creek, would place creek flow into a 48- inch diameter diversion pipe for a maximum of 18 months. This diameter pipe will meet the pipe sizes on either end of the temporarily diverted portion of the creek. Once the bridge pier footing is complete, the stream will be placed back to the original location and restored to preconstruction conditions. There will be no change to carrying capacity of the creek.

C. The Planning Director shall notify adjacent communities and the State of Oregon Department of Land Conservation and Development prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Insurance Administration.

Staff Finding 10: The applicant proposes alterations to both the Willamette River and McLean Creek. Prior to commencement of construction, the City of West Linn shall notify the Oregon Department of Land Conservation and Development, the City of Oregon City, the City of Lake Oswego, and Clackamas County of the alterations. The applicant shall not proceed until the City submits evidence of the notifications to the Federal Insurance Administration and the applicant per Condition of Approval 4. Subject to the Conditions of Approval, the criteria are met. The criteria are met.

D. The Planning Director shall require that maintenance be provided within the altered or relocated portion of said watercourse so that the flood-carrying capacity is not diminished.
E. The Planning Director shall require that alterations of watercourses must allow fish passage and preserve fish habitat.
F. The applicant shall submit a copy of a permit from the Oregon Division of State Lands and U.S. Army Corps of Engineers that allows the alteration, or states that it is exempt.

Staff Finding 11: Staff adopts applicant findings found in Exhibit PD-1, pages 15-16. The name of the creek is McLean Creek, not McLoughlin Creek. The applicant shall submit a final report documenting the restoration of the creek to pre-construction conditions per Condition of Approval 5. Subject to the Conditions of approval, the criteria are met.

Applicant Response: The Applicant will comply with the conditions of the permit. The diversion pipe would be maintained during the period it is in place (no more than 18 months).

Following construction, the creek would be restored to pre-construction conditions and the flood-carrying capacity of McLoughlin Creek would not be diminished as a result of the proposed project. Creek restoration would be monitored with other areas of site restoration when construction is complete.

Applicant Response: McLoughlin Creek does not provide fish habitat, as noted in Attachment I (email from Tom Murtagh, ODFW Fish Biologist). No preservation of fish habitat or fish passage would be required.

Applicant Response: See Attachment H (Exhibit PD-1, page 510) for a copy of a permit from the Oregon Division of State Lands and U.S. Army Corps of Engineers.

CHAPTER 28: WILLAMETTE AND TUALATIN RIVER PROTECTION AREA
28.070 PLANNING DIRECTOR VERIFICATION OF METRO HABITAT PROTECTION MAP BOUNDARIES
A. The HCA Map is the basis for identifying and designating the habitat conservation areas in the City. A copy of the latest, updated HCA Map is on file at the City and is adopted by reference for use with this chapter.
It is inevitable, given the large area that Metro's HCA Map covers, that there may be some errors. In cases where, for example, three properties share the same contours and the same natural features but the map shows the middle lot with an HCA designation on it, it is reasonable to question the accuracy of that HCA designation. Using tree overstory as the sole basis for HCA designation will also allow a change in designation since trees are already protected in the municipal code and Chapters 55 and 85 CDC.
B. The Planning Director shall verify the appropriate HCA or non-HCA designation by site visits or consultations with Metro or by other means. Determination is based on whether the Metro criteria are met or whether the Metro designation was based solely on tree overstory in which case a redesignation is appropriate. In cases where the determination is that the map is incorrect, the Planning Director will make a written finding of this as well as the site conditions that led to that conclusion.

Staff Finding 12: The applicant has submitted a request for re-designation of several HCA areas in the project boundary (Exhibit PD-1, Attachment L, page 569). After review of the applicant submittal, the Planning Director concurs with the analysis and approves the re-designation. The applicant has provided sufficient evidence that the HCA designations do not meet Metro criteria for designation as they are located within the engineered road prisms or are associated with culverts and provide no habitat functions. The criteria are met.

C. Class B public notice, per Chapter 99 CDC, shall be required prior to issuance of the redesignation decision if it involves redesignation of the HCA boundary to allow the construction of, or addition to, a house.

Staff Finding 13: The proposal does not include the construction of, or addition to, a house. The criteria do not apply.

D. This determination and findings shall become part of the City record and part of the record for any associated land use application. The Planning Director shall also include in the record the revised map boundary. The Planning Director's determination and map revisions shall also be sent to Metro so that their map may be corrected as necessary.

Staff Finding 14: The determinations and findings are part of the record. The revised map boundaries can be found in Exhibit PD-1, Attachment L, page 569. Per Condition of Approval 6, the Planning Director shall send the map revisions to Metro within 90 days of approval of the project. Subject to the Conditions of Approval, the criteria are met.

E. The Planning Director determination is appealable to the City Council per Chapter 99 CDC.
F. Lands that are designated as an HCA only due to a forested overstory are exempt under CDC 28.040, Exemptions, since trees are already protected in the municipal code and Chapters 55 and 85 CDC. Similar exemptions apply to lands that exhibit no constraints.

Staff Finding 15: Parties of record may appeal the re-designation to City Council. No exemptions are requested for forested overstory. The criteria are met.

28.110 APPROVAL CRITERIA
A. Development: All sites.
1. Sites shall first be reviewed using the HCA Map to determine if the site is buildable or what portion of the site is buildable. HCAs shall be verified by the Planning Director per CDC 28.070 and site visit. Also, "tree canopy only" HCAs shall not constitute a development limitation and may be exempted per CDC 28.070(A). The municipal code protection for trees and Chapters 55 and 85 CDC tree protection shall still apply.

Staff Finding 16: The applicant has requested re-designation of HCA areas and the Planning Director has approved the request as the areas are within the roadway engineered prism or associated with a culvert that provides no habitat value. See Staff Findings 12 to 15. The criteria are met.

2. HCAs shall be avoided to the greatest degree possible and development activity shall instead be directed to the areas designated "Habitat and Impact Areas Not Designated as HCAs," consistent with subsection (A) (3) of this section.
3. If the subject property contains no lands designated "Habitat and Impact Areas Not Designated as HCAs" and development within HCA land is the only option it shall be directed towards the low HCA areas first, then medium HCA areas and then to high HCA as the last choice. The goal is to, at best, avoid or, at least, minimize disturbance of the HCAs. (Water-dependent uses are exempt from this provision.)

Staff Finding 17: Staff adopts applicant findings found in Exhibit PD-1, page 17. The criteria are met.

Applicant Response: The project was designed to have the least possible impact on HCAs by avoiding and minimizing development activities in HCAs to the extent possible. Given the proximity of HCAs to the I-205 corridor and the Abernethy Bridge, some impacts from the proposed project were unavoidable if the purpose and need of the project is to be met. The purpose of the project is to improve traffic safety, relieve traffic congestion within the corridor, and provide an earthquake resilient route capable of being operational after a Cascadia seismic event. ODOT designated I-205 as a Phase 1 statewide north-south lifeline route, which means it must be operational quickly after a disaster renders other roadways unusable or impassable. To reduce congestion, an additional lane will be added in each direction contiguous with the existing lanes, thereby making some impacts to those HCAs located near roadways unavoidable. See applicant responses to D.1, D.2, and S below.

Applicant Response: Where development activities in HCAs cannot be avoided, impacts were minimized to the extent possible by designing the project to disturb "low" HCAs before "high" HCAs. Only one area of proposed work is within a "high" HCA, which is the area underneath the Abernethy Bridge directly west of the Willamette River. No feasible options were available that would avoid the high HCA and seismically upgrade the Abernethy Bridge which requires modifications to the substructure. See Table 1 in applicant response to D.1 below.

4. All development, including exempted activities of CDC 28.040, shall have approved erosion control measures per Clackamas County Erosion Prevention and Sediment Control Planning and Design Manual, rev. 2008, in place prior to site disturbance and be subject to the requirements of CDC 32.070 and 32.080 as deemed applicable by the Planning Director.

Staff Finding 18: The applicant has submitted erosion control measures per Clackamas County Erosion Prevention and Sediment Control Planning and Design Manual, rev. 2008. Measures will be in place prior to site disturbance. See Exhibit PD-1, Attachment Z, page 847. The criteria are met.

B. Single-family or attached residential.
(…)
C. Setbacks from top of bank.
(…)

Staff Finding 19: The proposal does not include residential construction. The criteria are not applicable.

D. Development of lands designated for industrial, commercial, office, public and other non-residential uses.
1. Development of lands designated for industrial, multi-family, mixed use, commercial, office, public and other non-single-family residential uses shall be permitted on the following land designations and in the following order of preference with "a" being the most appropriate for development and "d" being the least appropriate:
a. "Habitat and Impact Areas Not Designated as HCAs"

b. Low HCA
c. Moderate HCA
d. High HCA

Staff Finding 20: Staff adopts applicant findings found in Exhibit PD-1, pages 20-21 and Attachment M (page 581). The criteria are met.

Applicant Response: Table 1 below shows the breakdown of proposed development within a, b, c, and d lands, showing that permanent impacts were avoided or minimized to the extent feasible to the High HCA designated areas in accordance with the preferred order of development. Permanent impacts to HCAs are only proposed in two areas, along I-205 NB near 10th Street (HCA 1) and under the Abernethy Bridge (HCA 4). HCA 2 and HCA 3 do not have proposed permanent impacts to the HCA itself; impacts are proposed to the Habitat and Impact Areas Not Designated as HCAs. See Attachment M, HCA Impacts for areas of proposed permanent impacts in HCAs and non-HCAs.

Table 1. Proposed development on a-d designated lands

HCA #	"a" lands		"b" lands		"c" lands		"d" lands	
	Temp.	**Perm.**	**Temp.**	**Perm.**	**Temp.**	**Perm.**	**Temp.**	**Perm.**
1	23,967 sq. ft.	75,322 sq. ft.	3,760 sq. ft.	10,726 sq. ft.	0	0	0	0
2	5,559 sq. ft.	27,922 sq. ft.	0	0	0	0	0	0
3	4,026 sq. ft.	20,096 sq. ft.	0	0	0	0	0	0
4	520 sq. ft.	12,370 sq. ft.	0	0	44,602 sq. ft.	9,975 sq. ft.	199,340 sq. ft.	1,425 sq. ft.
Total	**34,072 sq. ft.**	**135,710 sq. ft**	**3,760 sq. ft.**	**10,726 sq. ft.**	**44,602 sq. ft.**	**9,975 sq. ft.**	**199,340 sq. ft.**	**1,425 sq. ft.**

2. Developing HCA land.
a. Where non-HCA or areas designated as "Habitat and Impact Areas Not Designated as HCAs" are lacking or are in such limited supply as to render uses allowed by the underlying zone (e.g., general industrial) functionally impractical, the HCA may be utilized and built upon but shall emphasize "b" and "c" designations.
b. Where it is proposed that a "d" or high HCA classification be used, the property owner must demonstrate that the proposed use is clearly a water-dependent use. Proximity to the river for the purpose of views is not valid grounds. However, public interpretive facilities of historic

facilities such as the government locks will be permitted as well as wildlife interpretive facilities and ADA-accessible platforms.

Staff Finding 21: Staff adopts applicant findings found in Exhibit PD-1, pages 21-22 and Attachment M (page 581). The name of the creek is McLean Creek, not McLoughlin Creek. The criteria are met.

Applicant Response: The Applicant will utilize "b" and "c" designations in areas without non-HCAs or areas designated as Habitat and Impact Areas Not Designated as HCAs (See Attachment M, HCA Impacts). Unavoidable proposed permanent impacts to "b" and "c" designations are along the I-205 corridor in HCA 1 and under the Abernethy Bridge in HCA 4.

Applicant Response: Development is proposed in areas classified as high HCA under the Abernethy Bridge in HCA 4. The proposed work includes replacing the existing bridge supports to provide a seismically stable Abernethy Bridge able to withstand the Cascadia Subduction Zone earthquake. The Abernethy Bridge will carry the I-205 lifeline traffic over the Willamette River and McLoughlin Creek after the earthquake allowing for emergency response and a more speedy recovery of the critical infrastructure within the region. The project was designed to have the least impact possible to HCAs, but some impacts are required in order to meet the project's objective. All other proposed impacts to HCAs are within a, b, or c classifications along the I-205 corridor. See Attachment M for proposed HCA impacts.

E. Hardship provisions and non-conforming structures.
1. For the purpose of this chapter, non-conforming structures are existing structures whose building footprint is completely or partially on HCA lands. Any additions, alterations, replacement, or rehabilitation of existing non-conforming non-water-related structures (including decks), roadways, driveways, accessory uses and accessory structures shall avoid encroachment upon the HCAs, especially high HCAs, except that:
a. A 10-foot lateral extension of an existing building footprint is allowed if the lateral extension does not encroach any further into the HCA or closer to the river or water resource area than the portion of the existing footprint immediately adjacent.

Staff Finding 22: The proposal does not include an extension of an existing building. The criteria do not apply.

b. An addition to the existing structure on the side of the structure opposite to the river or water resource area shall be allowed. There will be no square footage limitation in this direction except as described in subsection (E)(1)(c) of this section.
c. The same allowance for the use of, and construction of, 5,000 square feet of total impervious surface for sites in HCAs per subsections (B)(2) through (4) of this section shall apply to lots in this section.

Staff Finding 23: Staff adopts applicant findings found in Exhibit PD-1, page 22 and Attachment M (page 581). The name of the creek is McLean Creek, not McLoughlin Creek. The criteria are met.

Applicant Response: No additions to structures are proposed. The Abernethy Bridge has several piers located within multiple HCA designations, and those piers must be replaced or upgraded to allow the bridge to withstand the anticipated earthquake. The replacement of these piers will result in permanent impacts to HCA 4.

Applicant Response: No impervious surfaces are proposed in HCAs, only excavation, fill, and bridge piers are proposed as permanent impacts to HCAs.

d. Vertical additions are permitted including the construction of additional floors.
e. The provisions of Chapter 66 CDC, Non-conforming Structures, shall not apply.

Staff Finding 24: The proposal does not include construction of additional floors and CDC Chapter 66 is not part of the applicable criteria. The criteria are met.

F. Access and property rights.
1. Private lands within the protection area shall be recognized and respected.
2. Where a legal public access to the river or elsewhere in the protection area exists, that legal public right shall be recognized and respected.
3. To construct a water-dependent structure such as a dock, ramp, or gangway shall require that all pre-existing legal public access or similar legal rights in the protection area be recognized and respected. Where pre-existing legal public access, such as below the OLW, is to be obstructed by, for example, a ramp, the applicant shall provide a reasonable alternate route around, over or under the obstruction. The alternate route shall be as direct as possible. The proposed route, to include appropriate height clearances under ramps/docks and specifications for safe passage over or around ramps and docks, shall be reviewed and approved by the Planning Director for adequacy.
4. Any public or private water-dependent use or facility shall be within established DSL-authorized areas.
5. Legal access to, and along, the riverfront in single-family residential zoned areas shall be encouraged and pursued especially when there are reasonable expectations that a continuous trail system can be facilitated. The City recognizes the potential need for compensation where nexus and proportionality tests are not met. Fee simple ownership by the City shall be preferred. The trail should be dimensioned and designed appropriate to the terrain it traverses and the user group(s) it can reasonably expect to attract. The City shall be responsible for signing the trail and delineating the boundary between private and public lands or access easements.

Staff Finding 25: Staff adopts applicant findings found in Exhibit PD-1, pages 22-23. The criteria are met.

Applicant Response: The Applicant's proposal does not include private lands.

Applicant Response: All areas of public access in the protection area will be recognized and respected.

Applicant Response: No water-dependent structures are proposed.

Applicant Response: No water-dependent uses or facilities are proposed.

Applicant Response: The Applicant does not propose to restrict access to the riverfront.

G. Incentives to encourage access in industrial, multi-family, mixed use, commercial, office, public and non-single-family residential zoned areas.
1. For all industrial, multi-family, mixed use, commercial, office, public and other non-single-family residential zones, this section encourages the dedication or establishment of access easements to allow legal public access to, and along, the river. Support for access may be found in the Parks Master Plan, a neighborhood plan or any applicable adopted sub-area plans. The emphasis will be upon locating paths where there is a reasonable expectation that the path can be extended to adjacent properties to form a connective trail system in the future, and/or where the trail will provide opportunities for appreciation of, and access to, the river.
2. Height or density incentives may be available to developers who provide public access. Specifically, commercial, industrial, multi-family, mixed use, and public projects may be constructed to a height of 60 feet. No variance is required for the 60-foot height allowance regardless of the underlying zone height limitations; however, the following conditions must be met:
a. Provide a minimum 20-foot-wide all-weather public access path along the project's entire river frontage (reduced dimensions would only be permitted in response to physical site constraints such as rock outcroppings, significant trees, etc.); and
b. Provide a minimum 10-foot-wide all-weather public access path from an existing public right-of-way to that riverfront path or connect the riverfront path to an existing riverfront path on an adjoining property that accesses a public right-of-way.
c. Fencing may be required near steep dropoffs or grade changes.

Staff Finding 26: The proposal is for a public project. The 2013 City of West Linn Trails Plan identifies a trail across City-owned West Bridge Park, the ODOT right-of-way under I-205, and the City-owned McClean House property. The connection is identified as a secondary trail route in the 2013 Plan and would connect Territorial Drive with River Street. An informal, earthen footpath currently exists in this location. Improving the trail with pervious asphalt would provide opportunities for appreciation of, and access to, the river.

The Abernathy Bridge is located above ODOT right-of-way and exceeds the maximum height standard of 45 feet for any zoning district within the City. The existing height of the bridge is greater than 60 feet for much of its length within the city limits of West Linn. The Abernathy Bridge meets the definition of a non-conforming structure.

Non-conforming structure or use. A lawful existing structure or use, at the time the ordinance codified in this title or any amendment thereto becomes effective, which does not conform to the requirements of the zone in which it is located.

The project proposes an alteration to the non-conforming structure. The height of the structure would typically require a Class II Variance, with the option to provide public access in return for an allowed height of up to 60 feet for the structure without a variance. The City has found this passes the essential nexus test found in the Nolan decision.

The project proposes the expansion of existing bridge supports and the addition of new bridge supports within the Willamette River Greenway in the City of West Linn. This will create additional visual impacts and permanent disturbance to the Willamette River Greenway, which is protected under Oregon Statewide Planning Goal 15. The intent of Goal 15 was to increase public access and enjoyment of the river. The City of West Linn has applied the Dolan rough proportionality test to this proposal. The City finds the visual and physical impacts to the greenway are roughly proportional to providing an all-weather public access trail along the project's entire river frontage. The City defines the project's entire river frontage as Territorial Drive to River Street, crossing the City-owned West Bridge Park, the ODOT right-of-way, and the City-owned McLean House Park. The proposed project boundaries in West Linn for Phase 1a are roughly the I-205 northbound off-ramp to the river's edge, thus roughly proportional to Territorial Drive to River Street.

The 2013 City of West Linn Trails Plan recommends an eight to ten foot width for secondary trails. The City will accept a ten foot wide all-weather trail (pervious asphalt) in lieu of 20-feet to minimize impacts to natural features within the greenway.

The applicant shall provide a twenty-foot public trail easement centered on the trail where it crosses the ODOT right-of-way prior to construction of the trail.

Therefore, the applicant shall construct a ten-foot wide, pervious asphalt trail, unless found technically infeasible by the Community Development Director, per Condition of Approval 7. The trail shall be constructed prior to final City approval of the mitigation and restoration activities. The City of West Linn has found an essential nexus exists between allowing increased height within the Willamette River Greenway in exchange for a public access trail. City of West Linn has found the condition of approval roughly proportional to the impacts of the proposal on the Willamette River Greenway. Subject to the Conditions of Approval, the criteria are met.

H. Partitions, subdivisions and incentives.
I. Docks and other water-dependent structures.
J. Joint docks.
K. Non-conforming docks and other water-related structures.

Staff Finding 27: The application is neither requesting a partition or subdivision, nor does not include a dock or other water-dependent structures. The criteria are not applicable.

L. Roads, driveways, utilities, or passive use recreation facilities. Roads, driveways, utilities, public paths, or passive use recreation facilities may be built in those portions of HCAs that include wetlands, riparian areas, and water resource areas when no other practical alternative exists but shall use water-permeable materials unless City engineering standards do not allow that. Construction to the minimum dimensional standards for roads is required. Full mitigation and revegetation is required, with the applicant to submit a mitigation plan pursuant to CDC 32.070 and a revegetation plan pursuant to CDC 32.080. The maximum disturbance width for utility corridors is as follows:

1. For utility facility connections to utility facilities, no greater than 10 feet wide.

2. For upgrade of existing utility facilities, no greater than 15 feet wide.

3. For new underground utility facilities, no greater than 25 feet wide, and disturbance of no more than 200 linear feet of water quality resource area, or 20 percent of the total linear feet of water quality resource area, whichever is greater.

Staff Finding 28: The City of West Linn has found an essential nexus exists between allowing increased height within the Willamette River Greenway in exchange for a public access trail. City of West Linn has found the condition of approval roughly proportional to the impacts of the proposal on the Willamette River Greenway. The conditioned trail will be built within HCAs as no other practical alternative exists and will be constructed with pervious asphalt. The City will partner with the applicant submit a mitigation plan prior to final design and construction. Subject to the Conditions of Approval, the criteria are met.

M. Structures. All buildings and structures in HCAs and riparian areas, including all exterior mechanical equipment, should be screened, colored, or surfaced so as to blend with the riparian environment. Surfaces shall be non-polished/reflective or at least expected to lose their luster within a year. In addition to the specific standards and criteria applicable to water-dependent uses (docks), all other provisions of this chapter shall apply to water dependent uses, and any structure shall be no larger than necessary to accommodate the use.

Staff Finding 29: The applicant has proposed new supports for the Abernathy Bridge within the HCA and riparian area. The supports will match the existing bridge structures to maintain the same visual quality and will be non-polished/reflective. No water dependent use is proposed. The criteria are met.

N. Water-permeable materials for hardscapes. The use of water-permeable materials for parking lots, driveways, patios, and paths as well as flow-through planters, box filters, bioswales and drought tolerant plants are strongly encouraged in all “a” and “b” land classifications and shall be required in all “c” and “d” land classifications. The only exception in the “c” and “d” classifications would be where it is demonstrated that water-permeable driveways/hardscapes could not structurally support the axle weight of vehicles or equipment/storage load using those *areas. Flow through planters, box filters, bioswales, drought tolerant plants and other measures of treating and/or detaining runoff would still be required in these areas.*

Staff Finding 30: The City of West Linn has found an essential nexus exists between allowing increased height within the Willamette River Greenway in exchange for a public access trail. City of West Linn has found the condition of approval roughly proportional to the impacts of the proposal on the Willamette River Greenway. The conditioned trail will be built within HCAs classifications "a" to "d" and will be constructed with pervious asphalt. The City will partner with the applicant submit a stormwater mitigation plan prior to final design and construction. Subject to the Conditions of Approval, the criteria are met.

O. Signs and graphics. No sign or graphic display inconsistent with the purposes of the protection area shall have a display surface oriented toward or visible from the Willamette or Tualatin River. A limited number of signs may be allowed to direct public access along legal routes in the protection area.

Staff Finding 31: Staff adopts applicant findings found in Exhibit PD-1, pages 27-28. The proposed signage is a limited amount to direct public access (traffic on I-205) along a legal route in the protection area. The criteria are met.

Applicant Response: Several signs are proposed to be installed in the protection area, however, the intent of the signs is to direct public access along I-205 and are required for safety. The proposed signs will be located along I-205 and will be consistent with the existing aesthetic corridor feel. In accordance with FHWA design standards, approximately 11 signs are proposed on the Abernethy Bridge, which may be visible from the Willamette River. See Attachment X, Signing Plan.

P. Lighting. Lighting shall not be focused or oriented onto the surface of the river except as required by the Coast Guard. Lighting elsewhere in the protection area shall be the minimum necessary and shall not create off-site glare or be omni-directional. Screens and covers will be required.
Q. Parking. Parking and unenclosed storage areas located within or adjacent to the protection area boundary shall be screened from the river in accordance with Chapter 46 CDC, Off-Street Parking, Loading and Reservoir Areas. The use of water-permeable material to construct the parking lot is either encouraged or required depending on HCA classification per CDC 28.110(N)(4).

Staff Finding 32: Staff adopts applicant findings found in Exhibit PD-1, page 28. The criteria are met.

Applicant Response: No lighting is proposed to be focused or oriented onto the surface of the river.

Applicant Response: No parking lots or storage areas are proposed.

R. Views. Significant views of the Willamette and Tualatin Rivers shall be protected as much as possible as seen from the following public viewpoints: Mary S. Young Park, Willamette Park, Cedar Oak Park, Burnside Park, Maddox Park, Cedar Island, the Oregon City Bridge, Willamette Park, and Fields Bridge Park.
Where options exist in the placement of ramps and docks, the applicant shall select the least visually intrusive location as seen from a public viewpoint. However, if no options exist, then the ramp, pilings and dock shall be allowed at the originally proposed location.

Staff Finding 33: Staff adopts applicant findings found in Exhibit PD-1, page 28. There are no additional options for the proposed location of new support structures for the Abernathy Bridge. The original proposed location is allowed. The criteria are met.

Applicant Response: Views of the Willamette River will be protected to the extent possible while still meeting project objectives, which includes seismically retrofitting the Abernethy Bridge. The proposed replacement bridge piers have been designed to be visually consistent with the existing bridge. No proposed work from the project will affect the Tualatin River or its views.

S. Aggregate deposits. Extraction of aggregate deposits or dredging shall be conducted in a manner designed to minimize adverse effects on water quality, fish and wildlife, vegetation, bank stabilization, stream flow, visual quality, noise and safety, and to promote necessary reclamation.

Staff Finding 34: Staff adopts applicant findings found in Exhibit PD-1, pages 28-29 and Attachment U, page 688. The criteria are met.

Applicant Response: No extraction of aggregate deposits is proposed. The retrofit of the Abernethy Bridge will require excavation in the Willamette River. Removal and fill activities in the river have been designed to have the least amount of impact possible to water quality, fish and wildlife, vegetation, bank stabilization, and streamflow. The applicant consulted with the National Marine Fisheries Service (NMFS) and the Oregon Department of Fish and Wildlife (ODFW) regarding proposed impacts that may affect water quality, fish and wildlife habitat, and vegetation (Attachment U, NMFS Consultation). Several mitigation measures were identified to be implemented during construction. In-water work will be conducted during the in-water work window to reduce potential impacts to aquatic species. Best management practices will be implemented to prevent water quality impacts such as sedimentation and turbidity during excavation, including the use of cofferdams and erosion control measures. The existing piers will be cut off below the mud line to avoid and minimize potential effects to natural fluvial geomorphic processes. Vegetation removed on the bank for construction access will be restored after construction is complete.

T. Changing the landscape/grading.

1. Existing predominant topographical features of the bank line and escarpment shall be preserved and maintained except for disturbance necessary for the construction or establishment of a water related or water dependent use. Measures necessary to reduce potential bank and escarpment erosion, landslides, or flood hazard conditions shall also be taken.
Any construction to stabilize or protect the bank with rip rap, gabions, etc., shall only be allowed where there is clear evidence of erosion or similar hazard and shall be the minimum needed to stop that erosion or to avoid a specific and identifiable hazard. A geotechnical engineer's stamped report shall accompany the application with evidence to support the proposal.

Staff Finding 35: Staff adopts applicant findings found in Exhibit PD-1, page 29 and Attachment O, page 597. The applicant has shown predominant topographical features of the bank line and escarpment will be preserved and maintained. The applicant has submitted an Erosion Control Plan (Exhibit PD-1, Exhibit Z, page 847) and has received required permits from the US Army Corps of Engineers, Oregon Department of State Lands, and Oregon Department of Environmental Quality (Exhibit PD-1, Attachment H, page 510). The criteria are met.

Applicant Response: Riprap is not proposed within the ordinary high water or along the banks of the Willamette River, following replacement of the in-water shafts. See Attachment O for the Geotechnical Report.

2. The applicant shall establish to the satisfaction of the approval authority that steps have been taken to minimize the impact of the proposal on the riparian environment (areas between the top of the bank and the low water mark of the river including lower terrace, beach and river edge).

Staff Finding 36: Staff adopts applicant findings found in Exhibit PD-1, page 29. The applicant has provided adequate documentation (see Exhibit PD-1, all attachments) to establish that steps have been taken to minimize the impacts of the proposal on the riparian environment. The applicant will mitigate all impacts as required by CDC Chapters 27, 28, and 32 per the Conditions of Approval. Subject to the Conditions of Approval, the criteria are met.

Applicant Response: The project has been designed to have the least impact possible to riparian areas. In areas where proposed work could not be avoided or minimized, mitigation through revegetation is proposed. Work in riparian areas includes replacement and upgrades of bridge columns, including excavation, fill, and foundation stabilization. Jet grouting is proposed around the pier footings to meet seismic criteria. The combination of these activities requires large areas of excavation at each foundation. Construction access and staging are needed for large equipment and concrete trucks to access the repair sites. After construction is complete, temporary access and staging areas will be restored at grade and revegetated. Areas of permanent impact, including the foundation impacts, will be mitigated according to CDC 32.100.

1. *The applicant shall demonstrate that stabilization measures shall not cause subsequent erosion or deposits on upstream or downstream properties.*

Staff Finding 37: Staff adopts applicant findings found in Exhibit PD-1, page 29 and Attachment O, page 597. The applicant has shown the proposal will not cause subsequent erosion or deposits on upstream or downstream properties. The applicant has submitted an Erosion Control Plan (Exhibit PD-1, Exhibit Z, page 847) and has received required permits from the US Army Corps of Engineers, Oregon Department of State Lands, and Oregon Department of Environmental Quality (Exhibit PD-1, Attachment H, page 510). The criteria are met.

Applicant Response: The proposed work will not cause erosion or deposits on upstream or downstream properties. See Attachment O for the Geotechnical Report.

4. Prior to any grading or development, that portion of the HCA that includes wetlands, creeks, riparian areas and water resource area shall be protected with an anchored chain link fence (or approved equivalent) at its perimeter and shall remain undisturbed except as specifically allowed by an approved Willamette and Tualatin River Protection and/or water resource area (WRA) permit. Such fencing shall be maintained until construction is complete. That portion of the HCA that includes wetlands, creeks, riparian areas and water resource area shall be identified with City-approved permanent markers at all boundary direction changes and at 30- to 50-foot intervals that clearly delineate the extent of the protected area.

Staff Finding 38: Staff adopts applicant findings found in Exhibit PD-1, page 29. The applicant shall install an anchored chain link fence at the perimeter of the McLean Creek riparian area for protection of the resource that is not proposed to have direct impacts from the project. The fence shall be installed prior to grading or development and shall remain for the duration of the project per Condition of Approval 8. Subject to the Conditions of Approval, the criteria are met.

Applicant Response: Areas of HCAs that include wetlands, creeks, and riparian areas that are not to be impacted by the project will be fenced off and marked along the orange construction fencing. Fencing will be maintained for the duration of the project.

5. Full erosion control measures shall be in place and approved by the City Engineer prior to any grading, development or site clearing.

Staff Finding 39: Staff adopts applicant findings found in Exhibit PD-1, page 30 and Attachment Z, page 847. The applicant has submitted all construction plans for review by the City Engineer. Full erosion control measures shall be in place prior to any grading, development, or site clearing per Condition of Approval 9. Subject to the Conditions of Approval, the criteria are met.

Applicant Response: An Erosion and Sediment Control Plan (Attachment Z) has been developed and will be implemented prior to any grading, development, or site clearing. The Erosion and Sediment control plan has been developed in accordance with ODOT's NPDES 1200-CA permit issued by ODEQ.

U. Protect riparian and adjacent vegetation. Vegetative ground cover and trees upon the site shall be preserved, conserved, and maintained according to the following provisions:
1. Riparian vegetation below OHW removed during development shall be replaced with indigenous vegetation, which shall be compatible with and enhance the riparian environment and approved by the approval authority as part of the application.

Staff Finding 40: Staff adopts applicant findings found in Exhibit PD-1, page 30 and Attachment W, page 702 and Attachment K, page 563. The applicant has proposed revegetation of all riparian areas below OHW with indigenous vegetation. The applicant shall submit a final report documenting the restoration of the riparian areas below OHW to pre-construction conditions per Condition of Approval 10. Subject to the Conditions of Approval, the criteria are met.

Applicant Response: A revegetation plan (Attachment W) and a Mitigation Plan (Attachment K) have been developed that would restore functions of riparian vegetation removed during development.

2. Vegetative improvements to areas within the protection area may be required if the site is found to be in an unhealthy or disturbed state by the City Arborist or their designated expert. "Unhealthy or disturbed" includes those sites that have a combination of native trees, shrubs, and groundcover on less than 80 percent of the water resource area and less than 50 percent tree canopy coverage in the primary and secondary habitat conservation area to be preserved. "Vegetative improvements" will be documented by submitting a revegetation plan meeting CDC 28.160 criteria that will result in the primary and secondary habitat conservation area to be preserved having a combination of native trees, shrubs, and groundcover on more than 80 percent of its area, and more than 50 percent tree canopy coverage in its area. The vegetative improvements shall be guaranteed for survival for a minimum of two years. Once approved, the applicant is responsible for implementing the plan prior to final inspection.

Staff Finding 41: The applicant has submitted a revegetation plan, found in Exhibit PD-1, Attachment W, page 702 that meets CDC 28.160. The revegetation plan will result in the water resource area and HCA having greater than 80 percent vegetative cover and greater than 50 percent tree canopy. The applicant shall submit a final report documenting the revegetation of water resource areas and HCA per Condition of Approval 11. Subject to the Conditions of Approval, the criteria are met.

3. Tree cutting shall be prohibited in the protection area except that:

a. Diseased trees or trees in danger of falling may be removed with the City Arborist's approval; and

Staff Finding 42: The applicant has submitted a tree removal plan, found in Exhibit PD-1, pages 896 to 913. The City Arborist has reviewed and approved the removal of all hazard trees within the project footprint that are located in the identified HCA areas. The criteria are met.

b. Tree cutting may be permitted in conjunction with those uses listed in CDC 28.030 with City Arborist approval; to the extent necessary to accommodate the listed uses;

Staff Finding 43: The applicant has submitted a tree removal plan, found in Exhibit PD-1, pages 896 to 913. The proposed tree removal is in conjunction with the construction/expansion of Abernathy Bridge support structures, which is listed in CDC 28.030(D). The City Arborist has reviewed and approved the removal of trees associated within the project footprint that are located in the identified HCA areas. The criteria are met.

c. Selective cutting in accordance with the Oregon Forest Practices Act, if applicable, shall be permitted with City Arborist approval within the area between the OHW and the greenway boundary provided the natural scenic qualities of the greenway are maintained.

Staff Finding 44: The applicant has not proposed any removal of trees in accordance with the Oregon Forest Practices Act. All tree removal is approved for the project per Staff Findings 42 to 43. The criteria do not apply.

CHAPTER 32: WATER RESOURCE AREA PROTECTION
32.070 ALTERNATE REVIEW PROCESS
This section establishes a review and approval process that applicants can use when there is reason to believe that the width of the WRA prescribed under the standard process (CDC 32.060(D)) is larger than necessary to protect the functions of the water resource at a particular site. It allows a qualified professional to determine what water resources and associated functions (see Table 32-4 below) exist at a site and the WRA width that is needed to maintain those functions.

Staff Finding 45: Staff adopts applicant findings found in Exhibit PD-1, page 45. A qualified professional has submitted evidence to determine the associated functions of water resources and the WRA width needed to maintain the functions.

Applicant Response: There are six water resource areas (WRAs) present within the proposed Project area. As instructed by City of West Linn Planning Department, the Applicant is applying for a WRA permit under the alternate review process for two of these WRAs (WRA 3 and WRA 5) due to the locations of the WRAs. WRAs within the Project area overlap with existing roadway engineered facilities; therefore, the size of the buffers prescribed under the standard review process are larger than necessary to protect the existing functions of the

water resources. The remaining four WRAs (1, 2, 4, and 6) are addressed under the standard process. Responses to West Linn Community Development Code (CDC) Chapter 32 approval criteria are included below.

32.080 APPROVAL CRITERIA (ALTERNATE REVIEW PROCESS)
Applications reviewed under the alternate review process shall meet the following approval criteria:

A. *The proposed WRA shall be, at minimum, qualitatively equal, in terms of maintaining the level of functions allowed by the WRA standards of CDC 32.060(D).*

Staff Finding 46: Staff adopts applicant findings found in Exhibit PD-1, pages 45-48. The criteria are met.

Applicant Response: There are six WRAs within the project area, numbered as WRA 1–6 in Attachment Q (see Table 1 below). The applicant proposes reductions to WRA 3 and 5) because the standard width determined by following the guidance in Table 32-2 results in roads and road prisms being included within the calculated WRAs that would not enhance or protect the functions of the associated water resources, as outlined in CDC 32.070 (see Table 2 below). In addition to proposed reductions, the work proposed within the calculated WRA 1 and WRA 2 is exempt based on CDC 32.040.B.1 (maintenance), as the proposed roadway improvements are not expanding outside of the existing roadway prism into the WRA, as well as exemption 32.040.F.2, where streams are enclosed within culverts and development is proposed at right angles to those culverts (WRA 4). The width of WRA 6 was determined via Table 32-2 and no reductions or exemptions are proposed. Additional features are located on the West Linn WRA map, including a stream labeled as CA-01 north of I-205 near Sunset Avenue, and one stream labeled as CA-02 in between Sunset Avenue and Broadway Street. The CA-02 stream and riparian corridor are entirely outside of the Project area and are not included in this application. The CA-01 stream was delineated during the wetland delineation that occurred for the Project, which was determined to be a non-jurisdictional ditch (see Attachment S, DSL Concurrence and Wetland Delineation). Ditches are not counted as WRAs (as defined in CDC Chapter 2); therefore, the ditch is not included in this application.

Table 1. WRAs in the Project area

WRA #	Exemption	Reduction	Attachment Q, Figure #
1	32.040.B.1	-	1
2	32.040.B.1	-	1
3	-	Yes	2
4	32.040.F.2	-	3
5	-	Yes	3
6	-	No	4

Table 2. WRA Function Assessment for Road Prisms

Ecological Function	Landscape Features Potentially Providing the Function	Road Prism Functions
Stream flow moderation and/or water storage	A wetland or other water body with a hydrologic connection to a stream or flood area, the presence of fallen trees and density of vegetation in the WRA that slows the flow of storm water and increases its ability to retain sediment and infiltrate storm water, and the porosity of the WRA's surface to enable it to infiltrate storm water.	Roads lack vegetation and road prisms have sparse vegetation and neither have fallen trees. Roadways and road prisms do not store water or sediment and do not moderate stream flows.
Sediment or pollution control	Vegetation within 100 feet of a WRA on gentle slopes and up to 200 feet of a WRA if the slope is greater than 25%. The presence of fallen trees and other material that slows the flow of water and increase the ability to retain sediment, absorb pollutants and infiltrate stormwater; the composition and density of vegetation; slope; and soils.	Roads lack vegetation and the outside edges of roadway prisms have sparse vegetation that is routinely mowed. Neither the roads nor road prisms have fallen trees. Roads and roadway prisms do not retain or store sediments and pollutants.
Bank stabilization	Root masses, existing large rocks or anchored large wood along the stream bank.	No streams or stream banks are present in roads or road prisms, as they are mostly made up of impervious surfaces and roadway fill. No root masses, existing large rocks, or anchored word is present. Roads and road prisms do not provide bank stabilization functions.
Large wood recruitment for a fish bearing section of stream	Forest canopy within 50 to 150 feet of a fish bearing stream.	No forest canopy or fish-bearing streams are located within roads or road prisms. This function is not provided.
Organic material sources	Forest canopy or woody vegetation within 100 feet of a water resource; or within a flood area.	No forest canopy or woody vegetation are present in roads or road prisms. Some vegetation may be present on the outside edges of the roadway prism but it is mowed regularly for maintenance purposes. No organic material sources are provided by roads or road prisms.
Shade (water temperature moderation) and microclimate	Forest canopy or woody vegetation within 100 feet of the water resource. Roughly 300 feet of continuous canopy for microclimate.	No forest canopy or woody vegetation is present within roads or roadway prisms. No shade and microclimate functions are being provided.
Stream flow that sustains in-stream and adjacent habitats	Seasonal or perennial flow.	No streams with seasonal or perennial flow are present in roads or roadway prisms. This function is not being provided.
Other terrestrial habitat	Forest canopy natural vegetation contiguous to and within 100 to 300 feet of the water resource.	Forest canopy is not present in roads or roadway prisms. Roads are dangerous for terrestrial species and do not provide any habitat.

WRA 1 is located west of 10th Street, north of I-205 southbound (SB) and is associated with a stream and two wetlands (W-33 and W-34; Attachment Q, Figure 1). According to Table 32-2, the calculated WRA surrounding the stream is 15 feet as the stream is ephemeral, and the calculated WRA surrounding wetland W-33 is 65 feet, because the surrounding average slope is less than 25%, and the calculated WRA surrounding wetland W-34 is 150 feet, since the

adjacent slope is at least 25% to the top of the slope located approximately 100 feet from the delineated edge, plus an additional 50 feet. This calculated WRA 1 overlaps with the existing roadway. No impacts are proposed to WRA 1 outside of the existing engineered roadway prism; therefore, the proposed Project activities within WRA I are exempt under 32.040.B.1, as the proposed work falls under maintenance of existing roads.

WRA 2 is located both east and west of 10th Street, south of I-205 northbound (NB) and is associated with a stream and two wetlands (W-15 and W-17) at the toe of the slope (Attachment Q, Figure 1). According to Table 32-2, the calculated WRA 2 surrounding the wetland and stream is 200 feet wide, which would extend onto the engineered roadway prism, including overlapping existing roadway surfaces of I-205. No impacts are proposed to WRA 2 that would disturb the WRA beyond the footprint of the existing roadway prism, making it exempt under CDC 32.040.B.1 (maintenance of existing roads).

WRA 3 is located north of I-205 SB at the existing ODOT maintenance yard and is associated with two wetlands and an intermittent stream (Attachment Q, Figure 2). According to Table 32-2, the calculated WRA width would be 65 feet for the wetlands and 200 feet for the stream. However, this width leads to the WRA overlapping with the existing lanes of I-205 SB as well as the road entrance to the ODOT maintenance yard. These overlapping areas are proposed to be excluded from the WRA, as they are currently not providing any functions or values to the water resources. The wetlands and stream provide a low level of functions given their previous disturbance from their natural state and proximity to the freeway. The current functions provided by the water resources in this location include sediment and pollutant control. Due to the proximity of the freeway to the water resources do not provide high quality wildlife habitat; however, the wetlands and stream likely provide some habitat to birds and wildlife as there is forest canopy within 300 feet of the water resources. The existing roadway facilities do not provide functions, therefore, the functional WRA stops at the roadway prism, which varies from 3-65 feet from the edge of the delineated wetland.

WRA 4 is located approximately 600 feet east of WRA 3 north of I-205 SB and south of Imperial Drive near Radcliffe Court (Attachment Q, Figure 3). The WRA is associated with a small wetland and Tanner Creek. Using the guidance in Table 32-2, the wetland would have a 65-foot wide WRA (no significant slope) and the stream would have a 100-foot wide WRA, both based on the surrounding slope, which is less than 25%. Tanner Creek, which has presence of coastal cutthroat trout, according to StreamNet Mapper data, is contained within a culvert that extends underneath both lanes of I-205 and daylights again just south of I-205 NB. There is a short daylighted portion of the creek, approximately 80 feet long north of the culvert entrance. As outlined in CDC 32.040.F.2, piped sections of streams including development at right angles to the piped sections are exempt from WRA regulations. WRA 4 overlapping the culvert at a right angle from the inlet is excluded from the WRA.

WRA 5 is located immediately east of WRA 4 and is associated with three separate wetlands (Attachment Q, Figure 3). Following the guidance outlined in Table 32-2 results in the calculated WRA 5 being 65 feet wide. However, this width overlaps with approximately 10

feet of the existing roadway of I-205 SB, which is not providing the functions intended by the WRA chapter. Water quality functions currently being provided at the three wetlands include sediment and pollution control, since the proximity to the freeway results in sediment and pollutant runoff. The existing vegetation provides water quality functions by slowing and retaining sediments and stormwater runoff from I-205, although there are areas of bare ground and a gravel road that traverses the WRA. Other terrestrial habitat is provided due to the presence of forest canopy within 100 to 300 feet of the wetlands (as noted in Table 32-4). Because the calculated WRA overlaps with the roadway for 10 feet, the width required to protect the existing functions of the wetlands includes a 55-foot buffer that stops at the existing roadway. The reduction of the overlapping freeway lanes does not change the functions of the existing water resources, as those impervious surfaces are not currently providing any benefits. The Project will maintain water quality of the existing wetlands in WRA 4 due to the construction of additional stormwater facilities that will receive and treat runoff from I-205, thereby improving water quality functions.

B. If a WRA is already significantly degraded (e.g., native forest and ground cover have been removed or the site dominated by invasive plants, debris, or development), the approval authority may allow a reduced WRA in exchange for mitigation, if:
1. The proposed reduction in WRA width, coupled with the proposed mitigation, would result in better performance of functions than the standard WRA without such mitigation. The approval authority shall make this determination based on the applicant's proposed mitigation plan and a comparative analysis of ecological functions under existing and enhanced conditions (see Table 32-4).

Staff Finding 47: Staff adopts applicant findings found in Exhibit PD-1, page 48. The criteria are met.

Applicant Response: The reduction in WRA width has no result on the performance of functions of water resources since the areas proposed to be removed overlap with existing roadway or other engineered facilities within the roadway prism. These areas that would normally be part of the WRA boundary if following the guidance in Table 32-2 are currently not contributing any functions or values listed in Table 32-4., as described in the applicant response above. The water quality of the receiving waters will be improved by the applicant by implementing engineered water quality facilities that will provide treatment for all stormwater generated from impacted impervious surfaces that currently do not receive any treatment. Mitigation is proposed for all permanent impacts to WRAs in compliance with CDC 32.090. Temporarily impacted WRAs will be restored and revegetated in compliance with CDC 32.100. See Attachment W for the Landscaping Plan, which shows proposed WRA mitigation.

2. The mitigation project shall include all of the following components as applicable. It may also include other forms of enhancement (mitigation) deemed appropriate by the approval authority.
a. Removal of invasive vegetation.

b. Planting native, non-invasive plants (at minimum, consistent with CDC 32.100) that provide improved filtration of sediment, excess nutrients, and pollutants. The amount of enhancement (mitigation) shall meet or exceed the standards of CDC 32.090(C).
c. Providing permanent improvements to the site hydrology that would improve water resource functions.
d. Substantial improvements to the aquatic and/or terrestrial habitat of the WRA.

Staff Finding 48: Staff adopts applicant findings found in Exhibit PD-1, page 49. The name of the creek is McLean Creek, not McLoughlin Creek. The criteria are met.

Applicant Response: Invasive vegetation and noxious weeds will be removed within the mitigation area prior to planting. This will include species listed as noxious weeds by the State of Oregon as well as species listed on the City of Portland nuisance plant list. The mitigation proposed is in compliance with CDC 32.100 and includes native, non-invasive plants that will provide improved filtration of sediment, excess nutrients, and pollutants, among other functions (see Attachment K, Mitigation Plan or Attachment W, Landscaping Plan for a list of proposed plants). Proposed species were chosen specifically for their ability to provide these functions, as well as survivability. The proposed WRA mitigation will take place underneath and adjacent to the Abernethy Bridge, which currently is dominated by invasive species. Mitigation will remove these invasive species and replace with native species, improving habitat and resources for wildlife in the area. Proposed trees and shrubs will provide organic material sources to wetlands and waters in and adjacent to the mitigation site. In addition to the proposed plants that will absorb and filter stormwater runoff from impervious surfaces upland of the WRA, several water quality facilities are proposed near the bridge that will also reduce the amount of sediment and pollutants that enter McLoughlin Creek and the Willamette River. A large upland biofiltration swale is proposed near OR 43 that will treat 1.309 acres of non-Project area, providing additional stormwater treatment. A biofiltration swale is proposed within WRA 5, which will treat 12.393 acres of contributing impervious area. Full treatment of the ODOT facility as well as treatment of non-Project stormwater will improve water quality for native and resident fish in the Willamette River, some of which are listed under the Endangered Species Act as threatened or endangered. Newly planted vegetation will also help to prevent erosion, providing bank stabilization. The proposed mitigation at the bridge has been reviewed and approved by both DSL and USACE for a shorter version of the I-205 Project extending from OR 213 to OR 43. The Applicant is currently in progress with a revision to the permits to expand the Project to just west of 10th Street and account for impacts to wetland W-32.

C. Identify and discuss site design and methods of development as they relate to WRA functions.

Staff Finding 49: Staff adopts applicant findings found in Exhibit PD-1, page 49. The name of the creek is McLean Creek, not McLoughlin Creek. The criteria are met.

Applicant Response: The mitigation site under and adjacent to the Abernethy Bridge will mitigate for all proposed permanent WRA impacts and was designed to benefit McLoughlin Creek, the wetland adjacent to McLoughlin Creek, and the Willamette River, since these are the water resources currently providing the most and highest quality functions in the Project area. In total, 190,732 square feet of mitigation is proposed in the form of restoration planting, which will provide the functions listed in Table 32-4, including stream flow moderation from the increase in density of vegetation that will increase stormwater infiltration, and sediment and pollution retention. Stormwater facilities are proposed, as described in the applicant response above, that would absorb and filter stormwater from impervious upland surfaces. Once the restoration plants mature, they will be a source of both large wood recruitment and organic material sources to the Willamette River. The mature shrubs and trees will also provide shade to both McLoughlin Creek and the Willamette River, helping to regulate in-stream temperatures. Before any plants are planted, all invasive species will be removed from the mitigation site. The removal of invasive species and addition of native species will improve the quality and amount of habitat for birds and wildlife.

D. Address the approval criteria of CDC 32.060, with the exception of CDC 32.060(D).

Staff Finding 50: Please see Staff Findings 51 to 58. The criteria are met.

32.060 APPROVAL CRITERIA (STANDARD PROCESS)
A. WRA protection/minimizing impacts.
1. Development shall be conducted in a manner that will avoid or, if avoidance is not possible, minimize adverse impact on WRAs.

Staff Finding 51: Staff adopts applicant findings found in Exhibit PD-1, page 51. The applicant has demonstrated the project will be conducted in a manner to avoid or minimize adverse impacts on WRAs. The criteria are met.

Applicant Response: Attachment P identifies the WRAs in the Project area, and there are six WRAs present (see Table 3 below). The Applicant avoided and minimized impacts on WRAs to the extent possible, but some disturbance is necessary in order to meet the Project's objectives and as required by accepted engineering practices. The purpose of the Project is to improve traffic safety, provide an earthquake safety route, and to seismically upgrade the Abernethy Bridge to withstand a Cascadia seismic event. ODOT designated I-205 as a Phase I statewide north-south lifeline route, which means it must be operational quickly after a disaster renders other roadways unusable or impassable. To avoid congestion and associated pollution, an additional lane will be added, which needs to be contiguous with the existing lanes, thereby making some impacts to those HCAs located near roadways unavoidable. Attachment Q identifies impacts to WRAs.

Table 3. WRAs in the Project area.

WRA #	Width (feet)	Rationale
1	15-150	The stream has a 15-ft WRA due to being ephemeral and the surrounding slopes are less than 25%. Wetland W-33 has a 65-ft buffer (less than 25% slopes), which extends up to the existing roadway (I-205 SB). Wetland W-34 is adjacent to slopes over 25%, creating a 150-ft buffer. The work proposed at this WRA is exempt according to CDC 32.040.B.1, since the Project consists of maintenance of existing roadways that will not expand beyond the previously disturbed area at grade.
2	200	The water resources are all located at the toe of slope, which is more than 25%. The slope is over 25% for more than 30 feet and has no distinct top of slope for at least 150 feet, creating a 200-ft wide buffer. The work proposed at this WRA is exempt according to CDC 32.040.B.1, since the Project consists of maintenance of existing roadways that will not expand beyond the previously disturbed area at grade.
4	65-100	Based on the slopes adjacent to wetland W-30 and Tanner Creek, the WRA width according to Table 32-2 would be 65 feet around the wetland and 100 feet around Tanner Creek. However, Tanner Creek is partially contained within a culvert and is exempt under CDC 32.040.F.2.
6	65-200	The water resources located within WRA include McLoughlin Creek, the Willamette River, and one wetland (W-37). The WRA associated with McLoughlin Creek varies from 65 to 200 feet, based on the adjacent slope. The slope on the left bank of the creek is less than 25%, so a 65-foot buffer was determined. The slope on the right bank is more than 25% for more than 150 feet, so a 200-foot buffer was determined. The slope adjacent to the Willamette River is less than 25%, resulting in a 100-foot buffer, as it is a fish bearing stream. The slopes adjacent to wetland W-37 are more than 25% for at least 150 feet, resulting in a 200-foot buffer.

2. Mitigation and re-vegetation of disturbed WRAs shall be completed per CDC 32.090 and 32.100, respectively.

Staff Finding 52: Staff adopts applicant findings found in Exhibit PD-1, page 52-53 and Attachment W, page 702 and Attachment K, page 563. See Staff Findings 79 to 97 for compliance with CDC 32.090 and 32.100. The name of the creek is McLean Creek, not McLoughlin Creek. The applicant shall submit a final report documenting the restoration of the disturbed WRAs to pre-construction conditions per Condition of Approval 10. The applicant shall submit a final report documenting the revegetation of water resource areas and HCA per Condition of Approval 11. Subject to the Conditions of Approval, the criteria are met.

Applicant Response: The Applicant proposes mitigation and re-vegetation for all disturbed WRAs compliant with CDC 32.090 and 32.100. See Attachment Q for WRA Impacts, Attachment K for the Mitigation Plan, and Attachment W for the Revegetation Plan. Proposed impacts to WRA are as follows:

WRA 1 is located west of 10th Street, north of I-205 SB and is associated with two wetlands and a stream. No temporary or permanent impacts are proposed to WRA 1, as it is exempt under CDC 32.040.B.1.

WRA 2 is located both east and west of 10th Street, south of I-205 NB and is associated with a stream and two wetlands at the toe of the slope. No temporary or permanent impacts are proposed to WRA 2, as it is exempt under CDC 32.040.B.1.

WRA 3 is located within the existing ODOT maintenance yard north of I-205. Two wetlands (Wetlands W-31 and W-32) and a stream are present that require the WRA. WRA 2 will be permanently impacted due to widening of the roadway and its associated excavation and fill. In addition to impacts to the WRA, permanent wetland impacts to Wetland W-32 are proposed totaling 6,875 square feet. Impacts to wetland W-32 are under the jurisdiction of the Oregon Department of State Lands (DSL) and the U.S. Army Corps of Engineers (USACE); no impacts are proposed to Wetland W-31. Proposed impacts to the WRA include 6,432 square feet of permanent impacts and 1,839 square feet of temporary impacts. All proposed impacts are adjacent to the existing I-205 SB roadway. See Attachment Q, Figure 2. Mitigation for impacts to WRA 3 will take place underneath and adjacent to the Abernethy Bridge. See Attachment W, Landscaping Plan for proposed mitigation areas. Mitigation banking credits will be used for impacts to Wetland W-32, pending approval from USACE and DSL.

WRA 4 is located north of I-205 SB and south of Imperial Drive near Radcliffe Court. WRA 4 is associated with a stream that is located within a culvert, which is exempt from WRA regulations according to CDC 32.040.F. No permanent or temporary impacts are proposed from the Project, as WRA 4 is located outside of the construction impact area and because it is exempt due to the stream being located within a culvert.

WRA 5 surrounds an existing wetland east of WRA 4 (Attachment Q, Figure 3). Permanent impacts are proposed to the edge of the WRA closest to I-205 SB caused by fill associated with widening of I-205, in the amount of 948 square feet. 1,686 square feet of temporary impacts are proposed adjacent to permanent impacts and will be revegetated after construction is complete. Mitigation is proposed for permanent impacts to WRA 5 and will be located underneath and adjacent to the Abernethy Bridge. See Attachment W, Landscaping Plan for proposed mitigation areas.

WRA 6 will have both temporary and permanent impacts due to removal and replacement of piers supporting the Abernethy Bridge. The WRA buffer surrounds the Willamette River, McLoughlin Creek, and Wetland-37. No reductions in the WRA are proposed. Permanent impacts proposed to WRA 6 are equal to 10,538 square feet and result from excavation and fill associated with drilled shafts and piers for the bridge, excavation to balance fill in the floodplain, and construction of a stormwater facility. Although impacts are avoided and minimized to the extent possible, permanent impacts are proposed to WRA 6 that are necessary in order to seismically upgrade the bridge so it can withstand a Cascadia subduction zone earthquake. Temporary impacts in the amount of 159,831 square feet are proposed from construction access and staging, temporary excavation and fill associated with removal and replacement of shafts, all of which will be revegetated upon completion of construction in that area. Mitigation for permanent impacts will take place on-site in the

existing WRA. See Attachment Q, Figure 4 for WRA impacts and Attachment W, Landscaping Plan for proposed mitigation areas.

B. Storm water and storm water facilities.

1. Proposed developments shall be designed to maintain the existing WRAs and utilize them as the primary method of storm water conveyance through the project site unless:

a. The surface water management plan calls for alternate configurations (culverts, piping, etc.); or

b. Under CDC 32.070, the applicant demonstrates that the relocation of the water resource will not adversely impact the function of the WRA including, but not limited to, circumstances where the WRA is poorly defined or not clearly channelized.

Re-vegetation, enhancement and/or mitigation of the re-aligned water resource shall be required as applicable.

Staff Finding 53: Staff adopts applicant findings found in Exhibit PD-1, page 53. The applicant does not propose alternative configurations or permanent relocations of the water resources or WRAs. The criteria are met.

Applicant Response: The WRAs would be maintained at current locations. See Attachment R for the WRA and water quality facility (WQF) map.

2. Public and private storm water detention, storm water treatment facilities and storm water outfall or energy dissipaters (e.g., rip rap) may encroach into the WRA if:

a. Accepted engineering practice requires it;

b. Encroachment on significant trees shall be avoided when possible, and any tree loss shall be consistent with the City's Tree Technical Manual and mitigated per CDC 32.090;

c. There shall be no direct outfall into the water resource, and any resulting outfall shall not have an erosive effect on the WRA or diminish the stability of slopes; and

d. There are no reasonable alternatives available.

A geotechnical report may be required to make the determination regarding slope stability.

Staff Finding 54: Staff adopts applicant findings found in Exhibit PD-1, page 53. The criteria are met.

Applicant Response: 11 water quality facilities (WQFs) are proposed for the Project, one of which encroaches a WRA. As shown on Attachment R, Figure 3, WQF A is located entirely within WRA 6. WQF A is a water quality swale 3,740 square feet in area. It will be vegetated if there are species that can survive in the shade, since the WQF is located underneath the bridge and will not receive any sunlight. The proposed WQFs have been designed according to current engineering practices by a registered professional engineer. No trees associated with construction of WQFs will be removed, no direct outfall into the water resources is proposed, and the WQF will not cause erosion within the WRA. See Attachment Y for the Stormwater Site Plan and Attachment R for a map of WQFs relative to WRAs.

3. Roadside storm water conveyance swales and ditches may be extended within rights-of-way located in a WRA. When possible, they shall be located along the side of the road furthest from the water resource. If the conveyance facility must be located along the side of the road closest to the water resource, it shall be located as close to the road/sidewalk as possible and include habitat friendly design features (treatment train, rain gardens, etc.).

Staff Finding 55: Staff adopts applicant findings found in Exhibit PD-1, page 54. The criteria are met.

Applicant Response: Roadside stormwater conveyance swales are proposed in the right-of-way, but none will encroach WRAs. The swales were designed to be located as far as possible from the WRA while meeting accepted engineering practice. See Attachment Y for the Stormwater Site Plan and Attachment R for a map of WRAs and WQFs.

4. Storm water detention and/or treatment facilities in the WRA shall be designed without permanent perimeter fencing and shall be landscaped with native vegetation.

Staff Finding 56: Staff adopts applicant findings found in Exhibit PD-1, page 54. The criteria are met.

Applicant Response: See Attachment Y for the Stormwater Site Plan and See Attachment W for the Revegetation Plan. Storm water detention and/or treatment facilities in the WRA are proposed to be landscaped with native vegetation in accordance with ODOT standard practices with a water quality vegetation mix, which is comprised of a mix of the following species: California oatgrass (Danthonia califonica), tufted hairgrass (Deschampsia cespitosa), slender hairgrass (Deschampsia elongata), red fescue (Festuca rubra var. rubra), meadow barley (Hordeum brachyantherum), dense sedge (Carex densa), slough sedge (Carex obnupta), slender rush (Juncus patens), spreading rush (Juncus tenuis), broadleaf lupine (Lupinus latifolis), and graceful cinquefoil (Potentilla gracilis). No perimeter fencing is proposed.

5. Access to public storm water detention and/or treatment facilities shall be provided for maintenance purposes. Maintenance driveways shall be constructed to minimum width and use water permeable paving materials. Significant trees, including roots, shall not be disturbed to the degree possible. The encroachment and any tree loss shall be mitigated per CDC 32.090. There shall also be no adverse impacts upon the hydrologic conditions of the site.

Staff Finding 57: Staff adopts applicant findings found in Exhibit PD-1, page 54 and Attachment W, page 702 and Attachment K, page 563. See Staff Findings 79 to 87 for compliance with CDC 32.090. There will be no adverse impacts upon hydrologic conditions of the site related to WRA and stormwater facilities. The applicant shall submit a final report documenting the restoration of the disturbed WRAs to pre-construction conditions per Condition of Approval 10. The applicant shall submit a final report documenting the

revegetation and mitigation for tree loss per Condition of Approval 11. Subject to the Conditions of Approval, the criteria are met.

Applicant Response: Access to public stormwater detention and treatment facilities will be provided. Access roads will be made of gravel and will be 16 feet in width. The facilities shown on the following sheets in Attachment Y (Stormwater Plan) are proposed to have gravel access roads: HA06, HA11, HA12, and HA13. The remaining facilities will be accessed by sidewalks, multiuse trails, or from the roadway shoulder.

6. Storm detention and treatment and geologic hazards. Per the submittals required by CDC 32.050(F)(3) and 92.010(E), all proposed storm detention and treatment facilities must comply with the standards for the improvement of public and private drainage systems located in the West Linn Public Works Design Standards, there will be no adverse off-site impacts caused by the development (including impacts from increased intensity of runoff downstream or constrictions causing ponding upstream), and the applicant must provide sufficient factual data to support the conclusions of the submitted plan.

Staff Finding 58: Staff adopts applicant findings found in Exhibit PD-1, page 54. The applicant has submitted a Stormwater Report, found in Exhibit PD-1, Attachment G, with sufficient factual data to support the conclusions of the plan. The criteria are met.

Applicant Response: All facilities were designed to meet both ODOT and West Linn Standards. Adverse impacts will be avoided through detention for the basins that don't discharge to the Willamette River. Details supporting stormwater data can be found in Attachment G, Stormwater Report.

C. Repealed by Ord. 1647.

D. WRA width. Except for the exemptions in CDC 32.040, applications that are using the alternate review process of CDC 32.070, or as authorized by the approval authority consistent with the provisions of this chapter, all development is prohibited in the WRA as established in Table 32-2 below:

Staff Finding 59: Staff adopts applicant findings found in Exhibit PD-1, page 56. The applicant has demonstrated compliance with WRA width requirements found in Table 32-2 or has demonstrated an alternative width is suitable to maintain the function of the WRA (see Staff Findings 45 to 50). The criteria are met.

Applicant Response: The Applicant has determined the width of four WRAs (WRA 1, 2, 4, and 6) within the Project area based on Table 32-2. The other two WRA widths (WRA 3 and 5) were determined using the alternate review process (CDC 32.070-32.080). See Table 1 above for widths and rationales for each WRA. See applicant responses to CDC 32.070 above and Attachment P for the WRA map.

E. Per the submittals required by CDC 32.050(F)(4), the applicant must demonstrate that the proposed methods of rendering known or potential hazard sites safe for development, including proposed geotechnical remediation, are feasible and adequate to prevent landslides or other damage to property and safety. The review authority may impose conditions, including limits on type or intensity of land use, which it determines are necessary to mitigate known risks of landslides or property damage.

Staff Finding 60: Staff adopts applicant findings found in Exhibit PD-1, page 56. The applicant has demonstrated the site is safe for development by compliance with any recommended remediation techniques identified in the Geotechnical Report (Exhibit PD-1, Attachment O). No conditions are warranted. The criteria are met.

Applicant Response: Geotechnical reports were written for the Project which demonstrate that the proposed site is safe for development. See Attachment O, Geotechnical Report.

F. Roads, driveways and utilities.
1. New roads, driveways, or utilities shall avoid WRAs unless the applicant demonstrates that no other practical alternative exists. In that case, road design and construction techniques shall minimize impacts and disturbance to the WRA by the following methods:
a. New roads and utilities crossing riparian habitat areas or streams shall be aligned as close to perpendicular to the channel as possible.
b. Roads and driveways traversing WRAs shall be of the minimum width possible to comply with applicable road standards and protect public safety. The footprint of grading and site clearing to accommodate the road shall be minimized.
c. Road and utility crossings shall avoid, where possible:
1) Salmonid spawning or rearing areas;
2) Stands of mature conifer trees in riparian areas;
3) Highly erodible soils;
4) Landslide prone areas;
5) Damage to, and fragmentation of, habitat; and
6) Wetlands identified on the WRA Map.

Staff Finding 61: Staff adopts applicant findings found in Exhibit PD-1, page 57. The applicant has demonstrated impacts to the WRAs cannot be avoided because of the nature of the project being an alteration to an existing facility. The applicant demonstrated the temporary access road will be the minimum width necessary and be aligned as close to perpendicular to the channel as possible. The temporary access road and the expansion of I-205 will avoid, where possible the resources listed above. The criteria are met.

Applicant Response: A temporary construction access road is proposed from Willamette Drive (OR 43) to the bridge pier construction area (see Attachment V). This temporary access road will be constructed to a minimum width that will allow for bidirectional construction traffic necessary to complete the Abernethy Bridge foundation improvements. Proposed widening of existing I-205 roadway to current FHWA standards is proposed,

which will impact portions of several WRAs. Foundation improvements necessary to support the I-205 widening and meet current seismic standards were designed to minimize impacts to WRAs. For example, new foundations will be constructed using drilled shafts as opposed to spread footings, which will drastically reduce the permanent impacts to WRAs. Those WRAs with proposed impacts will have construction techniques and best management practices implemented to further minimize impacts to the WRA. Mitigation is proposed for impacts to WRA; See Attachment K for the Mitigation Plan and Attachment W for the Revegetation Plan.

2. Crossing of fish bearing streams and riparian corridors shall use bridges or arch-bottomless culverts or the equivalent that provides comparable fish protection, to allow passage of wildlife and fish and to retain the natural stream bed.

Staff Finding 62: Staff adopts applicant findings found in Exhibit PD-1, page 57. The applicant has proposed only bridges as part of the project. The criteria are met.

Applicant Response: All proposed development activities crossing of fish bearing streams and riparian corridors are bridges. No new crossings are proposed.

3. New utilities spanning fish bearing stream sections, riparian corridors, and wetlands shall be located on existing roads/bridges, elevated walkways, conduit, or other existing structures or installed underground via tunneling or boring at a depth that avoids tree roots and does not alter the hydrology sustaining the water resource, unless the applicant demonstrates that it is not physically possible or it is cost prohibitive. Bore pits associated with the crossings shall be restored upon project completion. Dry, intermittent streams may be crossed with open cuts during a time period approved by the City and any agency with jurisdiction.

Staff Finding 63: The applicant has proposed no new utilities. The criteria are met.

4. No fill or excavation is allowed within the ordinary high water mark of a water resource, unless all necessary permits are obtained from the City, U.S. Army Corps of Engineers and Oregon Department of State Lands (DSL).
5. Crossings of fish bearing streams shall be aligned, whenever possible, to serve multiple properties and be designed to accommodate conduit for utility lines. The applicant shall, to the extent legally permissible, work with the City to provide for a street layout and crossing location that will minimize the need for additional stream crossings in the future to serve surrounding properties.

Staff Finding 64: The applicant has submitted documentation of necessary permits from Oregon Department of State Lands, Oregon Department of Environmental Quality, and the Army Corps of Engineers. Please see Exhibit PD-1, Attachment H (page 510). The applicant has proposed no new crossings of fish bearing streams. The criteria are met.

Applicant Response: All proposed work within the ordinary high water mark of any water resources has been approved by DSL and the Corps. See Attachment H for permits.

Applicant Response: No new crossings of fish bearing streams are proposed. Proposed work on existing crossings will follow the existing alignment. The Abernethy Bridge will continue to support existing utilities, include the West Linn water supply line.

G. Passive recreation. Low impact or passive outdoor recreation facilities for public use including, but not limited to, multi-use paths and trails, not exempted per CDC 32.040(B)(2), viewing platforms, historical or natural interpretive markers, and benches in the WRA, are subject to the following standards:
1. Trails shall be constructed using non-hazardous, water permeable materials with a maximum width of four feet or the recommended width under the applicable American Association of State Highway and Transportation Officials (AASHTO) standards for the expected type and use, whichever is greater.
2. Paved trails are limited to the area within 20 feet of the outer boundary of the WRA, and such trails must comply with the storm water provisions of this chapter.
3. All trails in the WRA shall be set back from the water resource at least 30 feet except at stream crossing points or at points where the topography forces the trail closer to the water resource.

Staff Finding 65: The City of West Linn has found an essential nexus exists between allowing increased height within the Willamette River Greenway in exchange for a public access trail. City of West Linn has found the condition of approval roughly proportional to the impacts of the proposal on the Willamette River Greenway. The conditioned trail will be built within a portion of a WRA as no other practical alternative exists and will be constructed with non-hazardous, pervious asphalt. The width of the trail will be ten-feet, which is consistent with AASHTO standards for a multi-use trail. The trail will cross a stream within the WRA, the remaining portions of the trail will be outside of WRAs. Subject to the Conditions of Approval, the criteria are met.

4. Trails shall be designed to minimize disturbance to existing vegetation, work with natural contours, avoid the fall line on slopes where possible, avoid areas with evidence of slope failure and ensure that trail runoff does not create channels in the WRA.
5. Foot bridge crossings shall be kept to a minimum. When the stream bank adjacent to the foot bridge is accessible (e.g., due to limited vegetation or topography), where possible, fences or railings shall be installed from the foot bridge and extend 15 feet beyond the terminus of the foot bridge to discourage trail users and pets from accessing the stream bank, disturbing wildlife and habitat areas, and causing vegetation loss, stream bank erosion and stream turbidity. Bridges shall not be made of continuous impervious materials or be treated with toxic substances that could leach into the WRA.
6. Interpretive facilities (including viewpoints) shall be at least 10 feet from the top of the water resource's bankfull flow/OHW or delineated wetland edge and constructed with a fence between users and the resource. Interpretive signs may be installed on footbridges.

Staff Finding 66: The City of West Linn has found an essential nexus exists between allowing increased height within the Willamette River Greenway in exchange for a public access trail. City of West Linn has found the condition of approval roughly proportional to the impacts of the proposal on the Willamette River Greenway. The conditioned trail will minimize disturbance to existing vegetation, work with natural contours, and avoid areas with evidence of slope failure. Trail runoff will not create channels within the WRA. Fences will be installed where possible. Subject to the Conditions of Approval, the criteria are met.

H. Daylighting Piped Streams.
1. As part of any application, covered or piped stream sections shown on the WRA Map are encouraged to be "daylighted" or opened. Once it is daylighted, the WRA will be limited to 15 feet on either side of the stream. Within that WRA, water quality measures are required which may include a storm water treatment system (e.g., vegetated bioswales), continuous vegetative ground cover (e.g., native grasses) at least 15 feet in width that provides year round efficacy, or a combination thereof.
2. The re-opened stream does not have to align with the original piped route but may take a different route on the subject property so long as it makes the appropriate upstream and downstream connections and meet the standards of subsections (H)(3) and (4) of this section.
3. A re-aligned stream must not create WRAs on adjacent properties not owned by the applicant unless the applicant provides a notarized letter signed by the adjacent property owner(s) stating that the encroachment of the WRA is permitted.

Staff Finding 67: The proposal does not impact any piped streams, nor include any daylighting of streams. The proposal does not re-align a stream and thus no new WRAs are created on adjacent properties. The criteria are met.

4. The evaluation of proposed alignment and design of the reopened stream shall consider the following factors:
a. The ability of the reopened stream to safely carry storm drainage through the area without causing significant erosion.
b. Continuity with natural contours on adjacent properties, slope on site and drainage patterns.
c. Continuity of adjacent vegetation and habitat values.
d. The ability of the existing and proposed vegetation to filter sediment and pollutants and enhance water quality.
e. Provision of water temperature conducive to fish habitat.
5. Any upstream or downstream WRAs or riparian corridors shall not apply to, or overlap, the daylighted stream channel.
6. When a stream is daylighted the applicant shall prepare and record a legal document describing the reduced WRA required by subsections (H)(1) and (5) of this section. The document will be signed by a representative of the City and recorded at the applicant's expense to better ensure long term recognition of the reduced WRA and reduced restrictions for the daylighted stream section.

Staff Finding 68: The proposal does not include any daylighting of streams. The criteria are not applicable.

I. The following habitat friendly development practices shall be incorporated into the design of any improvements or projects in the WRA to the degree possible:
1. Restore disturbed soils to original or higher level of porosity to regain infiltration and storm water storage capacity.

Staff Finding 69: Staff adopts applicant findings found in Exhibit PD-1, page 60. The applicant has proposed restoration of disturbed soils to increase porosity to the degree possible. The criteria are met.

Applicant Response: The landscaping plan proposes an application of compost blanket and hydroseed on top of disturbed soils throughout the Project area. For mitigation areas, replanting efforts will inoculate the soil with mycorrhizae and beneficial bacteria by including PermaMatrix in backfill on bare root stock. The shrub and tree plantings will be individually mulched with arbor chips to prevent compaction, naturally suppress weeds, and develop the soil to encourage root growth and porosity. Soil roughness will be achieved by using ODOT Method D: Rough Areas for Seeded Revegetation or Erosion Control (ODOT standard Specifications). The mitigation areas will have a rough treatment of the surface of all future planted areas. Downed wood is also proposed in restoration areas to interrupt water and provide ecological benefit.

2. Apply a treatment train or series of storm water treatment measures to provide multiple opportunities for storm water treatment and reduce the possibility of system failure.

Staff Finding 70: Staff adopts applicant findings found in Exhibit PD-1, page 60. The applicant has proposed a series of storm water treatment measures to provide multiple opportunities for treatment and reduce the possibility of system failure to the degree possible. The criteria are met.

Applicant Response: The applicant has designed a series of stormwater treatment swales. Where possible, when swales are near WRAs, vegetation plantings will be brought up to the swales in case of overflow in storm events. See Attachment R for a map of WRAs and proposed stormwater facilities.

3. Incorporate storm water management in road rights-of-way.

Staff Finding 71: Staff adopts applicant findings found in Exhibit PD-1, page 60. The applicant has incorporated storm water management in rights-of-way to the degree possible. The criteria are met.

Applicant Response: Stormwater treatment swales are proposed in the I-205 right-ofway spanning from the Abernethy Bridge west to 10th Street.

4. Landscape with rain gardens to provide on-lot detention, filtering of rainwater, and groundwater recharge.

Staff Finding 72: Staff adopts applicant findings found in Exhibit PD-1, page 60. The applicant has proposed stormwater swales and ponds to provide on-site detention, filtering, and groundwater recharge to the degree possible. The criteria are met.

Applicant Response: Only stormwater swales and detention ponds are proposed. No rain gardens are proposed.

5. Use multi-functional open drainage systems in lieu of conventional curb-and-gutter systems.

Staff Finding 73: Staff adopts applicant findings found in Exhibit PD-1, page 60. The applicant has proposed stormwater swales as open drainage systems in lieu of curb-and-gutter systems to the degree possible. The criteria are met.

Applicant Response: The applicant proposes several swales as opposed to conventional curb-and-gutter systems where feasible. In some areas, such as along the Abernethy Bridge, conventional curb-and-gutter systems are necessary to direct stormwater to treatment facilities.

6. Use green roofs for runoff reduction, energy savings, improved air quality, and enhanced aesthetics.
7. Retain rooftop runoff in a rain barrel for later on-lot use in lawn and garden watering.
8. Disconnect downspouts from roofs and direct the flow to vegetated infiltration/filtration areas such as rain gardens.

Staff Finding 74: The proposal does not include any structures with a roof or downspouts from a roof. The criteria do not apply.

9. Use pervious paving materials for driveways, parking lots, sidewalks, patios, and walkways.
10. Reduce sidewalk width to a minimum four feet. Grade the sidewalk so it drains to the front yard of a residential lot or retention area instead of towards the street.
11. Use shared driveways.

Staff Finding 75: The proposal does not include any driveways, parking lots, sidewalks, patios, or walkways within a WRA. The criteria do not apply.

12. Reduce width of residential streets and driveways, especially at WRA crossings.
13. Reduce street length, primarily in residential areas, by encouraging clustering.

14. Reduce cul-de-sac radii and use pervious and/or vegetated islands in center to minimize impervious surfaces.

Staff Finding 76: The proposal does not include any residential streets, cul-de-sacs, or driveways. The criteria do not apply.

15. Use previously developed areas (PDAs) when given an option of developing PDA versus non-PDA land.

Staff Finding 77: Staff adopts applicant findings found in Exhibit PD-1, page 61. The applicant has proposed use of PDAs to the degree possible. The criteria are met.

Applicant Response: The Applicant's proposal is a transportation improvement Project in an existing transportation corridor. Where possible, the Project has widened I-205 to the center to minimize impacts to non-PDA areas located outside the roadway prism.

16. Minimize the building, hardscape and disturbance footprint.
17. Consider multi-story construction over a bigger footprint.

Staff Finding 78: Staff adopts applicant findings found in Exhibit PD-1, page 61. The applicant has minimized the hardscape and disturbance footprint to the degree possible. The applicant has considered multi-story construction over a bigger footprint to the degree possible. The criteria are met.

Applicant Response: The Applicant's proposal is designed to minimize the disturbance footprint in the WRA to the extent practicable.

Applicant Response: To reduce the construction footprint by stacking highway lanes would require extensive reconstruction of the existing highway, resulting in greater environmental impacts and prohibitive costs.

32.090 MITIGATION PLAN
A. A mitigation plan shall only be required if development is proposed within a WRA (including development of a PDA). (Exempted activities of CDC 32.040 do not require mitigation unless specifically stated. Temporarily disturbed areas, including TDAs associated with exempted activities, do not require mitigation, just grade and soil restoration and re-vegetation.) The mitigation plan shall satisfy all applicable provisions of CDC 32.100, Re-Vegetation Plan Requirements.

Staff Finding 79: The applicant proposes development within a WRA. The applicant has submitted a Revegetation Plan (Exhibit PD-1, Attachment W, page 702) and a Mitigation Plan (Exhibit PD-1, Attachment K, page 563). Please see Staff Findings 88 to 97 for compliance with CDC 32.100. The criteria are met.

B. Mitigation shall take place in the following locations, according to the following priorities (subsections (B)(1) through (4) of this section):

1. On-site mitigation by restoring, creating or enhancing WRAs.

2. Off-site mitigation in the same sub-watershed will be allowed, but only if the applicant has demonstrated that:

a. It is not practicable to complete mitigation on-site, for example, there is not enough area on-site; and

b. The mitigation will provide equal or superior ecological function and value.

3. Off-site mitigation outside the sub-watershed will be allowed, but only if the applicant has demonstrated that:

a. It is not practicable to complete mitigation on-site, for example, there is not enough area on-site; and

b. The mitigation will provide equal or superior ecological function and value.

4. Purchasing mitigation credits though DSL or other acceptable mitigation bank.

Staff Finding 80: The applicant has proposed all mitigation to occur on-site in accordance with Priority 1. Please see the submitted Revegetation Plan (Exhibit PD-1, Attachment W, page 702) and Mitigation Plan (Exhibit PD-1, Attachment K, page 563). The criteria are met.

C. Amount of mitigation.

1. The amount of mitigation shall be based on the square footage of the permanent disturbance area by the application. For every one square foot of non-PDA disturbed area, on-site mitigation shall require one square foot of WRA to be created, enhanced or restored.

2. For every one square foot of PDA that is disturbed, on-site mitigation shall require one half a square foot of WRA vegetation to be created, enhanced or restored.

Staff Finding 81: The applicant has proposed to disturb 17,918 square feet of non-PDA area within WRAs. The applicant has proposed to mitigate, through creation, enhancement, or restoration of, 17,918 square feet of WRAs. The applicant has not proposed any PDA area, thus no additional mitigation is required. Please see the submitted Revegetation Plan (Exhibit PD-1, Attachment W, page 702) and Mitigation Plan (Exhibit PD-1, Attachment K, page 563). The applicant shall submit a final report, per Condition of Approval 12, documenting the mitigation of non-PDA water resource areas per the mitigation plan found in Exhibit PD-1, Attachment K, page 563. Subject to the Conditions of Approval, the criteria are met.

3. For any off-site mitigation, including the use of DSL mitigation credits, the requirement shall be for every one square foot of WRA that is disturbed, two square feet of WRA shall be created, enhanced or restored. The DSL mitigation credits program or mitigation bank shall require a legitimate bid on the cost of on-site mitigation multiplied by two to arrive at the appropriate dollar amount.

Staff Finding 82: The applicant proposes to use on-site mitigation. No off-site mitigation or use of credits is proposed. The criteria are met.

D. The Planning Director may limit or define the scope of the mitigation plan and submittal requirements commensurate with the scale of the disturbance relative to the resource and pursuant to the authority of Chapter 99 CDC. The Planning Director may determine that a consultant is required to complete all or a part of the mitigation plan requirements.

Staff Finding 83: The proposed mitigation plan was prepared by a Senior Environmental Scientist at HDR with 22 years of experience in the field of environmental science. The criteria are met.

E. A mitigation plan shall contain the following information:
1. A list of all responsible parties including, but not limited to, the owner, applicant, contractor, or other persons responsible for work on the development site.

Staff Finding 84: The Mitigation Plan (Exhibit PD-1, Attachment K, page 563) lists all responsible parties for implementation of the plan. The State of Oregon contactor will be under contractual obligation to fulfill the obligation of implementing the plan. The criteria are met.

2. A map showing where the specific adverse impacts will occur and where the mitigation activities will occur.

Staff Finding 85: The applicant has submitted maps showing the location of specific adverse impacts to WRAs and mitigation locations. See Exhibit PD-1, Attachment W, page 702, Exhibit PD-1, Attachment K, page 563, Exhibit PD-1, Attachment Q, page 644, and Exhibit PD-1, Attachment L, page 569. The criteria are met.

3. A re-vegetation plan for the area(s) to be mitigated that meets the standards of CDC 32.100.

Staff Finding 86: Please see Staff Findings 88 to 97. The criteria are met.

4. An implementation schedule, including timeline for construction, mitigation, mitigation maintenance, monitoring, and reporting. All in-stream work in fish bearing streams shall be done in accordance with the Oregon Department of Fish and Wildlife.
5. Assurances shall be established to rectify any mitigation actions that are not successful within the first three years. This may include bonding or other surety.

Staff Finding 87: The applicant has submitted documentation of necessary permits from Oregon Department of State Lands, Oregon Department of Environmental Quality, and the Army Corps of Engineers. All in-stream work in fish bearing streams will be done in accordance with the Oregon Department of Fish and Wildlife. The applicant has submitted an implementation schedule, timeline for construction, mitigation, mitigation maintenance, monitoring, and reporting (see below) as provided in Exhibit PD-1, Attachment K, page 563. The applicant, per Condition of Approval 13, shall submit a financial surety to ensure

successful mitigation and follow with a monitoring report within three years of completion. The financial surety will be released upon acceptance of the monitoring report by the City. Subject to the Conditions of Approval, the criteria are met.

Applicant Response: Implementation schedule (timeline for construction, mitigation, mitigation maintenance, monitoring, reporting) Construction will begin in Fall of 2022 and continue until Fall of 2025. Restoration will be implemented Fall of 2025 and continue through Spring of 2026. Monitoring and maintenance will begin in Spring 2026 and continue through 2031.

The State of Oregon, acting though the Department of Transportation, shall include contractual obligations with the selected contractor to fulfill the mitigation criteria as presented. Mitigation plantings will be monitored for success consistent with the Stream and Water Restoration Plan. Through the issuance of permits from both DSL and USACE, ODOT is legally obligated to 5 years of mitigation monitoring and success criteria found within the Stream and Water Restoration Plan. See Attachment Z for the DSL and USACE permits. A monitoring report will be submitted to the City's planning division, documenting plant survival rates of shrubs and trees on the mitigation sites after the third year of monitoring and maintenance. The report will also include photographs of the mitigation sites. ODOT will conduct active maintenance to reduce non-native vegetation coverage. Routine maintenance may include limited spot herbicide treatments, mulching undesirable trees and shrubs, and replanting and/or reseeding with native species. Site maintenance will occur on an as-need basis. Informal hydrology and natural resource observations will be included along with an assessment of performance standards. If performance standards are not met, then remedial actions will be proposed in the monitoring report.

32.100 RE-VEGETATION PLAN REQUIREMENTS

A. In order to achieve the goal of re-establishing forested canopy, native shrub and ground cover and to meet the mitigation requirements of CDC 32.090 and vegetative enhancement of CDC 32.080, tree and vegetation plantings are required according to the following standards:

1. All trees, shrubs and ground cover to be planted must be native plants selected from the Portland Plant List.

Staff Finding 88: The applicant has submitted a Revegetation Plan (Exhibit PD-1, Attachment W, page 702) that proposes all trees, shrubs, and ground cover to be planted are found on the Portland Plant list. The criteria are met.

2. Plant size. Replacement trees must be at least one-half inch in caliper, measured at six inches above the ground level for field grown trees or above the soil line for container grown trees (the one-half inch minimum size may be an average caliper measure, recognizing that trees are not uniformly round), unless they are oak or madrone which may be one gallon size. Shrubs must be in at least a one-gallon container or the equivalent in ball and burlap and must be at least 12 inches in height.

Staff Finding 89: The applicant has submitted a Revegetation Plan (Exhibit PD-1, Attachment W, page 702) that proposes all replacement trees be a minimum of one-half inch in caliper. All proposed shrubs will be one gallon in size or bare root, which is the equivalent of one gallon size, and a minimum of 12 inches in height. The criteria are met.

3. Plant coverage.
a. Native trees and shrubs are required to be planted at a rate of five trees and 25 shrubs per every 500 square feet of disturbance area (calculated by dividing the number of square feet of disturbance area by 500, and then multiplying that result times five trees and 25 shrubs, and rounding all fractions to the nearest whole number of trees and shrubs; for example, if there will be 330 square feet of disturbance area, then 330 divided by 500 equals 0.66, and 0.66 times five equals 3.3, so three trees must be planted, and 0.66 times 25 equals 16.5, so 17 shrubs must be planted). Bare ground must be planted or seeded with native grasses or herbs. Non-native sterile wheat grass may also be planted or seeded, in equal or lesser proportion to the native grasses or herbs.

Staff Finding 90: The applicant has submitted a Revegetation Plan (Exhibit PD-1, Attachment W, page 702) that proposes five trees and 25 shrubs per every 500 square feet of disturbance area. A total of 180 trees (17,918 square feet of disturbance/500 x 5 = 180 trees) and 896 (17,918 square feet of disturbance/500 x 25 = 896 shrubs) shrubs are required for impacts to the WRAs. A total of 222 trees (22,126 square feet of disturbance/500 x 5 = 222 trees) and 1107 (22,126 square feet of disturbance/500 x 25 = 1107 shrubs) shrubs are required for impacts to the HCAs. The applicant has proposed a total of 704 trees and 2,067 shrubs to mitigate both the WRA and HCA impacts. The applicant has also proposed seeding almost 2 million square feet of bare ground with native grasses or herbs. The criteria are met.

b. Trees shall be planted between eight and 12 feet on center and shrubs shall be planted between four and five feet on center, or clustered in single species groups of no more than four plants, with each cluster planted between eight and 10 feet on center. When planting near existing trees, the dripline of the existing tree shall be the starting point for plant spacing measurements.

Staff Finding 91: The applicant has submitted a Revegetation Plan (Exhibit PD-1, Attachment W, page 702) that proposes a minimum distance of 15 feet between trees and the same for shrubs. The City Arborist has reviewed the plan and recommends, per best revegetation practices, the minimum of 15 feet be allowed to reduce the danger of overcrowding and loss of plant material. The applicant has exceeded the number of required mitigation trees to provide a better spread of riparian canopy coverage in the project area. Subject to industry best practices, the criteria are met.

Applicant Submittal: Trees are proposed to be planted at an average of 15 feet on center. Shrubs will be installed 5 feet on center, in groups of 3 to 9 plants per species. Shrub groups will be spaced no closer than 15 feet apart and no closer than 5 feet to an adjacent tree. Planting at a more open density will yield a healthier, more self-sustaining ecosystem.

Overplanting will require removals or result in tree-fall as species crowd each other out. The revegetation plan does not meet this standard; however, to make up for the lower density plantings, the applicant proposes additional mitigation area, trees, and shrubs that will exceed the required amounts based on disturbance. Overall, the amount of proposed mitigation is equal to 190,732 square feet, including 704 trees and 2,067 shrubs.

4. Plant diversity. Shrubs must consist of at least two different species. If 10 trees or more are planted, then no more than 50 percent of the trees may be of the same genus.

Staff Finding 92: The applicant has submitted a Revegetation Plan (Exhibit PD-1, Attachment W, page 702) that proposes a minimum of 11 different species of shrubs and 18 different species of trees. The criteria are met.

5. Invasive vegetation. Invasive non-native or noxious vegetation must be removed within the mitigation area prior to planting.

Staff Finding 93: The applicant has submitted a Revegetation Plan (Exhibit PD-1, Attachment W, page 702) that proposes the removal of all invasive non-native or noxious vegetation prior to planting the mitigation areas. The criteria are met.

6. Tree and shrub survival. A minimum survival rate of 80 percent of the trees and shrubs planted is expected by the third anniversary of the date that the mitigation planting is completed.

Staff Finding 94: The applicant has submitted a Revegetation Plan (Exhibit PD-1, Attachment W, page 702). The applicant, per Condition of Approval 13, shall submit a financial surety to ensure successful mitigation and follow with a monitoring report within three years of completion. The financial surety will be released upon acceptance of the monitoring report by the City that shows 80 percent survival rate. Subject to the Conditions of Approval, the criteria are met.

7. Monitoring and reporting. Monitoring of the mitigation site is the ongoing responsibility of the property owner. Plants that die must be replaced in kind.

Staff Finding 95: The applicant has submitted an implementation schedule, timeline for construction, mitigation, mitigation maintenance, monitoring, and reporting (see below) as provided in Exhibit PD-1, Attachment K, page 563. The applicant, per Condition of Approval 13, shall submit a financial surety to ensure successful mitigation and follow with a monitoring report within three years of completion. The financial surety will be released upon acceptance of the monitoring report by the City. Subject to the Conditions of Approval, the criteria are met.

Applicant Response: Implementation schedule (timeline for construction, mitigation, mitigation maintenance, monitoring, reporting) Construction will begin in Fall of 2022 and

continue until Fall of 2025. Restoration will be implemented Fall of 2025 and continue through Spring of 2026. Monitoring and maintenance will begin in Spring 2026 and continue through 2031.

The State of Oregon, acting though the Department of Transportation, shall include contractual obligations with the selected contractor to fulfill the mitigation criteria as presented. Mitigation plantings will be monitored for success consistent with the Stream and Water Restoration Plan. Through the issuance of permits from both DSL and USACE, ODOT is legally obligated to 5 years of mitigation monitoring and success criteria found within the Stream and Water Restoration Plan. See Attachment Z for the DSL and USACE permits.
A monitoring report will be submitted to the City's planning division, documenting plant survival rates of shrubs and trees on the mitigation sites after the third year of monitoring and maintenance. The report will also include photographs of the mitigation sites. ODOT will conduct active maintenance to reduce non-native vegetation coverage. Routine maintenance may include limited spot herbicide treatments, mulching undesirable trees and shrubs, and replanting and/or reseeding with native species. Site maintenance will occur on an as-need basis. Informal hydrology and natural resource observations will be included along with an assessment of performance standards. If performance standards are not met, then remedial actions will be proposed in the monitoring report.

8. To enhance survival of tree replacement and plantings, the following practices are required:
a. Mulching. Mulch new plantings a minimum of three inches in depth and 18 inches in diameter to retain moisture and discourage weed growth.
b. Irrigation. Water new plantings one inch per week between June 15th to October 15th, for the three years following planting.
c. Weed control. Remove, or control, non-native or noxious vegetation throughout maintenance period.
d. Planting season. Plant bare root trees between December 1st and February 28th, and potted plants between October 15th and April 30th.
e. Wildlife protection. Use plant sleeves or fencing to protect trees and shrubs against wildlife browsing and resulting damage to plants.

Staff Finding 96: The applicant shall mulch new plantings a minimum of three inches in depth and 18 inches in diameter per Condition of Approval 14. The applicant shall water new plantings one inch per week between June 15th and October 15th for three years following planting per Condition of Approval 15. The applicant shall remove or control non-native or noxious vegetation throughout the maintenance period per Condition of Approval 16. The applicant shall plant bare root trees between December 1st and February 28th and potted plants between October 15th and April 30th, or as guided by industry best practices per Condition of Approval 17. The applicant shall use plant sleeves or fencing to protect trees and shrubs against damage to plants, guided by industry best practices, per Condition of Approval 18. Subject to the Conditions of Approval, the criteria are met.

B. When weather or other conditions prohibit planting according to schedule, the applicant shall ensure that disturbed areas are correctly protected with erosion control measures and shall provide the City with funds in the amount of 125 percent of a bid from a recognized landscaper or nursery which will cover the cost of the plant materials, installation and any follow up maintenance. Once the planting conditions are favorable the applicant shall proceed with the plantings and receive the funds back from the City upon completion, or the City will complete the plantings using those funds.

Staff Finding 97: The applicant has submitted an implementation schedule, timeline for construction, mitigation, mitigation maintenance, monitoring, and reporting (see below) as provided in Exhibit PD-1, Attachment K, page 563. The applicant, per Condition of Approval 13, shall submit a financial surety to ensure successful mitigation and follow with a monitoring report within three years of completion. The financial surety will be released upon acceptance of the monitoring report by the City. Subject to the Conditions of Approval, the criteria are met.

EXHIBIT PD-1 APPLICANT SUBMITTAL

City of West Linn

Planning & Development • 22500 Salamo Rd #1000 • West Linn, Oregon 97068
Telephone 503.656.4211 • Fax 503.656.4106 • westlinnoregon.gov

DEVELOPMENT REVIEW APPLICATION

For Office Use Only		
STAFF CONTACT Wyss	PROJECT NO(S). WAP-21-01 WRG-21-01 MISC-21-02	PRE-APPLICATION NO. PA-19-15
NON-REFUNDABLE FEE(S)	REFUNDABLE DEPOSIT(S) $1,850 + $1,700 + $1,050	TOTAL $4,600

Type of Review (Please check all that apply):

- ☐ Annexation (ANX)
- ☐ Appeal and Review (AP)
- ☐ Conditional Use (CUP)
- ☐ Design Review (DR)
- ☐ Easement Vacation
- ☐ Extraterritorial Ext. of Utilities
- ☐ Final Plat or Plan (FP)
- ☒ Flood Management Area
- ☐ Hillside Protection & Erosion Control
- ☐ Historic Review
- ☐ Legislative Plan or Change
- ☐ Lot Line Adjustment (LLA)
- ☐ Minor Partition (MIP) (Preliminary Plat or Plan)
- ☐ Non-Conforming Lots, Uses & Structures
- ☐ Planned Unit Development (PUD)
- ☐ Pre-Application Conference (PA)
- ☐ Street Vacation
- ☐ Subdivision (SUB)
- ☐ Temporary Uses
- ☐ Time Extension
- ☐ Variance (VAR)
- ☐ Water Resource Area Protection/Single Lot (WAP)
- ☒ Water Resource Area Protection/Wetland (WAP)
- ☒ Willamette & Tualatin River Greenway (WRG)
- ☐ Zone Change

Home Occupation, Pre-Application, Sidewalk Use, Sign Review Permit, and Temporary Sign Permit applications require different or additional application forms, available on the City website or at City Hall.

Site Location/Address: I-205 Corridor: Abernethy Bridge to west of 10th Street

Assessor's Map No.: **21E35C, 21E36D, 22E31BB, 22E31, 22E31BA, 22E30CD, 22E30DC, 22E30DB**

Tax Lot(s):

Total Land Area:

Brief Description of Proposal: This Project will widen I-205 through West Linn to add a third general purpose travel lane in each direction and conduct a Phase II seismic retrofit of the Abernethy Bridge. To conform to the new I-205 widths, the OR 43 Interchange ramps will be modified. The bridges over West A Street, Sunset Avenue will be replaced, and the Broadway Street overcrossing will be permanently removed.

Proposed structural upgrades to Abernethy Bridge include replacement of piers, adding columns, increasing foundation sizes, enlarging columns and beams, and other substructure improvements. A drill rig will be used to strengthen subsurface soils with deep soil mixing and jet grouting. A temporary work bridge will be installed to facilitate construction activities at Abernethy Bridge. The project includes work in the floodplain.

Applicant Name: (please print) Mandy Putney, Oregon Department of Transportation
Phone: 503.731.8356
Address: 123 NW Flanders Street
Email: Mandy.Putney@odot.state.or.us
City State Zip: Portland, OR 97209

Owner Name (required): (please print) SAME AS ABOVE
Phone:
Address:
Email:
City State Zip:

Consultant Name: (please print) Brian Bauman, HDR
Phone: 503-727-3908
Address: 1050 SW 6th Ave, Suite 1800
Email: Brian.Bauman@hdrinc.com
City State Zip: Portland, OR 97204

1. All application fees are non-refundable (excluding deposit). **Any overruns to deposit will result in additional billing.**
   a. $1,050 deposit for the FMA permit
   b. $1,700 for the WRG review
   c. $1,850 deposit for the WRA permit
2. The owner/applicant or their representative should be present at all public hearings.

West Linn Land Use Application

ODOT | K19786 I-205: I-5 – OR 213

I-205 Improvements Project

ODOT EA: PE003013

HDR Project # 10063137

February 19, 2021

Contents

Part 1

Attachments

3. A decision may be reversed on appeal. No permit will be in effect until the appeal period has expired.
4. **One complete hard-copy set of application materials must be submitted with this application.**
   One complete digital set of application materials must also be submitted electronically in PDF format.
   If large sets of plans are required in application please submit one set.

The undersigned property owner(s) hereby authorizes the filing of this application, and authorizes on site review by authorized staff. I hereby agree to comply with all code requirements applicable to my application. Acceptance of this application does not infer a complete submittal. All amendments to the Community Development Code and to other regulations adopted after the application is approved shall be enforced where applicable. Approved applications and subsequent development is not vested under the provisions in place at the time of the initial application.

Marty Putney	2/22/2021	Marty Putney	2/22/2021
Applicant's signature	Date	Owner's signature ***(required)***	Date

RECEIVED
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West Linn Development Review Application

I-205 Improvements: Stafford Road – OR 213

ODOT EA: PE003013

HDR Project # 10063137

City of West Linn

February 19, 2021

DEVELOPMENT REVIEW APPLICATION
Applicant's Submittal
February 19, 2021

APPLICANT:	Name: Mandy Putney, Oregon Department of Transportation Address: 123 NW Flanders Street Portland OR 97209
OWNER:	Name: Mandy Putney, Oregon Department of Transportation Address: 123 NW Flanders Street Portland OR 97209
REQUEST:	Land use review, including Flood Management Area review, Water Resource Area review, and Willamette & Tualatin River Protection Area review
LOCATION:	I-205 ODOT right-of-way from 10th Street to the Willamette River

I. PROJECT DESCRIPTION

There is a 30 percent chance that a Magnitude 8.0+ earthquake will occur in Oregon within the next 50 years. Transportation infrastructure resilience is one of the primary components required for an effective recovery following this significant natural disaster. In the event of the earthquake, I-205 may be the only connection between Oregon and Washington. ODOT designated I-205 as a Phase 1 statewide north-south lifeline route, which means it must be operational quickly after a disaster renders other roadways unusable or impassable. This critical route will provide supplies and services to the region. Upgrading the Abernethy Bridge is part of the effort to maintain I-205 in the event of a Cascadia Seismic Event. The I-205 Improvements: Stafford Road – OR 213Project (Project) will widen I-205 in West Linn to add a third general purpose travel lane in each direction and conduct a Phase II seismic retrofit of the Abernethy Bridge. To conform to the new I-205 widths, the OR 43 Interchange ramps will be reconfigured. Bridges over West A Street and Sunset Avenue will be replaced, and the Broadway Street overcrossing will be permanently removed. Specific elements of the project include:

- Adding a third northbound (NB) and southbound (SB) lane to I-205
- Abernethy Bridge widening and seismic retrofit
- Broadway Street overcrossing bridge removal
- West A Street and Sunset Avenue overcrossing bridge replacements

- I-205 NB rock blasting operations (West A Street to Sunset Avenue)
- OR43 interchange ramp reconfiguration, shared use path improvements, and roundabout installation
- Removal of redundant OR43 NB entrance ramp
- Constructing new sign structures (sign bridge and cantilever)
- Installation of new high mast lighting from OR213 to 10th Street
- Construction of stormwater management facilities

Roadway improvements are planned to occur within the existing right-of-way. Proposed improvements are designed to minimize modifications of entrance and exit ramps at interchanges, retaining walls, illumination relocations, and the amount of freeway construction work. They are also designed to minimize impacts to environmentally sensitive features.

Three general purpose lanes in each direction of I-205 will extend just west of 10th Street. The additional SB lane will become an exit only lane at 10th Street, and the third NB lane will be added as the “A” lane immediately north of the 10th Street Overcrossing.

The Abernethy Bridge will be widened to provide an additional through lane and a wider outside shoulder, resulting in an additional 16 feet of roadway width in both directions. The river span widenings consist of steel member cantilevers from the existing main span box girders and the approach span widenings are achieved through the addition of multiple steel girder lines. The bridge seismic retrofit includes nearly all existing columns and crossbeams. These elements require enlargement or alternative seismic retrofit measures to resolve seismic deficiencies. Additional foundation elements, including drilled shafts and micropiles, will be needed at a number of bents to resolve seismic deficiencies. Ground improvement consisting of deep soil mixing or jet grouting is also needed under the Abernethy Bridge to reduce the potential effects of liquefaction and lateral spreading that may occur in the alluvium and gravel soils during a seismic event. For the work within the Willamette River, a temporary work bridge will be constructed from both banks from both upstream and downstream of the existing piers and will remain in place for up to 4 years (Attachment A, Figures 5-7 to 5-9). A contractor access road from OR 43 immediately adjacent to the bridge will be used to access the work bridge on the west bank, north of the bridge.

Widening of the bridge lanes also requires modification to the approach spans and ramps on either end of the bridge. The I-205 southbound exit ramp to OR 43 (Attachment A, Figure 5-3C) will be widened to provide standard shoulders on the ramp structure and to shift the exit ramp over by the width of the additional lane and shoulder being added to the mainline portion of the bridge. The widening will be accomplished on the outside edge of the structure.

Rock blasting will occur south of I-205 NB from West A Street to Sunset Avenue to accommodate lane widening. Approximately 30-40 feet of rock cut is proposed from the existing face.

The I-205 bridge overcrossings of Broadway Street, West A Street, and Sunset Avenue conflict with the proposed mainline widening. To eliminate the conflict, the West A Street Bridge and the Sunset Avenue Bridge will be replaced and the Broadway Street Bridge will be removed.

II. DEVELOPMENT REVIEW PROCESS

A pre-application conference was held for the Project on June 20, 2019. The meeting notes are included as Attachment B. The proposal requires a flood management area permit (FMA), a water resource area permit (WRA), and a Willamette and Tualatin River protection review (WRG). The land use process for all three reviews is performed by the City of West Linn Planning Manager. No public hearing is required. In this document, the Applicant has addressed the submittal requirements and standards for decision-making in Community Development Code (CDC) Chapters 27, 28, and 32.

Chapter 27 Flood Management Areas

27.050 APPLICATION

A. A pre-application conference as a prerequisite to the filing of the application.

Applicant Response: See Attachment B

B. An application initiated by the property owner, or the owner's authorized agent, and accompanied by the appropriate fee.

Applicant Response: A completed application form and fee are provided in introductory materials for this submittal.

C. An application submittal that includes the completed application form, one copy of written responses addressing CDC 27.060, 27.070, 27.080 (if applicable), and 27.090 (if applicable), one copy of all maps and plans at the original scale, one copy of all maps and plans reduced to a paper size not greater than 11 inches by 17 inches, and a copy in a digital format acceptable to the City.

Applicant Response: A completed application form is provided in introductory materials for this submittal. This document includes written responses addressing CDC 27.060, 27.070, 27.090, and 27.120. CDC 27.080 is not applicable because the project does not involve residential construction. Copies of the project site plan are included in Attachment C as specified.

D. A map of the property indicating the nature of the proposed alteration and its relationship to property zones, structures, trees, and any other pertinent features.

Applicant Response: See Attachment C for a map of the project area that includes property zones (tax lots), structures, trees, and other pertinent features, as well as the Project footprint. The proposed alteration is described as follows:

The I-205: I-5 – OR 213, Phase I Sec. Project (Project) proposes to add a northbound and southbound travel lane to I-205 between just west of the 10th Street Interchange and the OR 99E Interchange and an I-205 northbound auxiliary lane between OR 99E and OR 213. The I-205 George Abernethy Bridge (Abernethy Bridge) across the Willamette River will be seismically retrofitted to withstand the Cascadia Seismic Event.

Seismic retrofits will require new or improved foundations. The Project will achieve the seismic design criteria at the Abernethy Bridge through a series of structural upgrades including replacement of the substructure, adding columns, increasing foundation sizes, enlarging columns and beams, and other substructure improvements. The pier replacements will impact the West Linn Flood Management Area. The Project will not increase flood elevations, since proposed work will result in net removal within the floodplain.

Within the Flood Management Area, the Abernethy Bridge will be widened to include an additional through-lane and a wider outside shoulder in both the northbound and southbound directions resulting in an additional 16 feet of roadway width in both directions. The main spans of the Abernethy Bridge will be widened by sliding the existing bridge girders toward the outside of the bridge and construction of cantilever supports to the inside of the bridge. The additional lane width will be constructed between the northbound and southbound lanes and over the new cantilever sections. This widening will be supported by larger, seismically stable in-water support piers to be located upstream and downstream of the existing piers. Existing piers and a portion of the associated riprap will be removed. Widening of the bridge lanes also requires modification to the approach spans and ramps at either end of the bridge.

E. Information regarding the elevation of the site prior to development, the base flood elevation data for subdivisions (if applicable), and a description of water course alterations, if proposed.

Applicant Response: Attachment D provides the flood management area, including elevations prior to development. The proposed project is not a subdivision. McLoughlin Creek will be temporarily diverted into a pipe to facilitate construction (no more than 18 months) and restored to preconstruction conditions. See Attachment V for McLoughlin Creek site plans. Attachment E describes project elements within the Willamette River floodplain and flood management area and how construction will balance cut and fill to avoid alteration of the water course.

F. A topographic map of the site at contour intervals of five feet or less showing a delineation of the flood management area, which includes, but is not limited to, areas shown on the Flood Management Area map. The City Engineer or Building Official, as applicable, may, at his/her discretion, require the map to be prepared by a registered land surveyor to ensure accuracy. A written narrative explaining the reason why the owner wishes to alter the floodplain shall accompany the site plan map.

Applicant Response: See Attachment D for a topographic map showing a delineation of the flood management area and the Project area. The floodplain under the Abernethy Bridge must be altered to construct the substructure and foundation retrofits as part of the seismic improvements and additional lane capacity. Specifically within the Flood Management Area of West Linn, ODOT needs to construct new columns at Piers 5, 6, 7, and 8 to strengthen and widen the bridge.

G. The elevation in relation to mean sea level, of the lowest floor (including basement) of all structures.

Applicant Response: The proposed project is construction of a transportation facility that does not include building floors or basements. The locations of project elements within the flood management area in West Linn are shown in Figure 1 in Attachment D. These project elements are Piers 5, 6, 7, and 8 of the Abernethy Bridge. Piers 5 and 6 are in the river and extend below mean sea level and below the channel surface floor. Pier 7 will have columns constructed at 11 and 22 feet above ordinary high water, and Pier 8 will have columns constructed at 33 and 51 feet above ordinary high water.

H. The elevation in relation to mean sea level to which any structure has been flood-proofed (non-residential only). (Ord. 1622 § 10, 2014; Ord. 1636 § 24, 2014)

Applicant Response: The proposed construction is a transportation facility that does not include flood-proofed structures. Structural elements subject to water flow are designed for purposes of maintaining their integrity during high flood events.

27.060 APPROVAL CRITERIA

The Planning Director shall make written findings with respect to the following criteria when approving, approving with conditions, or denying an application for development in flood management areas:

A. Development, excavation, and fill shall be performed in a manner to maintain or increase flood storage and conveyance capacity and not increase design flood elevations.

Applicant Response: Development, excavation, and fill will be balanced to maintain flood storage and conveyance capacity. The project involves replacement of four bridge piers within the flood management area of West Linn: a total of ten columns associated with the existing piers would be replaced with a total of eight new columns. The total volume of fill required for the new columns is 120 cubic yards greater than the volume for the existing columns. To mitigate the loss of floodplain storage, 120 cubic yards of material will be excavated (cut) adjacent to the Pier 8 to balance the fill. See Attachment E for a detailed description of the proposed cut/fill work within the floodplain. The project will not increase design flood elevations as evidenced by the No-rise Memorandum in Attachment F.

B. No net fill increase in any floodplain is allowed. All fill placed in a floodplain shall be balanced with an equal amount of soil material removal. Excavation areas shall not exceed fill areas by more than 50 percent of the square footage. Any excavation below the ordinary high water line shall not count toward compensating for fill.

Applicant Response: No net fill increase is proposed. All proposed cut/fill will be balanced in the floodplain, excluding excavation below the ordinary high water line. See Attachment E.

C. Excavation to balance a fill shall be located on the same lot or parcel as the fill unless it is not reasonable or practicable to do so. In such cases, the excavation shall be located in the same drainage basin and as close as possible to the fill site, so long as the proposed excavation and fill will not increase flood impacts for surrounding properties as determined through hydrologic and hydraulic analysis.

Applicant Response: Proposed cut and excavation will take place within ODOT right-of-way, and will be balanced within the same drainage basin and as close as possible to the fill site. No increase in flood impacts are anticipated. Attachment F (No-rise Memorandum) describes hydrologic and hydraulic analysis used to determine the project will not increase flood impacts.

D. Minimum finished floor elevations must be at least one foot above the design flood height or highest flood of record, whichever is higher, for new habitable structures in the flood area.

Applicant Response: No habitable structures in the flood area are proposed.

E. Temporary fills permitted during construction shall be removed.

Applicant Response: Permitted temporary fills for purposes of construction will be removed after construction has been completed.

F. Prohibit encroachments, including fill, new construction, substantial improvements, and other development in floodways unless certification by a professional civil engineer licensed to practice in the State of Oregon is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.

Applicant Response: The Applicant has prepared a No-Rise Memorandum (Attachment F) to demonstrate there will not be an increase in flood levels.

G. All proposed improvements to the floodplain or floodway which might impact the flood-carrying capacity of the river shall be designed by a professional civil engineer licensed to practice in the State of Oregon.

Applicant Response: All proposed work within the floodplain has been designed by professional civil engineers licensed in Oregon.

H. New culverts, stream crossings, and transportation projects shall be designed as balanced cut and fill projects or designed not to significantly raise the design flood elevation. Such projects shall be designed to minimize the area of fill in flood management areas and to minimize erosive velocities. Stream crossings shall be as close to perpendicular to the stream as practicable. Bridges shall be used instead of culverts wherever practicable.

Applicant Response: No new stream crossings are proposed. All bridge work is replacing or removing existing bridges in the same locations. No new culverts are proposed. See Attachment E for proposed balanced cut/fill work within the floodplain.

I. Excavation and fill required for the construction of detention facilities or structures, and other facilities, such as levees, specifically shall be designed to reduce or mitigate flood impacts and improve water quality. Levees shall not be used to create vacant buildable land.

Applicant Response: To meet stormwater design criteria, water quality facilities and detention facilities are proposed along the length of the proposed project. The Preliminary Stormwater Design Report, provided as Attachment G, describes the design criteria and analysis used to determine the appropriate design for water quality and stormwater facilities associated with the project.

J. The applicant shall provide evidence that all necessary permits have been obtained from those federal, State, or local governmental agencies from which prior approval is required. (Ord. 1522, 2005; Ord. 1635 § 15, 2014; Ord. 1636 § 25, 2014)

Applicant Response: The Applicant has included documentation of necessary permit applications. See Attachment H for DSL, DEQ, and USACE permit applications.

27.070 CONSTRUCTION MATERIALS AND METHODS

A. All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage using methods and practices that minimize flood damage.

> **Applicant Response:** The transportation improvements will be constructed with materials and utility equipment resistant to flood damage. The temporary work bridge will be constructed above the typical 2-year flow elevation and will be constructed to withstand high water flows. Mobile equipment will be required to be staged at least 150 feet from the ordinary high water elevation. Should high flows be anticipated, the contractor will relocate equipment above the anticipated flood elevation.

B. Electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

> **Applicant Response:** No service facilities are included in the proposal.

C. New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.

> **Applicant Response:** The existing water supply system traversing the Abernethy Bridge will be maintained during construction. It is currently designed to eliminate infiltration of flood waters.

D. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters.

> **Applicant Response:** No new or replacement sanitary sewage systems are proposed.

E. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

> **Applicant Response:** No waste disposal systems will be constructed as part of the proposed development. Managing construction waste will be the responsibility of the construction contractor. The Applicant would require the construction contractor to locate temporary waste collection areas to avoid impairment to them or contamination from them during flooding.

F. All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure.

> **Applicant Response:** The new facilities are designed to withstand major seismic events and flooding. Structural elements subject to water flow are designed for purposes of maintaining their integrity during high flood events.

27.080 RESIDENTIAL CONSTRUCTION – NOT APPLICABLE

27.090 NON-RESIDENTIAL CONSTRUCTION

New construction and substantial improvement of any commercial, industrial, or other non-residential structure shall either have the lowest floor, including basement, elevated to at least one foot above the level of the base flood elevation; or, together with attendant utility and sanitary facilities, shall:

A. Be flood-proofed so that below the base flood level the structure is watertight with walls impermeable to the passage of water;

> **Applicant Response:** The proposed construction is a transportation facility that does not include walls. There is no expectation the transportation surfaces and related facilities would be water tight.

B. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;

> **Applicant Response:** The new facilities are designed to withstand major seismic events and flooding. Structural elements subject to water flow are designed for purposes of maintaining their integrity during high flood events.

C. Be certified by a professional civil engineer licensed to practice in the State of Oregon that the design and methods of construction shall prevent seepage, collapse or cracking of basement walls, prevent buckling of basement floors, prevent backup of water from sewer lines, and have all openings located one foot above the base flood elevation. In addition, all protective features must operate automatically without human intervention;

> **Applicant Response:** All proposed work has been designed by professional civil engineers licensed in Oregon. No structures are proposed that would have basements, floors, or sewer lines.

D. Non-residential construction that is elevated, but not flood-proofed (i.e., the foundation is not at least one foot above the 100-year flood elevation) shall also comply with the standards set forth in CDC 27.080. (Ord. 1522, 2005)

> **Applicant Response:** This section is not applicable. The Applicant's proposal does not include construction that would require flood-proofing.

27.120 ALTERATION OF WATERCOURSES

A. The applicant shall meet the requirements of Chapter 28 CDC, Willamette and Tualatin River Protection, or Chapter 32 CDC, Water Resource Area Protection, as applicable, in addition to this chapter's requirements.

> **Applicant Response:** The Applicant's responses to the requirements of CDC Chapters 28 and 32 are included in this submittal under separate heading.

B. A comparison by a professional civil engineer licensed to practice in the State of Oregon shall be made between the existing channel capacity and the proposed capacity and the changes assessed. The *alteration or modification must maintain the carrying capacity of the watercourse and not increase the base flood elevation.*

Applicant Response: Piers 5, 6, 7, and 8 of the Abernethy Bridge, which are in the flood management area of the Willamette River, will be replaced, each with two new columns. The footing for Abernethy Bridge Pier 10 that extends under McLoughlin Creek will be retrofitted to allow the bridge to meet seismic standards. A professional civil engineer licensed to practice in the State of Oregon has compared the existing channel capacity of the Willamette River and McLoughlin Creek to the proposed project changes in these watercourses and determined that their carrying capacities will be maintained and the base flood elevation will not increase. In the case of the Willamette River, the No-rise Memorandum in Attachment F and the cut/fill memo in Attachment E provide detailed descriptions of the proposed project and the means of avoiding an increase in base flood elevation and maintaining the river's carrying capacity. To minimize impacts to McLoughlin Creek the project will temporarily relocate the creek during construction. The temporary alteration of McLoughlin Creek, would place creek flow into a 48-inch diameter diversion pipe for a maximum of 18 months. This diameter pipe will meet the pipe sizes on either end of the temporarily diverted portion of the creek. Once the bridge pier footing is complete, the stream will be placed back to the original location and restored to pre-construction conditions. There will be no change to carrying capacity of the creek.

C. The Planning Director shall notify adjacent communities and the State of Oregon Department of Land Conservation and Development prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Insurance Administration.

Applicant Response: The Applicant accepts and supports this notification process.

D. The Planning Director shall require that maintenance be provided within the altered or relocated portion of said watercourse so that the flood-carrying capacity is not diminished.

Applicant Response: The Applicant will comply with the conditions of the permit. The diversion pipe would be maintained during the period it is in place (no more than 18 months). Following construction, the creek would be restored to pre-construction conditions and the flood-carrying capacity of McLoughlin Creek would not be diminished as a result of the proposed project. Creek restoration would be monitored with other areas of site restoration when construction is complete.

E. The Planning Director shall require that alterations of watercourses must allow fish passage and preserve fish habitat.

Applicant Response: According to McLoughlin Creek does not provide fish habitat, as noted in Attachment I (email from Tom Murtagh, ODFW Fish Biologist). No preservation of fish habitat or fish passage would be required.

F. The applicant shall submit a copy of a permit from the Oregon Division of State Lands and U.S. Army Corps of Engineers that allows the alteration, or states that it is exempt.

Applicant Response: See Attachment H for a copy of a permit from the Oregon Division of State Lands and U.S. Army Corps of Engineers.

Chapter 28 Willamette and Tualatin River Protection

28.110 APPROVAL CRITERIA

No application for development on property within the protection area shall be approved unless the decision-making authority finds that the following standards have been met or can be met by conditions of approval. The development shall comply with the following criteria as applicable:

A. Development: All sites.

1. Sites shall first be reviewed using the HCA Map to determine if the site is buildable or what portion of the site is buildable. HCAs shall be verified by the Planning Director per CDC 28.070 and site visit. Also, "tree canopy only" HCAs shall not constitute a development limitation and may be exempted per CDC 28.070(A). The municipal code protection for trees and Chapters 55 and 85 CDC tree protection shall still apply.

Applicant Response: The applicant reviewed the HCA Map determined where HCAs exist within the project area. There are multiple HCAs within the project area, including low and high designations, as well as habitat and impact areas not designated as HCA (Attachment J). Some of the HCAs in the project area have mapping errors, which the applicant has created an HCA Map Amendment Narrative (Attachment L) documenting the errors.

2. HCAs shall be avoided to the greatest degree possible and development activity shall instead be directed to the areas designated "Habitat and Impact Areas Not Designated as HCAs," consistent with subsection (A)(3) of this section.

Applicant Response: The project was designed to have the least possible impact on HCAs by avoiding and minimizing development activities in HCAs to the extent possible. Given the proximity of HCAs to the I-205 corridor and the Abernethy Bridge, some impacts from the proposed project were unavoidable if the purpose and need of the project is to be met. The purpose of the project is to improve traffic safety, relieve traffic congestion within the corridor, and provide an earthquake resilient route capable of being operational after a Cascadia seismic event. ODOT designated I-205 as a Phase 1 statewide north-south lifeline route, which means it must be operational quickly after a disaster renders other roadways unusable or impassable. To reduce congestion, an additional lane will be added in each direction contiguous with the existing lanes, thereby making some impacts to those HCAs located near roadways unavoidable. See applicant responses to D.1, D.2, and S below.

3. If the subject property contains no lands designated "Habitat and Impact Areas Not Designated as HCAs" and development within HCA land is the only option it shall be directed towards the low HCA areas first, then medium HCA areas and then to high HCA as the last choice. The goal is to, at best, avoid or, at least, minimize disturbance of the HCAs. (Water-dependent uses are exempt from this provision.)

Applicant Response: Where development activities in HCAs cannot be avoided, impacts were minimized to the extent possible by designing the project to disturb "low" HCAs before "high" HCAs. Only one area of proposed work is within a "high" HCA, which is the area underneath the Abernethy Bridge directly west of the Willamette River. No feasible options were available that would avoid the high HCA and seismically upgrade the Abernethy Bridge which requires modifications to the substructure. See Table 1 in applicant response to D.1 below.

4. All development, including exempted activities of CDC 28.040, shall have approved erosion control measures per Clackamas County Erosion Prevention and Sediment Control Planning and Design Manual, rev. 2008, in place prior to site disturbance and be subject to the requirements of CDC 32.070 and 32.080 as deemed applicable by the Planning Director.
Applicant Response: The Applicant has prepared an Erosion and Sediment Control Plan that includes erosion control measures per Clackamas County Erosion Prevention and Sediment Control Planning and Design Manual, rev. 2008, which meets the requirements of CDC 32.070 and 32.080 (See Attachment Z).

B. Single-family or attached residential. Development of single-family homes or attached housing shall be permitted on the following HCA designations and in the following order of preference with "a" being the most appropriate and "d" being the least appropriate:

a "Habitat and Impact Areas Not Designated as HCAs"

b Low HCA

c Moderate HCA

d High HCA

1. Development of land classifications in "b," "c" and "d" shall not be permitted if at least a 5,000-square-foot area of buildable land ("a") exists for home construction, and associated impermeable surfaces (driveways, patios, etc.).
2. If 5,000 square feet of buildable land ("a") are not available for home construction, and associated impermeable surfaces (driveways, patios, etc.) then combinations of land classifications ("a," "b" and "c") totaling a maximum of 5,000 square feet shall be used to avoid intrusion into high HCA lands. Development shall emphasize area "a" prior to extending construction into area "b," then "c" lands.
3. The underlying zone FAR shall also apply as well as allowable lot coverage.
4. Development may occur on legal lots and non-conforming lots of record located completely within the HCA areas or that have the majority of the lot in the HCA to the extent that the applicant has less than 5,000 square feet of non-HCA land.

Development shall disturb the minimum necessary area to allow the proposed use or activity, shall direct development to any available non-HCA lands and in any situation shall create no more than 5,000 square feet of impervious surface. (Driveways, paths, patios, etc., that are constructed of approved water-permeable materials will not count in calculating the 5,000-square-foot lot coverage.) The underlying zone FAR and allowable lot coverage shall also apply and may result in less than 5,000 square feet of lot coverage.

When only HCA land is available then the structure shall be placed as far away from the water resource area or river as possible. To facilitate this, the front setback of the structure or that side which is furthest away from the water resource or river may be reduced to a five-foot setback from the front property line without a variance. Any attached garage must provide a 20-foot by 20-foot *parking pad or driveway so as to provide off-street parking exclusive of the garage. The setbacks of subsection C of this section shall still apply.*

5. Driveways, paths, patios, etc., that are constructed of approved water-permeable materials will be exempt from the lot coverage calculations of subsections (B)(1) through (4) of this section and the underlying zone.

6. Table showing development allowed by land classification:

	Development Allowed
Non-HCA ("a")	*Yes*
Low-Medium HCA ("b" and "c")	*Yes, if less than 5,000 sq. ft. of non-HCA land available. Avoid "d."*
High HCA ("d")	*Yes, but only if less than 5,000 sq. ft. of "a," "b" and "c" land available.*
Non-conforming Structures (structures on HCA land)	*Yes: vertically, laterally and/or away from river.* *Avoid "d" where possible.*

(The underlying zone FAR and allowable lot coverage shall also apply.)

Applicant Response: This section (B) is not applicable. The Applicant's proposal does not include single-family or attached residential development.

C. <u>Setbacks from top of bank</u>.

1. Development of single-family homes or attached housing on lands designated as "Habitat and Impact Areas Not Designated as HCAs" shall require a structural setback of 15 feet from any top of bank that represents the edge of the land designated as "Habitat and Impact Areas Not Designated as HCAs."

2. At-grade water-permeable patios or decks within 30 inches of grade may encroach into that setback but must keep five feet from top of bank and cannot cantilever over the top of bank or into the five-foot setback area.

3. For properties that lack a distinct top of bank the applicant shall identify the boundary of the area designated as "Habitat and Impact Areas Not Designated as HCAs" which is closest to the river. A structural setback of 15 feet is required from that boundary line. That 15-foot measurement extends from the boundary line away from the river. At-grade water-permeable patios or decks within 30 inches of grade may encroach into that setback 10 feet but must keep five feet from the boundary and cannot cantilever into the five-foot setback area. For vacant lots of record that comprise no lands with "Habitat and Impact Areas Not Designated as HCAs" designation or insufficient lands with those designations so that the above setbacks cannot be

met, the house shall be set back as far from river as possible to accommodate house as part of the allowed 5,000 square feet of impermeable surfaces.
Applicant Response: This section is not applicable. The Applicant's proposal does not include single-family or attached residential development, or patios or decks.

D. <u>Development of lands designated for industrial, commercial, office, public and other non-residential uses</u>.

1. Development of lands designated for industrial, multi-family, mixed use, commercial, office, public and other non-single-family residential uses shall be permitted on the following land designations and in the following order of preference with "a" being the most appropriate for development and "d" being the least appropriate:

a "Habitat and Impact Areas Not Designated as HCAs"

b Low HCA

c Moderate HCA

d High HCA

Applicant Response: Table 1 below shows the breakdown of proposed development within a, b, c, and d lands, showing that permanent impacts were avoided or minimized to the extent feasible to the High HCA designated areas in accordance with the preferred order of development. Permanent impacts to HCAs are only proposed in two areas, along I-205 NB near 10th Street (HCA 1) and under the Abernethy Bridge (HCA 4). HCA 2 and HCA 3 do not have proposed permanent impacts to the HCA itself; impacts are proposed to the Habitat and Impact Areas Not Designated as HCAs. See Attachment M, HCA Impacts for areas of proposed permanent impacts in HCAs and non-HCAs.

Table 1. Proposed development on a-d designated lands

HCA #	"a" lands		"b" lands		"c" lands		"d" lands	
	Temp.	**Perm.**	**Temp.**	**Perm.**	**Temp.**	**Perm.**	**Temp.**	**Perm.**
1	23,967 sq. ft.	75,322 sq. ft.	3,760 sq. ft.	10,726 sq. ft.	0	0	0	0
2	5,559 sq. ft.	27,922 sq. ft.	0	0	0	0	0	0
3	4,026 sq. ft.	20,096 sq. ft.	0	0	0	0	0	0
4	520 sq. ft.	12,370 sq. ft.	0	0	44,602 sq. ft.	9,975 sq. ft.	199,340 sq. ft.	1,425 sq. ft.
Total	**34,072 sq. ft.**	**135,710 sq. ft**	**3,760 sq. ft.**	**10,726 sq. ft.**	**44,602 sq. ft.**	**9,975 sq. ft.**	**199,340 sq. ft.**	**1,425 sq. ft.**

2. <u>Developing HCA land</u>.

a. Where non-HCA or areas designated as "Habitat and Impact Areas Not Designated as HCAs" are lacking or are in such limited supply as to render uses allowed by the underlying zone (e.g., general industrial) functionally impractical, the HCA may be utilized and built upon but shall emphasize "b" and "c" designations.

Applicant Response: The Applicant will utilize "b" and "c" designations in areas without non-HCAs or areas designated as Habitat and Impact Areas Not Designated as HCAs (See Attachment M, HCA Impacts). Unavoidable proposed permanent impacts to "b" and "c" designations are along the I-205 corridor in HCA 1 and under the Abernethy Bridge in HCA 4.

b. Where it is proposed that a "d" or high HCA classification be used, the property owner must demonstrate that the proposed use is clearly a water-dependent use. Proximity to the river for the purpose of views is not valid grounds. However, public interpretive facilities of historic facilities such as the government locks will be permitted as well as wildlife interpretive facilities and ADA-accessible platforms.

Applicant Response: Development is proposed in areas classified as high HCA under the Abernethy Bridge in HCA 4. The proposed work includes replacing the existing bridge supports to provide a seismically stable Abernethy Bridge able to withstand the Cascadia Subduction Zone earthquake. The Abernethy Bridge will carry the I-205 lifeline traffic over the Willamette River and McLoughlin Creek after the earthquake allowing for emergency response and a more speedy recovery of the critical infrastructure within the region. The project was designed to have the least impact possible to HCAs, but some impacts are required in order to meet the project's objective.

All other proposed impacts to HCAs are within a, b, or c classifications along the I-205 corridor. See Attachment M for proposed HCA impacts.

E. *Hardship provisions and non-conforming structures.*

1. For the purpose of this chapter, non-conforming structures are existing structures whose building footprint is completely or partially on HCA lands. Any additions, alterations, replacement, or rehabilitation of existing non-conforming non-water-related structures (including decks), roadways, driveways, accessory uses and accessory structures shall avoid encroachment upon the HCAs, especially high HCAs, except that:

a. A 10-foot lateral extension of an existing building footprint is allowed if the lateral extension does not encroach any further into the HCA or closer to the river or water resource area than the portion of the existing footprint immediately adjacent.

Applicant Response: No building extensions are proposed.

b. An addition to the existing structure on the side of the structure opposite to the river or water resource area shall be allowed. There will be no square footage limitation in this direction except as described in subsection (E)(1)(c) of this section.

Applicant Response: No additions to structures are proposed. The Abernethy Bridge has several piers located within multiple HCA designations, and those piers must be replaced or upgraded to allow the bridge to withstand the anticipated earthquake. The replacement of these piers will result in permanent impacts to HCA 4.

c. The same allowance for the use of, and construction of, 5,000 square feet of total impervious surface for sites in HCAs per subsections (B)(2) through (4) of this section shall apply to lots in this section.

Applicant Response: No impervious surfaces are proposed in HCAs, only excavation, fill, and bridge piers are proposed as permanent impacts to HCAs.

d. Vertical additions are permitted including the construction of additional floors.

Applicant Response: No construction of additional floors is proposed.

e. The provisions of Chapter 66 CDC, Non-conforming Structures, shall not apply.

Applicant Response: The Applicant acknowledges that CDC Chapter 66 do not apply.

F. Access and property rights.

1. Private lands within the protection area shall be recognized and respected.

Applicant Response: The Applicant's proposal does not include private lands.

2. Where a legal public access to the river or elsewhere in the protection area exists, that legal public right shall be recognized and respected.

Applicant Response: All areas of public access in the protection area will be recognized and respected.

3. To construct a water-dependent structure such as a dock, ramp, or gangway shall require that all pre-existing legal public access or similar legal rights in the protection area be recognized and *respected. Where pre-existing legal public access, such as below the OLW, is to be obstructed by, for example, a ramp, the applicant shall provide a reasonable alternate route around, over or under the obstruction. The alternate route shall be as direct as possible. The proposed route, to include appropriate height clearances under ramps/docks and specifications for safe passage over or around ramps and docks, shall be reviewed and approved by the Planning Director for adequacy.*

Applicant Response: No water-dependent structures are proposed.

4. Any public or private water-dependent use or facility shall be within established DSL-authorized areas.

Applicant Response: No water-dependent uses or facilities are proposed.

5. Legal access to, and along, the riverfront in single-family residential zoned areas shall be encouraged and pursued especially when there are reasonable expectations that a continuous trail system can be facilitated. The City recognizes the potential need for compensation where nexus and proportionality tests are not met. Fee simple ownership by the City shall be preferred. The trail should be dimensioned and designed appropriate to the terrain it traverses and the user group(s) it can reasonably expect to attract. The City shall be responsible for signing the trail and delineating the boundary between private and public lands or access easements.

Applicant Response: The Applicant does not propose to restrict access to the riverfront.

G. <u>Incentives to encourage access in industrial, multi-family, mixed use, commercial, office, public and non-single-family residential zoned areas</u>.

1. For all industrial, multi-family, mixed use, commercial, office, public and other non-single-family residential zones, this section encourages the dedication or establishment of access easements to allow legal public access to, and along, the river. Support for access may be found in the Parks Master Plan, a neighborhood plan or any applicable adopted sub-area plans. The emphasis will be upon locating paths where there is a reasonable expectation that the path can be extended to adjacent properties to form a connective trail system in the future, and/or where the trail will provide opportunities for appreciation of, and access to, the river.

Applicant Response: The Applicant's proposal is intended to improve the safety and reliability of vehicular travel on I-205, and is not a development that would impede or enhance river access. Although there is no formal designated trail, the ODOT right-of-way under the Abernethy Bridge is utilized as a connection between the McLean House and Park and West Bridge Park. Trail connectivity will be maintained during and after construction of the project.

2. Height or density incentives may be available to developers who provide public access. Specifically, commercial, industrial, multi-family, mixed use, and public projects may be constructed to a height of 60 feet. No variance is required for the 60-foot height allowance regardless of the underlying zone height limitations; however, the following conditions must be met:

a. Provide a minimum 20-foot-wide all-weather public access path along the project's entire river frontage (reduced dimensions would only be permitted in response to physical site constraints such as rock outcroppings, significant trees, etc.); and *b. Provide a minimum 10-foot-wide all-weather public access path from an existing public right-of-way to that riverfront path or connect the riverfront path to an existing riverfront path on an adjoining property that accesses a public right-of-way.*

c. Fencing may be required near steep dropoffs or grade changes.

Applicant Response: The applicant is not seeking height or density incentives to upgrade the seismic resiliency and mobility of the I-205 corridor.

H. Partitions, subdivisions and incentives.

1. When dividing a property into lots or parcels, an applicant shall verify the boundaries of the HCA on the property.

2. Applicant shall partition or subdivide the site so that all lots or parcels have a buildable site or envelope available for home construction located on non-HCA land or areas designated "Habitat and Impact Areas Not Designated as HCAs" per the HCA Map.

3. Development of HCA-dominated lands shall be undertaken as a last resort. A planned unit development (PUD) of Chapter 24 CDC may be required.

4. Incentives are available to encourage provision of public access to, and/or along, the river. By these means, planned unit developments shall be able to satisfy the shared outdoor recreation area requirements of CDC 55.100(F). Specifically, for every square foot of riverfront path, the applicant will receive credit for two square feet in calculating the required shared outdoor recreation area square footage. Applicants shall also be eligible for a density bonus under CDC 24.150(B). To be eligible to receive either of these incentives, applicants shall:

a. Provide a minimum 20-foot-wide all-weather public access path along the project's entire river frontage (reduced dimensions would only be permitted in response to physical site constraints such as rock outcroppings, significant trees, etc.); and

b. Provide a minimum 10-foot-wide all-weather public access path from an existing public right-of-way to that riverfront path or connect the riverfront path to an existing riverfront path on an adjoining property that accesses a public right-of-way;

c. Fencing may be required near steep dropoffs or grade changes.

Applicant Response: The Applicant does not propose partition or subdivide any properties and therefore does not seek any incentives to do so. Work will be completed within State or City right-of-way.

I. Docks and other water-dependent structures.

1. Once the preference rights area is established by DSL, the property owner identifies where the water-dependent use will be located within the authorized portion of the preference rights area. The water-dependent use should be centered or in the middle of the preference rights/authorized area or meet the side yard setbacks of the underlying zone.

Private and public non-commercial docks are permitted where dredging is required so long as all applicable federal and State permits are obtained. Dredging is encouraged if deposits silt up under an existing dock. Dredging is seen as preferable to the construction of longer docks/ramps.

2. Both joint and single use docks shall not extend into the water any further than necessary to provide four feet between the ship's keel or fixed propeller/rudder and the bottom of the water at any time during the water's lowest point.

3. In no case except as provided in this section shall a private ramp and private dock extend more than 100 feet from OLW towards the center of the river or slough. In the case of L-shaped docks, the 100 feet shall be measured from the OLW to the furthest part of the private dock closest to the center of the river.

4. Docks on sloughs and similar channels shall not extend more than 30 percent of the distance between two land masses at OHW, such as between the mainland and an island or peninsula, measured in a lineal manner at right angle to the dominant shoreline. In no way shall a dock impede existing public usage or block navigation of a channel.

5. Boat storage associated with a rail launch facility shall be located above the OHW, either vertically raised above the ordinary high water line or set back behind the OHW. Such boat storage structure will be natural wood colors or similar earth tones. Private railed launch facilities are permitted for individual boat owners. The onshore setback of the storage structure is equal distance on both sides as extended perpendicular to the thread of the stream, or seven and one-half feet, whichever is the greater setback.

6. The width of each deck section shall be no more than 12 feet wide.

7. For only single-user and joint-user docks, pilings shall not exceed a maximum height of eight feet above the 100-year flood elevation.

8. A single user non-commercial dock shall not exceed 400 square feet in deck area. The boat slip is not included in the calculation of this square footage limitation.

9. Private non-commercial boat houses are allowed but only if they are within 50 feet of OLW and/or in locations sufficiently screened from view so that they do not have a significant visual impact on views from adjacent and nearby homes. Building and roof colors shall be brown, gray, beige, natural or similar earth tones. Non-commercial boat houses shall not exceed 12 feet in height measured from the boat house deck level to the roof peak. The size of the boat house shall be sized to accommodate one boat only and shall not exceed a footprint greater than 500 square feet. Boatlifts are permitted within the boat house. The above provisions also apply to open-walled boat shelters with or without boatlifts.

Applicant Response: No dock or other water-dependent structures are proposed. This section (I) does not apply to the proposed Project.

J. <u>Joint docks</u>.

1. Joint use boat docks may be permitted by the reviewing authority where the applicants are riverfront property owners, ideally owners of adjacent lots of record.
2. Co-owners of the joint dock use shall be prohibited from having their own non-joint dock.

3. A joint use agreement shall be prepared which will be included in the application for review by the reviewing authority and subsequently recorded. A copy of the recorded document with the County Recorder's stamp shall be submitted to the City.
4. A condition of approval for any joint use permit shall be that the dock must be used to serve the same lots of record for which the dock permit was issued. Joint use cannot be transferred to, or used by, any party other than the original applicants or the future owners of those properties.
5. Joint docks may go on the common property line between the two landowners who are sharing the dock. Unless agreed to by the adjoining owner, joint docks not being shared with the adjacent property owner must be at least 15 feet from the preference rights area side lines or centered in the middle of the preference rights area.
Applicant Response: No joint docks are proposed. This section does not apply to the proposed Project.

K. Non-conforming docks and other water-related structures. Pre-existing non-conforming structures, including docks, ramps, boat houses, etc., as defined in this chapter may remain in place. Replacement in kind (e.g., replacement of decking and other materials) will be allowed provided the replacement meets the standards of this chapter. However, if any non-conforming structure that is damaged and destroyed or otherwise to be replaced to the extent that the rebuilding or replacing (including replacement in kind) would exceed 50 percent of the current replacement cost of the entire structure, the owner shall be required to meet all the standards of this chapter.
Applicant Response: No work is proposed to any pre-existing non-conforming docks or other water-related structures.

L. Roads, driveways, utilities, or passive use recreation facilities. Roads, driveways, utilities, public paths, or passive use recreation facilities may be built in those portions of HCAs that include wetlands, riparian areas, and water resource areas when no other practical alternative exists but shall use water-permeable materials unless City engineering standards do not allow that. Construction to the minimum dimensional standards for roads is required. Full mitigation and revegetation is required, with the applicant to submit a mitigation plan pursuant to CDC 32.070 and a revegetation plan pursuant to CDC 32.080. The maximum disturbance width for utility corridors is as follows:

1. For utility facility connections to utility facilities, no greater than 10 feet wide.
Applicant Response: No utility facility connections to utility facilities are proposed.

2. For upgrade of existing utility facilities, no greater than 15 feet wide.
Applicant Response: No upgrades of existing utility facilities are proposed.

3. For new underground utility facilities, no greater than 25 feet wide, and disturbance of no more than 200 linear feet of water quality resource area, or 20 percent of the total linear feet of water quality resource area, whichever is greater.
Applicant Response: No new underground utility facilities are proposed.

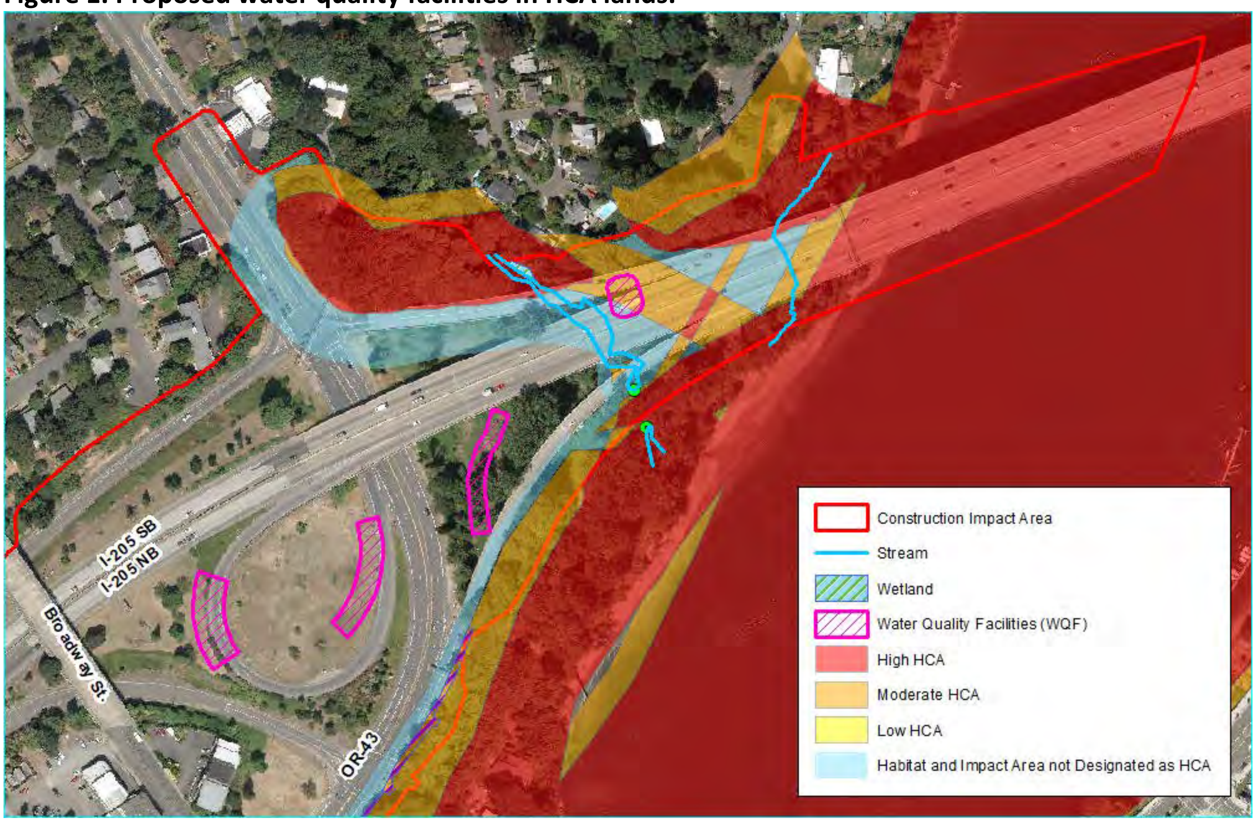
M. Structures. All buildings and structures in HCAs and riparian areas, including all exterior mechanical equipment, should be screened, colored, or surfaced so as to blend with the riparian environment. Surfaces shall be non-polished/reflective or at least expected to lose their luster within a year. In addition to the specific standards and criteria applicable to water-dependent uses (docks), all other provisions of *this chapter shall apply to water dependent uses, and any structure shall be no larger than necessary to accommodate the use.*

Applicant Response: The only structures proposed in HCAs and riparian areas are supports for the Abernethy Bridge, which will match the existing structure to maintain the same visual quality as currently exists.

N. <u>Water-permeable materials for hardscapes</u>. The use of water-permeable materials for parking lots, driveways, patios, and paths as well as flow-through planters, box filters, bioswales and drought tolerant plants are strongly encouraged in all "a" and "b" land classifications and shall be required in all "c" and "d" land classifications. The only exception in the "c" and "d" classifications would be where it is demonstrated that water-permeable driveways/hardscapes could not structurally support the axle weight of vehicles or equipment/storage load using those areas. Flow through planters, box filters, bioswales, drought tolerant plants and other measures of treating and/or detaining runoff would still be required in these areas.

Applicant Response: No impervious parking lots, driveways, patios, or paths are proposed in HCAs. All impervious surfaces created from the project will be treated. A water quality swale is proposed in HCA 4 that will capture and treat runoff from the project area. It is located mostly in "c" lands with a small portion that falls within "a" lands (see Figure 1 below).

Figure 1. Proposed water quality facilities in HCA lands.



O. <u>Signs and graphics</u>. No sign or graphic display inconsistent with the purposes of the protection area shall have a display surface oriented toward or visible from the Willamette or Tualatin River. A limited number of signs may be allowed to direct public access along legal routes in the protection area.

Applicant Response: Several signs are proposed to be installed in the protection area, however, the intent of the signs is to direct public access along I-205 and are required for safety. The proposed signed will be located along I-205 and will be consistent with the existing aesthetic corridor feel. In accordance with FHWA design standards, approximately 11 signs are proposed on the Abernethy Bridge, which may be visible from the Willamette River. See Attachment X, Signing Plan.

P. Lighting. Lighting shall not be focused or oriented onto the surface of the river except as required by the Coast Guard. Lighting elsewhere in the protection area shall be the minimum necessary and shall not create off-site glare or be omni-directional. Screens and covers will be required.

Applicant Response: No lighting is proposed to be focused or oriented onto the surface of the river.

Q. Parking. Parking and unenclosed storage areas located within or adjacent to the protection area boundary shall be screened from the river in accordance with Chapter 46 CDC, Off-Street Parking, Loading and Reservoir Areas. The use of water-permeable material to construct the parking lot is either encouraged or required depending on HCA classification per CDC 28.110(N)(4).

Applicant Response: No parking lots or storage areas are proposed.

R. Views. Significant views of the Willamette and Tualatin Rivers shall be protected as much as possible as seen from the following public viewpoints: Mary S. Young Park, Willamette Park, Cedar Oak Park, Burnside Park, Maddox Park, Cedar Island, the Oregon City Bridge, Willamette Park, and Fields Bridge Park.

Where options exist in the placement of ramps and docks, the applicant shall select the least visually intrusive location as seen from a public viewpoint. However, if no options exist, then the ramp, pilings and dock shall be allowed at the originally proposed location.

Applicant Response: Views of the Willamette River will be protected to the extent possible while still meeting project objectives, which includes seismically retrofitting the Abernethy Bridge. The proposed replacement bridge piers have been designed to be visually consistent with the existing bridge. No proposed work from the project will affect the Tualatin River or its views.

S. Aggregate deposits. Extraction of aggregate deposits or dredging shall be conducted in a manner designed to minimize adverse effects on water quality, fish and wildlife, vegetation, bank stabilization, stream flow, visual quality, noise and safety, and to promote necessary reclamation.

Applicant Response: No extraction of aggregate deposits is proposed. The retrofit of the Abernethy Bridge will require excavation in the Willamette River. Removal and fill activities in the river have been designed to have the least amount of impact possible to water quality, fish and wildlife, vegetation, bank stabilization, and streamflow. The applicant consulted with the National Marine Fisheries Service (NMFS) and the Oregon Department of Fish and Wildlife (ODFW) regarding proposed impacts that may affect water quality, fish and wildlife habitat, and vegetation (Attachment U, NMFS Consultation). Several mitigation measures were identified to be implemented during construction. In-water work will be conducted during the in-water work window to reduce potential impacts to aquatic species. Best management practices will be implemented to prevent water quality impacts such as sedimentation and turbidity during excavation, including the use of cofferdams and erosion control measures. The existing piers will be cut off below the mud line to avoid and minimize potential effects to natural fluvial geomorphic processes. Vegetation removed on the bank for construction access will be restored after construction is complete.

T. *<u>Changing the landscape/grading</u>.*

1. Existing predominant topographical features of the bank line and escarpment shall be preserved and maintained except for disturbance necessary for the construction or establishment of a water related or water dependent use. Measures necessary to reduce potential bank and escarpment erosion, landslides, or flood hazard conditions shall also be taken.

Any construction to stabilize or protect the bank with rip rap, gabions, etc., shall only be allowed where there is clear evidence of erosion or similar hazard and shall be the minimum needed to stop that erosion or to avoid a specific and identifiable hazard. A geotechnical engineer's stamped report shall accompany the application with evidence to support the proposal.
Applicant Response: Riprap is not proposed within the ordinary high water or along the banks of the Willamette River, following replacement of the in-water shafts. See Attachment O for the Geotechnical Report.

2. The applicant shall establish to the satisfaction of the approval authority that steps have been taken to minimize the impact of the proposal on the riparian environment (areas between the top of the bank and the low water mark of the river including lower terrace, beach and river edge).
Applicant Response: The project has been designed to have the least impact possible to riparian areas. In areas where proposed work could not be avoided or minimized, mitigation through revegetation is proposed. Work in riparian areas includes replacement and upgrades of bridge columns, including excavation, fill, and foundation stabilization. Jet grouting is proposed around the pier footings to meet seismic criteria. The combination of these activities requires large areas of excavation at each foundation. Construction access and staging are needed for large equipment and concrete trucks to access the repair sites. After construction is complete, temporary access and staging areas will be restored at grade and revegetated. Areas of permanent impact, including the foundation impacts, will be mitigated according to CDC 32.100.

3. The applicant shall demonstrate that stabilization measures shall not cause subsequent erosion or deposits on upstream or downstream properties.
Applicant Response: The proposed work will not cause erosion or deposits on upstream or downstream properties. See Attachment O for the Geotechnical Report.

4. Prior to any grading or development, that portion of the HCA that includes wetlands, creeks, riparian areas and water resource area shall be protected with an anchored chain link fence (or approved equivalent) at its perimeter and shall remain undisturbed except as specifically allowed by an approved Willamette and Tualatin River Protection and/or water resource area (WRA) permit. Such fencing shall be maintained until construction is complete. That portion of the HCA that includes wetlands, creeks, riparian areas and water resource area shall be identified with City-approved permanent markers at all boundary direction changes and at 30- to 50-foot intervals that clearly delineate the extent of the protected area.
Applicant Response: Areas of HCAs that include wetlands, creeks, and riparian areas that are not to be impacted by the project will be fenced off and marked along the orange construction fencing. Fencing will be maintained for the duration of the project.

5. Full erosion control measures shall be in place and approved by the City Engineer prior to any grading, development or site clearing.

Applicant Response: An Erosion and Sediment Control Plan (Attachment Z) has been developed and will be implemented prior to any grading, development, or site clearing. The Erosion and Sediment control plan has been developed in accordance with ODOT's NPDES 1200-CA permit issued by ODEQ.

U. Protect riparian and adjacent vegetation. Vegetative ground cover and trees upon the site shall be preserved, conserved, and maintained according to the following provisions:

1. Riparian vegetation below OHW removed during development shall be replaced with indigenous vegetation, which shall be compatible with and enhance the riparian environment and approved by the approval authority as part of the application.

Applicant Response: A revegetation plan (Attachment W) and a Mitigation Plan (Attachment K) have been developed that would restore functions of riparian vegetation removed during development.

2. Vegetative improvements to areas within the protection area may be required if the site is found to be in an unhealthy or disturbed state by the City Arborist or his or her designated expert. "Unhealthy or disturbed" includes those sites that have a combination of native trees, shrubs, and groundcover on less than 80 percent of the water resource area and less than 50 percent tree canopy coverage in the primary and secondary habitat conservation area to be preserved. "Vegetative improvements" will be documented by submitting a revegetation plan meeting CDC 28.160 criteria that will result in the primary and secondary habitat conservation area to be preserved having a combination of native trees, shrubs, and groundcover on more than 80 percent of its area, and more than 50 percent tree canopy coverage in its area. The vegetative improvements shall be guaranteed for survival for a minimum of two years. Once approved, the applicant is responsible for implementing the plan prior to final inspection.

Applicant Response: The City Arborist has not designated any vegetative improvements in the project.

3. Tree cutting shall be prohibited in the protection area except that:

a. Diseased trees or trees in danger of falling may be removed with the City Arborist's approval; and

b. Tree cutting may be permitted in conjunction with those uses listed in CDC 28.030 with City Arborist approval; to the extent necessary to accommodate the listed uses;

c. Selective cutting in accordance with the Oregon Forest Practices Act, if applicable, shall be permitted with City Arborist approval within the area between the OHW and the greenway boundary provided the natural scenic qualities of the greenway are maintained. (Ord. 1576, 2008; Ord. 1590 § 1, 2009; Ord. 1604 §§ 29 – 36, 2011; amended during July 2014 supplement; Ord. 1635 § 17, 2014; Ord. 1636 § 27, 2014)

Applicant Response: Tree removal is proposed under the Abernethy Bridge along the Willamette River. See Attachment T for a map of proposed tree removal within the riparian area. Any trees proposed to be cut will be submitted to the City Arborist for approval prior to cutting.

Chapter 28 Willamette and Tualatin River Protection

28.110 APPROVAL CRITERIA

No application for development on property within the protection area shall be approved unless the decision-making authority finds that the following standards have been met or can be met by conditions of approval. The development shall comply with the following criteria as applicable:

A. Development: All sites.

1. Sites shall first be reviewed using the HCA Map to determine if the site is buildable or what portion of the site is buildable. HCAs shall be verified by the Planning Director per CDC 28.070 and site visit. Also, "tree canopy only" HCAs shall not constitute a development limitation and may be exempted per CDC 28.070(A). The municipal code protection for trees and Chapters 55 and 85 CDC tree protection shall still apply.

Applicant Response: The applicant reviewed the HCA Map determined where HCAs exist within the project area. There are multiple HCAs within the project area, including low and high designations, as well as habitat and impact areas not designated as HCA (Attachment J). Some of the HCAs in the project area have mapping errors, which the applicant has created an HCA Map Amendment Narrative (Attachment L) documenting the errors.

2. HCAs shall be avoided to the greatest degree possible and development activity shall instead be directed to the areas designated "Habitat and Impact Areas Not Designated as HCAs," consistent with subsection (A)(3) of this section.

Applicant Response: The project was designed to have the least possible impact on HCAs by avoiding and minimizing development activities in HCAs to the extent possible. Given the proximity of HCAs to the I-205 corridor and the Abernethy Bridge, some impacts from the proposed project were unavoidable if the purpose and need of the project is to be met. The purpose of the project is to improve traffic safety, relieve traffic congestion within the corridor, and provide an earthquake resilient route capable of being operational after a Cascadia seismic event. ODOT designated I-205 as a Phase 1 statewide north-south lifeline route, which means it must be operational quickly after a disaster renders other roadways unusable or impassable. To reduce congestion, an additional lane will be added in each direction contiguous with the existing lanes, thereby making some impacts to those HCAs located near roadways unavoidable. See applicant responses to D.1, D.2, and S below.

3. If the subject property contains no lands designated "Habitat and Impact Areas Not Designated as HCAs" and development within HCA land is the only option it shall be directed towards the low HCA areas first, then medium HCA areas and then to high HCA as the last choice. The goal is to, at best, avoid or, at least, minimize disturbance of the HCAs. (Water-dependent uses are exempt from this provision.)

Applicant Response: Where development activities in HCAs cannot be avoided, impacts were minimized to the extent possible by designing the project to disturb "low" HCAs before "high" HCAs. Only one area of proposed work is within a "high" HCA, which is the area underneath the Abernethy Bridge directly west of the Willamette River. No feasible options were available that would avoid the high HCA and seismically upgrade the Abernethy Bridge which requires modifications to the substructure. See Table 1 in applicant response to D.1 below.

4. All development, including exempted activities of CDC 28.040, shall have approved erosion control measures per Clackamas County Erosion Prevention and Sediment Control Planning and Design Manual, rev. 2008, in place prior to site disturbance and be subject to the requirements of CDC 32.070 and 32.080 as deemed applicable by the Planning Director.
Applicant Response: The Applicant has prepared an Erosion and Sediment Control Plan that includes erosion control measures per Clackamas County Erosion Prevention and Sediment Control Planning and Design Manual, rev. 2008, which meets the requirements of CDC 32.070 and 32.080 (See Attachment Z).

B. Single-family or attached residential. Development of single-family homes or attached housing shall be permitted on the following HCA designations and in the following order of preference with "a" being the most appropriate and "d" being the least appropriate:

a "Habitat and Impact Areas Not Designated as HCAs"

b Low HCA

c Moderate HCA

d High HCA

1. Development of land classifications in "b," "c" and "d" shall not be permitted if at least a 5,000-square-foot area of buildable land ("a") exists for home construction, and associated impermeable surfaces (driveways, patios, etc.).
2. If 5,000 square feet of buildable land ("a") are not available for home construction, and associated impermeable surfaces (driveways, patios, etc.) then combinations of land classifications ("a," "b" and "c") totaling a maximum of 5,000 square feet shall be used to avoid intrusion into high HCA lands. Development shall emphasize area "a" prior to extending construction into area "b," then "c" lands.
3. The underlying zone FAR shall also apply as well as allowable lot coverage.
4. Development may occur on legal lots and non-conforming lots of record located completely within the HCA areas or that have the majority of the lot in the HCA to the extent that the applicant has less than 5,000 square feet of non-HCA land.

Development shall disturb the minimum necessary area to allow the proposed use or activity, shall direct development to any available non-HCA lands and in any situation shall create no more than 5,000 square feet of impervious surface. (Driveways, paths, patios, etc., that are constructed of approved water-permeable materials will not count in calculating the 5,000-square-foot lot coverage.) The underlying zone FAR and allowable lot coverage shall also apply and may result in less than 5,000 square feet of lot coverage.

When only HCA land is available then the structure shall be placed as far away from the water resource area or river as possible. To facilitate this, the front setback of the structure or that side which is furthest away from the water resource or river may be reduced to a five-foot setback from the front property line without a variance. Any attached garage must provide a 20-foot by 20-foot *parking pad or driveway so as to provide off-street parking exclusive of the garage. The setbacks of subsection C of this section shall still apply.*

5. Driveways, paths, patios, etc., that are constructed of approved water-permeable materials will be exempt from the lot coverage calculations of subsections (B)(1) through (4) of this section and the underlying zone.

6. Table showing development allowed by land classification:

	Development Allowed
Non-HCA ("a")	*Yes*
Low-Medium HCA ("b" and "c")	*Yes, if less than 5,000 sq. ft. of non-HCA land available. Avoid "d."*
High HCA ("d")	*Yes, but only if less than 5,000 sq. ft. of "a," "b" and "c" land available.*
Non-conforming Structures (structures on HCA land)	*Yes: vertically, laterally and/or away from river.* *Avoid "d" where possible.*

(The underlying zone FAR and allowable lot coverage shall also apply.)

Applicant Response: This section (B) is not applicable. The Applicant's proposal does not include single-family or attached residential development.

C. <u>Setbacks from top of bank</u>.

1. Development of single-family homes or attached housing on lands designated as "Habitat and Impact Areas Not Designated as HCAs" shall require a structural setback of 15 feet from any top of bank that represents the edge of the land designated as "Habitat and Impact Areas Not Designated as HCAs."

2. At-grade water-permeable patios or decks within 30 inches of grade may encroach into that setback but must keep five feet from top of bank and cannot cantilever over the top of bank or into the five-foot setback area.

3. For properties that lack a distinct top of bank the applicant shall identify the boundary of the area designated as "Habitat and Impact Areas Not Designated as HCAs" which is closest to the river. A structural setback of 15 feet is required from that boundary line. That 15-foot measurement extends from the boundary line away from the river. At-grade water-permeable patios or decks within 30 inches of grade may encroach into that setback 10 feet but must keep five feet from the boundary and cannot cantilever into the five-foot setback area. For vacant lots of record that comprise no lands with "Habitat and Impact Areas Not Designated as HCAs" designation or insufficient lands with those designations so that the above setbacks cannot be

met, the house shall be set back as far from river as possible to accommodate house as part of the allowed 5,000 square feet of impermeable surfaces.
Applicant Response: This section is not applicable. The Applicant's proposal does not include single-family or attached residential development, or patios or decks.

D. <u>Development of lands designated for industrial, commercial, office, public and other non-residential uses</u>.

1. Development of lands designated for industrial, multi-family, mixed use, commercial, office, public and other non-single-family residential uses shall be permitted on the following land designations and in the following order of preference with "a" being the most appropriate for development and "d" being the least appropriate:

a "Habitat and Impact Areas Not Designated as HCAs"

b Low HCA

c Moderate HCA

d High HCA

Applicant Response: Table 1 below shows the breakdown of proposed development within a, b, c, and d lands, showing that permanent impacts were avoided or minimized to the extent feasible to the High HCA designated areas in accordance with the preferred order of development. Permanent impacts to HCAs are only proposed in two areas, along I-205 NB near 10th Street (HCA 1) and under the Abernethy Bridge (HCA 4). HCA 2 and HCA 3 do not have proposed permanent impacts to the HCA itself; impacts are proposed to the Habitat and Impact Areas Not Designated as HCAs. See Attachment M, HCA Impacts for areas of proposed permanent impacts in HCAs and non-HCAs.

Table 1. Proposed development on a-d designated lands

HCA #	"a" lands		"b" lands		"c" lands		"d" lands	
	Temp.	**Perm.**	**Temp.**	**Perm.**	**Temp.**	**Perm.**	**Temp.**	**Perm.**
1	23,967 sq. ft.	75,322 sq. ft.	3,760 sq. ft.	10,726 sq. ft.	0	0	0	0
2	5,559 sq. ft.	27,922 sq. ft.	0	0	0	0	0	0
3	4,026 sq. ft.	20,096 sq. ft.	0	0	0	0	0	0
4	520 sq. ft.	12,370 sq. ft.	0	0	44,602 sq. ft.	9,975 sq. ft.	199,340 sq. ft.	1,425 sq. ft.
Total	**34,072 sq. ft.**	**135,710 sq. ft**	**3,760 sq. ft.**	**10,726 sq. ft.**	**44,602 sq. ft.**	**9,975 sq. ft.**	**199,340 sq. ft.**	**1,425 sq. ft.**

2. *Developing HCA land.*

a. *Where non-HCA or areas designated as "Habitat and Impact Areas Not Designated as HCAs" are lacking or are in such limited supply as to render uses allowed by the underlying zone (e.g., general industrial) functionally impractical, the HCA may be utilized and built upon but shall emphasize "b" and "c" designations.*

Applicant Response: The Applicant will utilize "b" and "c" designations in areas without non-HCAs or areas designated as Habitat and Impact Areas Not Designated as HCAs (See Attachment M, HCA Impacts). Unavoidable proposed permanent impacts to "b" and "c" designations are along the I-205 corridor in HCA 1 and under the Abernethy Bridge in HCA 4.

b. *Where it is proposed that a "d" or high HCA classification be used, the property owner must demonstrate that the proposed use is clearly a water-dependent use. Proximity to the river for the purpose of views is not valid grounds. However, public interpretive facilities of historic facilities such as the government locks will be permitted as well as wildlife interpretive facilities and ADA-accessible platforms.*

Applicant Response: Development is proposed in areas classified as high HCA under the Abernethy Bridge in HCA 4. The proposed work includes replacing the existing bridge supports to provide a seismically stable Abernethy Bridge able to withstand the Cascadia Subduction Zone earthquake. The Abernethy Bridge will carry the I-205 lifeline traffic over the Willamette River and McLoughlin Creek after the earthquake allowing for emergency response and a more speedy recovery of the critical infrastructure within the region. The project was designed to have the least impact possible to HCAs, but some impacts are required in order to meet the project's objective.

All other proposed impacts to HCAs are within a, b, or c classifications along the I-205 corridor. See Attachment M for proposed HCA impacts.

E. *Hardship provisions and non-conforming structures.*

1. For the purpose of this chapter, non-conforming structures are existing structures whose building footprint is completely or partially on HCA lands. Any additions, alterations, replacement, or rehabilitation of existing non-conforming non-water-related structures (including decks), roadways, driveways, accessory uses and accessory structures shall avoid encroachment upon the HCAs, especially high HCAs, except that:

a. A 10-foot lateral extension of an existing building footprint is allowed if the lateral extension does not encroach any further into the HCA or closer to the river or water resource area than the portion of the existing footprint immediately adjacent.

Applicant Response: No building extensions are proposed.

b. An addition to the existing structure on the side of the structure opposite to the river or water resource area shall be allowed. There will be no square footage limitation in this direction except as described in subsection (E)(1)(c) of this section.

Applicant Response: No additions to structures are proposed. The Abernethy Bridge has several piers located within multiple HCA designations, and those piers must be replaced or upgraded to allow the bridge to withstand the anticipated earthquake. The replacement of these piers will result in permanent impacts to HCA 4.

c. The same allowance for the use of, and construction of, 5,000 square feet of total impervious surface for sites in HCAs per subsections (B)(2) through (4) of this section shall apply to lots in this section.

Applicant Response: No impervious surfaces are proposed in HCAs, only excavation, fill, and bridge piers are proposed as permanent impacts to HCAs.

d. Vertical additions are permitted including the construction of additional floors.

Applicant Response: No construction of additional floors is proposed.

e. The provisions of Chapter 66 CDC, Non-conforming Structures, shall not apply.

Applicant Response: The Applicant acknowledges that CDC Chapter 66 do not apply.

F. Access and property rights.

1. Private lands within the protection area shall be recognized and respected.

Applicant Response: The Applicant's proposal does not include private lands.

2. Where a legal public access to the river or elsewhere in the protection area exists, that legal public right shall be recognized and respected.

Applicant Response: All areas of public access in the protection area will be recognized and respected.

3. To construct a water-dependent structure such as a dock, ramp, or gangway shall require that all pre-existing legal public access or similar legal rights in the protection area be recognized and *respected. Where pre-existing legal public access, such as below the OLW, is to be obstructed by, for example, a ramp, the applicant shall provide a reasonable alternate route around, over or under the obstruction. The alternate route shall be as direct as possible. The proposed route, to include appropriate height clearances under ramps/docks and specifications for safe passage over or around ramps and docks, shall be reviewed and approved by the Planning Director for adequacy.*

Applicant Response: No water-dependent structures are proposed.

4. Any public or private water-dependent use or facility shall be within established DSL-authorized areas.

Applicant Response: No water-dependent uses or facilities are proposed.

5. Legal access to, and along, the riverfront in single-family residential zoned areas shall be encouraged and pursued especially when there are reasonable expectations that a continuous trail system can be facilitated. The City recognizes the potential need for compensation where nexus and proportionality tests are not met. Fee simple ownership by the City shall be preferred. The trail should be dimensioned and designed appropriate to the terrain it traverses and the user group(s) it can reasonably expect to attract. The City shall be responsible for signing the trail and delineating the boundary between private and public lands or access easements.

Applicant Response: The Applicant does not propose to restrict access to the riverfront.

G. <u>Incentives to encourage access in industrial, multi-family, mixed use, commercial, office, public and non-single-family residential zoned areas</u>.

1. For all industrial, multi-family, mixed use, commercial, office, public and other non-single-family residential zones, this section encourages the dedication or establishment of access easements to allow legal public access to, and along, the river. Support for access may be found in the Parks Master Plan, a neighborhood plan or any applicable adopted sub-area plans. The emphasis will be upon locating paths where there is a reasonable expectation that the path can be extended to adjacent properties to form a connective trail system in the future, and/or where the trail will provide opportunities for appreciation of, and access to, the river.

Applicant Response: The Applicant's proposal is intended to improve the safety and reliability of vehicular travel on I-205, and is not a development that would impede or enhance river access. Although there is no formal designated trail, the ODOT right-of-way under the Abernethy Bridge is utilized as a connection between the McLean House and Park and West Bridge Park. Trail connectivity will be maintained during and after construction of the project.

2. Height or density incentives may be available to developers who provide public access. Specifically, commercial, industrial, multi-family, mixed use, and public projects may be constructed to a height of 60 feet. No variance is required for the 60-foot height allowance regardless of the underlying zone height limitations; however, the following conditions must be met:

a. Provide a minimum 20-foot-wide all-weather public access path along the project's entire river frontage (reduced dimensions would only be permitted in response to physical site constraints such as rock outcroppings, significant trees, etc.); and *b. Provide a minimum 10-foot-wide all-weather public access path from an existing public right-of-way to that riverfront path or connect the riverfront path to an existing riverfront path on an adjoining property that accesses a public right-of-way.*

c. Fencing may be required near steep dropoffs or grade changes.

Applicant Response: The applicant is not seeking height or density incentives to upgrade the seismic resiliency and mobility of the I-205 corridor.

H. <u>Partitions, subdivisions and incentives</u>.

1. When dividing a property into lots or parcels, an applicant shall verify the boundaries of the HCA on the property.

2. Applicant shall partition or subdivide the site so that all lots or parcels have a buildable site or envelope available for home construction located on non-HCA land or areas designated "Habitat and Impact Areas Not Designated as HCAs" per the HCA Map.

3. Development of HCA-dominated lands shall be undertaken as a last resort. A planned unit development (PUD) of Chapter 24 CDC may be required.

4. Incentives are available to encourage provision of public access to, and/or along, the river. By these means, planned unit developments shall be able to satisfy the shared outdoor recreation area requirements of CDC 55.100(F). Specifically, for every square foot of riverfront path, the applicant will receive credit for two square feet in calculating the required shared outdoor recreation area square footage. Applicants shall also be eligible for a density bonus under CDC 24.150(B). To be eligible to receive either of these incentives, applicants shall:

a. Provide a minimum 20-foot-wide all-weather public access path along the project's entire river frontage (reduced dimensions would only be permitted in response to physical site constraints such as rock outcroppings, significant trees, etc.); and

b. Provide a minimum 10-foot-wide all-weather public access path from an existing public right-of-way to that riverfront path or connect the riverfront path to an existing riverfront path on an adjoining property that accesses a public right-of-way;

c. Fencing may be required near steep dropoffs or grade changes.

Applicant Response: The Applicant does not propose partition or subdivide any properties and therefore does not seek any incentives to do so. Work will be completed within State or City right-of-way.

I. <u>Docks and other water-dependent structures</u>.

1. Once the preference rights area is established by DSL, the property owner identifies where the water-dependent use will be located within the authorized portion of the preference rights area. The water-dependent use should be centered or in the middle of the preference rights/authorized area or meet the side yard setbacks of the underlying zone.

Private and public non-commercial docks are permitted where dredging is required so long as all applicable federal and State permits are obtained. Dredging is encouraged if deposits silt up under an existing dock. Dredging is seen as preferable to the construction of longer docks/ramps.

2. Both joint and single use docks shall not extend into the water any further than necessary to provide four feet between the ship's keel or fixed propeller/rudder and the bottom of the water at any time during the water's lowest point.

3. In no case except as provided in this section shall a private ramp and private dock extend more than 100 feet from OLW towards the center of the river or slough. In the case of L-shaped docks, the 100 feet shall be measured from the OLW to the furthest part of the private dock closest to the center of the river.

4. Docks on sloughs and similar channels shall not extend more than 30 percent of the distance between two land masses at OHW, such as between the mainland and an island or peninsula, measured in a lineal manner at right angle to the dominant shoreline. In no way shall a dock impede existing public usage or block navigation of a channel.

5. Boat storage associated with a rail launch facility shall be located above the OHW, either vertically raised above the ordinary high water line or set back behind the OHW. Such boat storage structure will be natural wood colors or similar earth tones. Private railed launch facilities are permitted for individual boat owners. The onshore setback of the storage structure is equal distance on both sides as extended perpendicular to the thread of the stream, or seven and one-half feet, whichever is the greater setback.

6. The width of each deck section shall be no more than 12 feet wide.

7. For only single-user and joint-user docks, pilings shall not exceed a maximum height of eight feet above the 100-year flood elevation.

8. A single user non-commercial dock shall not exceed 400 square feet in deck area. The boat slip is not included in the calculation of this square footage limitation.

9. Private non-commercial boat houses are allowed but only if they are within 50 feet of OLW and/or in locations sufficiently screened from view so that they do not have a significant visual impact on views from adjacent and nearby homes. Building and roof colors shall be brown, gray, beige, natural or similar earth tones. Non-commercial boat houses shall not exceed 12 feet in height measured from the boat house deck level to the roof peak. The size of the boat house shall be sized to accommodate one boat only and shall not exceed a footprint greater than 500 square feet. Boatlifts are permitted within the boat house. The above provisions also apply to open-walled boat shelters with or without boatlifts.

Applicant Response: No dock or other water-dependent structures are proposed. This section (I) does not apply to the proposed Project.

J. Joint docks.

1. Joint use boat docks may be permitted by the reviewing authority where the applicants are riverfront property owners, ideally owners of adjacent lots of record.
2. Co-owners of the joint dock use shall be prohibited from having their own non-joint dock.

3. A joint use agreement shall be prepared which will be included in the application for review by the reviewing authority and subsequently recorded. A copy of the recorded document with the County Recorder's stamp shall be submitted to the City.
4. A condition of approval for any joint use permit shall be that the dock must be used to serve the same lots of record for which the dock permit was issued. Joint use cannot be transferred to, or used by, any party other than the original applicants or the future owners of those properties.
5. Joint docks may go on the common property line between the two landowners who are sharing the dock. Unless agreed to by the adjoining owner, joint docks not being shared with the adjacent property owner must be at least 15 feet from the preference rights area side lines or centered in the middle of the preference rights area.
Applicant Response: No joint docks are proposed. This section does not apply to the proposed Project.

K. <u>Non-conforming docks and other water-related structures</u>. Pre-existing non-conforming structures, including docks, ramps, boat houses, etc., as defined in this chapter may remain in place. Replacement in kind (e.g., replacement of decking and other materials) will be allowed provided the replacement meets the standards of this chapter. However, if any non-conforming structure that is damaged and destroyed or otherwise to be replaced to the extent that the rebuilding or replacing (including replacement in kind) would exceed 50 percent of the current replacement cost of the entire structure, the owner shall be required to meet all the standards of this chapter.
Applicant Response: No work is proposed to any pre-existing non-conforming docks or other water-related structures.

L. <u>Roads, driveways, utilities, or passive use recreation facilities</u>. Roads, driveways, utilities, public paths, or passive use recreation facilities may be built in those portions of HCAs that include wetlands, riparian areas, and water resource areas when no other practical alternative exists but shall use water-permeable materials unless City engineering standards do not allow that. Construction to the minimum dimensional standards for roads is required. Full mitigation and revegetation is required, with the applicant to submit a mitigation plan pursuant to CDC <u>32.070</u> and a revegetation plan pursuant to CDC <u>32.080</u>. The maximum disturbance width for utility corridors is as follows:

1. For utility facility connections to utility facilities, no greater than 10 feet wide.
Applicant Response: No utility facility connections to utility facilities are proposed.

2. For upgrade of existing utility facilities, no greater than 15 feet wide.
Applicant Response: No upgrades of existing utility facilities are proposed.

3. For new underground utility facilities, no greater than 25 feet wide, and disturbance of no more than 200 linear feet of water quality resource area, or 20 percent of the total linear feet of water quality resource area, whichever is greater.
Applicant Response: No new underground utility facilities are proposed.

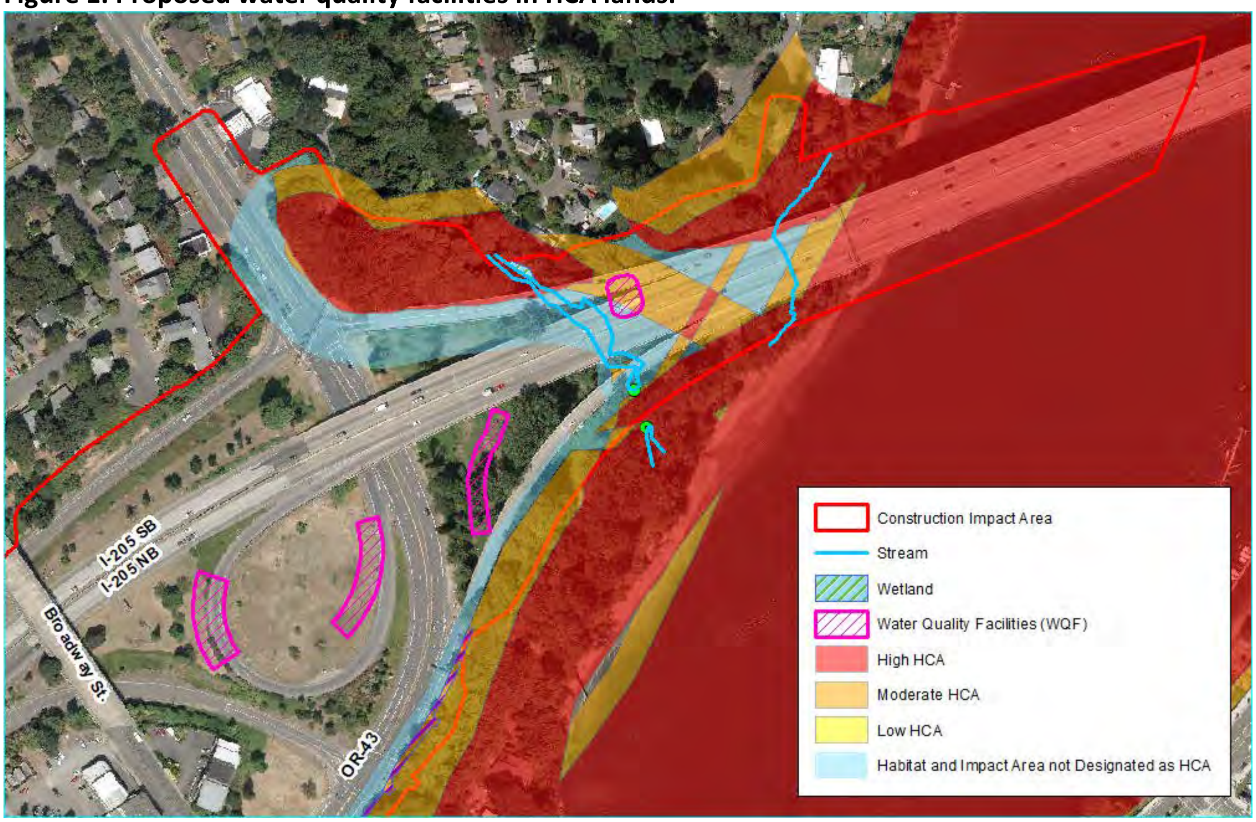
M. <u>Structures</u>. All buildings and structures in HCAs and riparian areas, including all exterior mechanical equipment, should be screened, colored, or surfaced so as to blend with the riparian environment. Surfaces shall be non-polished/reflective or at least expected to lose their luster within a year. In addition to the specific standards and criteria applicable to water-dependent uses (docks), all other provisions of *this chapter shall apply to water dependent uses, and any structure shall be no larger than necessary to accommodate the use.*

Applicant Response: The only structures proposed in HCAs and riparian areas are supports for the Abernethy Bridge, which will match the existing structure to maintain the same visual quality as currently exists.

N. <u>Water-permeable materials for hardscapes</u>. The use of water-permeable materials for parking lots, driveways, patios, and paths as well as flow-through planters, box filters, bioswales and drought tolerant plants are strongly encouraged in all "a" and "b" land classifications and shall be required in all "c" and "d" land classifications. The only exception in the "c" and "d" classifications would be where it is demonstrated that water-permeable driveways/hardscapes could not structurally support the axle weight of vehicles or equipment/storage load using those areas. Flow through planters, box filters, bioswales, drought tolerant plants and other measures of treating and/or detaining runoff would still be required in these areas.

Applicant Response: No impervious parking lots, driveways, patios, or paths are proposed in HCAs. All impervious surfaces created from the project will be treated. A water quality swale is proposed in HCA 4 that will capture and treat runoff from the project area. It is located mostly in "c" lands with a small portion that falls within "a" lands (see Figure 1 below).

Figure 1. Proposed water quality facilities in HCA lands.



O. <u>Signs and graphics</u>. No sign or graphic display inconsistent with the purposes of the protection area shall have a display surface oriented toward or visible from the Willamette or Tualatin River. A limited number of signs may be allowed to direct public access along legal routes in the protection area.

Applicant Response: Several signs are proposed to be installed in the protection area, however, the intent of the signs is to direct public access along I-205 and are required for safety. The proposed signed will be located along I-205 and will be consistent with the existing aesthetic corridor feel. In accordance with FHWA design standards, approximately 11 signs are proposed on the Abernethy Bridge, which may be visible from the Willamette River. See Attachment X, Signing Plan.

P. Lighting. Lighting shall not be focused or oriented onto the surface of the river except as required by the Coast Guard. Lighting elsewhere in the protection area shall be the minimum necessary and shall not create off-site glare or be omni-directional. Screens and covers will be required.

Applicant Response: No lighting is proposed to be focused or oriented onto the surface of the river.

Q. Parking. Parking and unenclosed storage areas located within or adjacent to the protection area boundary shall be screened from the river in accordance with Chapter 46 CDC, Off-Street Parking, Loading and Reservoir Areas. The use of water-permeable material to construct the parking lot is either encouraged or required depending on HCA classification per CDC 28.110(N)(4).

Applicant Response: No parking lots or storage areas are proposed.

R. Views. Significant views of the Willamette and Tualatin Rivers shall be protected as much as possible as seen from the following public viewpoints: Mary S. Young Park, Willamette Park, Cedar Oak Park, Burnside Park, Maddox Park, Cedar Island, the Oregon City Bridge, Willamette Park, and Fields Bridge Park.

Where options exist in the placement of ramps and docks, the applicant shall select the least visually intrusive location as seen from a public viewpoint. However, if no options exist, then the ramp, pilings and dock shall be allowed at the originally proposed location.

Applicant Response: Views of the Willamette River will be protected to the extent possible while still meeting project objectives, which includes seismically retrofitting the Abernethy Bridge. The proposed replacement bridge piers have been designed to be visually consistent with the existing bridge. No proposed work from the project will affect the Tualatin River or its views.

S. Aggregate deposits. Extraction of aggregate deposits or dredging shall be conducted in a manner designed to minimize adverse effects on water quality, fish and wildlife, vegetation, bank stabilization, stream flow, visual quality, noise and safety, and to promote necessary reclamation.

Applicant Response: No extraction of aggregate deposits is proposed. The retrofit of the Abernethy Bridge will require excavation in the Willamette River. Removal and fill activities in the river have been designed to have the least amount of impact possible to water quality, fish and wildlife, vegetation, bank stabilization, and streamflow. The applicant consulted with the National Marine Fisheries Service (NMFS) and the Oregon Department of Fish and Wildlife (ODFW) regarding proposed impacts that may affect water quality, fish and wildlife habitat, and vegetation (Attachment U, NMFS Consultation). Several mitigation measures were identified to be implemented during construction. In-water work will be conducted during the in-water work window to reduce potential impacts to aquatic species. Best management practices will be implemented to prevent water quality impacts such as sedimentation and turbidity during excavation, including the use of cofferdams and erosion control measures. The existing piers will be cut off below the mud line to avoid and minimize potential effects to natural fluvial geomorphic processes. Vegetation removed on the bank for construction access will be restored after construction is complete.

T. *Changing the landscape/grading*.

1. Existing predominant topographical features of the bank line and escarpment shall be preserved and maintained except for disturbance necessary for the construction or establishment of a water related or water dependent use. Measures necessary to reduce potential bank and escarpment erosion, landslides, or flood hazard conditions shall also be taken.

Any construction to stabilize or protect the bank with rip rap, gabions, etc., shall only be allowed where there is clear evidence of erosion or similar hazard and shall be the minimum needed to stop that erosion or to avoid a specific and identifiable hazard. A geotechnical engineer's stamped report shall accompany the application with evidence to support the proposal.
Applicant Response: Riprap is not proposed within the ordinary high water or along the banks of the Willamette River, following replacement of the in-water shafts. See Attachment O for the Geotechnical Report.

2. The applicant shall establish to the satisfaction of the approval authority that steps have been taken to minimize the impact of the proposal on the riparian environment (areas between the top of the bank and the low water mark of the river including lower terrace, beach and river edge).
Applicant Response: The project has been designed to have the least impact possible to riparian areas. In areas where proposed work could not be avoided or minimized, mitigation through revegetation is proposed. Work in riparian areas includes replacement and upgrades of bridge columns, including excavation, fill, and foundation stabilization. Jet grouting is proposed around the pier footings to meet seismic criteria. The combination of these activities requires large areas of excavation at each foundation. Construction access and staging are needed for large equipment and concrete trucks to access the repair sites. After construction is complete, temporary access and staging areas will be restored at grade and revegetated. Areas of permanent impact, including the foundation impacts, will be mitigated according to CDC 32.100.

3. The applicant shall demonstrate that stabilization measures shall not cause subsequent erosion or deposits on upstream or downstream properties.
Applicant Response: The proposed work will not cause erosion or deposits on upstream or downstream properties. See Attachment O for the Geotechnical Report.

4. Prior to any grading or development, that portion of the HCA that includes wetlands, creeks, riparian areas and water resource area shall be protected with an anchored chain link fence (or approved equivalent) at its perimeter and shall remain undisturbed except as specifically allowed by an approved Willamette and Tualatin River Protection and/or water resource area (WRA) permit. Such fencing shall be maintained until construction is complete. That portion of the HCA that includes wetlands, creeks, riparian areas and water resource area shall be identified with City-approved permanent markers at all boundary direction changes and at 30- to 50-foot intervals that clearly delineate the extent of the protected area.
Applicant Response: Areas of HCAs that include wetlands, creeks, and riparian areas that are not to be impacted by the project will be fenced off and marked along the orange construction fencing. Fencing will be maintained for the duration of the project.

5. Full erosion control measures shall be in place and approved by the City Engineer prior to any grading, development or site clearing.

Applicant Response: An Erosion and Sediment Control Plan (Attachment Z) has been developed and will be implemented prior to any grading, development, or site clearing. The Erosion and Sediment control plan has been developed in accordance with ODOT's NPDES 1200-CA permit issued by ODEQ.

U. <u>Protect riparian and adjacent vegetation</u>. Vegetative ground cover and trees upon the site shall be preserved, conserved, and maintained according to the following provisions:

1. Riparian vegetation below OHW removed during development shall be replaced with indigenous vegetation, which shall be compatible with and enhance the riparian environment and approved by the approval authority as part of the application.

Applicant Response: A revegetation plan (Attachment W) and a Mitigation Plan (Attachment K) have been developed that would restore functions of riparian vegetation removed during development.

2. Vegetative improvements to areas within the protection area may be required if the site is found to be in an unhealthy or disturbed state by the City Arborist or his or her designated expert. "Unhealthy or disturbed" includes those sites that have a combination of native trees, shrubs, and groundcover on less than 80 percent of the water resource area and less than 50 percent tree canopy coverage in the primary and secondary habitat conservation area to be preserved. "Vegetative improvements" will be documented by submitting a revegetation plan meeting CDC <u>28.160</u> criteria that will result in the primary and secondary habitat conservation area to be preserved having a combination of native trees, shrubs, and groundcover on more than 80 percent of its area, and more than 50 percent tree canopy coverage in its area. The vegetative improvements shall be guaranteed for survival for a minimum of two years. Once approved, the applicant is responsible for implementing the plan prior to final inspection.

Applicant Response: The City Arborist has not designated any vegetative improvements in the project.

3. Tree cutting shall be prohibited in the protection area except that:

a. Diseased trees or trees in danger of falling may be removed with the City Arborist's approval; and

b. Tree cutting may be permitted in conjunction with those uses listed in CDC <u>28.030</u> with City Arborist approval; to the extent necessary to accommodate the listed uses;

c. Selective cutting in accordance with the Oregon Forest Practices Act, if applicable, shall be permitted with City Arborist approval within the area between the OHW and the greenway boundary provided the natural scenic qualities of the greenway are maintained. (Ord. 1576, 2008; Ord. 1590 § 1, 2009; Ord. 1604 §§ 29 – 36, 2011; amended during July 2014 supplement; Ord. 1635 § 17, 2014; Ord. 1636 § 27, 2014)

Applicant Response: Tree removal is proposed under the Abernethy Bridge along the Willamette River. See Attachment T for a map of proposed tree removal within the riparian area. Any trees proposed to be cut will be submitted to the City Arborist for approval prior to cutting.

Chapter 32 Water Resource Area Protection

There are six water resource areas (WRAs) present within the proposed Project area. As instructed by City of West Linn Planning Department, the Applicant is applying for a WRA permit under the alternate review process for two of these WRAs (WRA 3 and WRA 5) due to the locations of the WRAs. WRAs within the Project area overlap with existing roadway engineered facilities; therefore, the size of the buffers prescribed under the standard review process are larger than necessary to protect the existing functions of the water resources. The remaining four WRAs (1, 2, 4, and 6) are addressed under the standard process. Responses to West Linn Community Development Code (CDC) Chapter 32 approval criteria are included below.

32.080 APPROVAL CRITERIA (ALTERNATE REVIEW PROCESS)

Applications reviewed under the alternate review process shall meet the following approval criteria:

A. *The proposed WRA shall be, at minimum, qualitatively equal, in terms of maintaining the level of functions allowed by the WRA standards of CDC 32.060(D).*

Applicant Response: There are six WRAs within the project area, numbered as WRA 1–6 in Attachment Q (see Table 1 below). The applicant proposes reductions to WRA 3 and 5) because the standard width determined by following the guidance in Table 32-2 results in roads and road prisms being included within the calculated WRAs that would not enhance or protect the functions of the associated water resources, as outlined in CDC 32.070 (see Table 2 below). In addition to proposed reductions, the work proposed within the calculated WRA 1 and WRA 2 is exempt based on CDC 32.040.B.1 (maintenance), as the proposed roadway improvements are not expanding outside of the existing roadway prism into the WRA, as well as exemption 32.040.F.2, where streams are enclosed within culverts and development is proposed at right angles to those culverts (WRA 4). The width of WRA 6 was determined via Table 32-2 and no reductions or exemptions are proposed. Additional features are located on the West Linn WRA map, including a stream labeled as CA-01 north of I-205 near Sunset Avenue, and one stream labeled as CA-02 in between Sunset Avenue and Broadway Street. The CA-02 stream and riparian corridor are entirely outside of the Project area and are not included in this application. The CA-01 stream was delineated during the wetland delineation that occurred for the Project, which was determined to be a non-jurisdictional ditch (see Attachment S, DSL Concurrence and Wetland Delineation). Ditches are not counted as WRAs (as defined in CDC Chapter 2); therefore, the ditch is not included in this application.

Table 1. WRAs in the Project area

WRA #	Exemption	Reduction	Attachment Q, Figure #
1	32.040.B.1	-	1
2	32.040.B.1	-	1
3	-	Yes	2
4	32.040.F.2	-	3
5	-	Yes	3
6	-	No	4

Table 2. WRA Function Assessment for Road Prisms

Ecological Function	Landscape Features Potentially Providing the Function	Road Prism Functions
Stream flow moderation and/or water storage	A wetland or other water body with a hydrologic connection to a stream or flood area, the presence of fallen trees and density of vegetation in the WRA that slows the flow of storm water and increases its ability to retain sediment and infiltrate storm water, and the porosity of the WRA's surface to enable it to infiltrate storm water.	Roads lack vegetation and road prisms have sparse vegetation and neither have fallen trees. Roadways and road prisms do not store water or sediment and do not moderate stream flows.
Sediment or pollution control	Vegetation within 100 feet of a WRA on gentle slopes and up to 200 feet of a WRA if the slope is greater than 25%. The presence of fallen trees and other material that slows the flow of water and increase the ability to retain sediment, absorb pollutants and infiltrate stormwater; the composition and density of vegetation; slope; and soils.	Roads lack vegetation and the outside edges of roadway prisms have sparse vegetation that is routinely mowed. Neither the roads nor road prisms have fallen trees. Roads and roadway prisms do not retain or store sediments and pollutants.
Bank stabilization	Root masses, existing large rocks or anchored large wood along the stream bank.	No streams or stream banks are present in roads or road prisms, as they are mostly made up of impervious surfaces and roadway fill. No root masses, existing large rocks, or anchored word is present. Roads and road prisms do not provide bank stabilization functions.
Large wood recruitment for a fish bearing section of stream	Forest canopy within 50 to 150 feet of a fish bearing stream.	No forest canopy or fish-bearing streams are located within roads or road prisms. This function is not provided.
Organic material sources	Forest canopy or woody vegetation within 100 feet of a water resource; or within a flood area.	No forest canopy or woody vegetation are present in roads or road prisms. Some vegetation may be present on the outside edges of the roadway prism but it is mowed regularly for maintenance purposes. No organic material sources are provided by roads or road prisms.
Shade (water temperature moderation) and microclimate	Forest canopy or woody vegetation within 100 feet of the water resource. Roughly 300 feet of continuous canopy for microclimate.	No forest canopy or woody vegetation is present within roads or roadway prisms. No shade and microclimate functions are being provided.
Stream flow that sustains in-stream and adjacent habitats	Seasonal or perennial flow.	No streams with seasonal or perennial flow are present in roads or roadway prisms. This function is not being provided.
Other terrestrial habitat	Forest canopy natural vegetation contiguous to and within 100 to 300 feet of the water resource.	Forest canopy is not present in roads or roadway prisms. Roads are dangerous for terrestrial species and do not provide any habitat.

WRA 1 is located west of 10th Street, north of I-205 southbound (SB) and is associated with a stream and two wetlands (W-33 and W-34; Attachment Q, Figure 1). According to Table 32-2, the calculated WRA surrounding the stream is 15 feet as the stream is ephemeral, and the calculated WRA surrounding wetland W-33 is 65 feet, because the surrounding average slope is less than 25%, and the calculated WRA surrounding wetland W-34 is 150 feet, since the adjacent slope is at least 25% to the top of the slope located approximately 100 feet from the delineated edge, plus an additional 50 feet. This calculated WRA 1 overlaps with the existing roadway. No impacts are proposed to WRA 1 outside of the existing engineered roadway prism; therefore, the proposed Project activities within WRA I are exempt under 32.040.B.1, as the proposed work falls under maintenance of existing roads.

WRA 2 is located both east and west of 10th Street, south of I-205 northbound (NB) and is associated with a stream and two wetlands (W-15 and W-17) at the toe of the slope (Attachment Q, Figure 1). According to Table 32-2, the calculated WRA 2 surrounding the wetland and stream is 200 feet wide, which would extend onto the engineered roadway prism, including overlapping existing roadway surfaces of I-205. No impacts are proposed to WRA 2 that would disturb the WRA beyond the footprint of the existing roadway prism, making it exempt under CDC 32.040.B.1 (maintenance of existing roads).

WRA 3 is located north of I-205 SB at the existing ODOT maintenance yard and is associated with two wetlands and an intermittent stream (Attachment Q, Figure 2). According to Table 32-2, the calculated WRA width would be 65 feet for the wetlands and 200 feet for the stream. However, this width leads to the WRA overlapping with the existing lanes of I-205 SB as well as the road entrance to the ODOT maintenance yard. These overlapping areas are proposed to be excluded from the WRA, as they are currently not providing any functions or values to the water resources. The wetlands and stream provide a low level of functions given their previous disturbance from their natural state and proximity to the freeway. The current functions provided by the water resources in this location include sediment and pollutant control. Due to the proximity of the freeway to the water resources do not provide high quality wildlife habitat; however, the wetlands and stream likely provide some habitat to birds and wildlife as there is forest canopy within 300 feet of the water resources. The existing roadway facilities do not provide functions, therefore, the functional WRA stops at the roadway prism, which varies from 3-65 feet from the edge of the delineated wetland.

WRA 4 is located approximately 600 feet east of WRA 3 north of I-205 SB and south of Imperial Drive near Radcliffe Court (Attachment Q, Figure 3). The WRA is associated with a small wetland and Tanner Creek. Using the guidance in Table 32-2, the wetland would have a 65-foot wide WRA (no significant slope) and the stream would have a 100-foot wide WRA, both based on the surrounding slope, which is less than 25%. Tanner Creek, which has presence of coastal cutthroat trout, according to StreamNet Mapper data, is contained within a culvert that extends underneath both lanes of I-205 and daylights again just south of I-205 NB. There is a short daylighted portion of the creek, approximately 80 feet long north of the culvert entrance. As outlined in CDC 32.040.F.2, piped sections of streams including development at right angles to the piped sections are exempt from WRA regulations. WRA 4 overlapping the culvert at a right angle from the inlet is excluded from the WRA.

WRA 5 is located immediately east of WRA 4 and is associated with three separate wetlands (Attachment Q, Figure 3). Following the guidance outlined in Table 32-2 results in the calculated WRA 5 being 65 feet wide. However, this width overlaps with approximately 10 feet of the existing roadway of I-205 SB, which is not providing the functions intended by the WRA chapter. Water quality functions currently being provided at the three wetlands include sediment and pollution control, since the proximity to the freeway results in sediment and pollutant runoff. The existing vegetation provides water quality functions by slowing and retaining sediments and stormwater runoff from I-205, although there are areas of bare ground and a gravel road that traverses the WRA. Other terrestrial habitat is provided due to the presence of forest canopy within 100 to 300 feet of the wetlands (as noted in Table 32-4). Because the calculated WRA overlaps with the roadway for 10 feet, the width required to protect the existing functions of the wetlands includes a 55-foot buffer that stops at the existing roadway. The reduction of the overlapping freeway lanes does not change the functions of the existing water resources, as those impervious surfaces are not currently providing any benefits. The Project will maintain water quality of the existing wetlands in WRA 4 due to the construction of additional stormwater facilities that will receive and treat runoff from I-205, thereby improving water quality functions.

B. If a WRA is already significantly degraded (e.g., native forest and ground cover have been removed or the site dominated by invasive plants, debris, or development), the approval authority may allow a reduced WRA in exchange for mitigation, if:

1. The proposed reduction in WRA width, coupled with the proposed mitigation, would result in better performance of functions than the standard WRA without such mitigation. The approval authority shall make this determination based on the applicant's proposed mitigation plan and a comparative analysis of ecological functions under existing and enhanced conditions (see Table 32-4).

Applicant Response: The reduction in WRA width has no result on the performance of functions of water resources since the areas proposed to be removed overlap with existing roadway or other engineered facilities within the roadway prism. These areas that would normally be part of the WRA boundary if following the guidance in Table 32-2 are currently not contributing any functions or values listed in Table 32-4., as described in the applicant response above. The water quality of the receiving waters will be improved by the applicant by implementing engineered water quality facilities that will provide treatment for all stormwater generated from impacted impervious surfaces that currently do not receive any treatment. Mitigation is proposed for all permanent impacts to WRAs in compliance with CDC 32.090. Temporarily impacted WRAs will be restored and revegetated in compliance with CDC 32.100. See Attachment W for the Landscaping Plan, which shows proposed WRA mitigation.

2. The mitigation project shall include all of the following components as applicable. It may also include other forms of enhancement (mitigation) deemed appropriate by the approval authority.

a. Removal of invasive vegetation.

b. Planting native, non-invasive plants (at minimum, consistent with CDC 32.100) that provide improved filtration of sediment, excess nutrients, and pollutants. The amount of enhancement (mitigation) shall meet or exceed the standards of CDC 32.090(C).

c. Providing permanent improvements to the site hydrology that would improve water resource functions.

d. Substantial improvements to the aquatic and/or terrestrial habitat of the WRA.

Applicant Response: Invasive vegetation and noxious weeds will be removed within the mitigation area prior to planting. This will include species listed as noxious weeds by the State of Oregon as well as species listed on the City of Portland nuisance plant list. The mitigation proposed is in compliance with CDC 32.100 and includes native, non-invasive plants that will provide improved filtration of sediment, excess nutrients, and pollutants, among other functions (see Attachment K, Mitigation Plan or Attachment W, Landscaping Plan for a list of proposed plants). Proposed species were chosen specifically for their ability to provide these functions, as well as survivability. The proposed WRA mitigation will take place underneath and adjacent to the Abernethy Bridge, which currently is dominated by invasive species. Mitigation will remove these invasive species and replace with native species, improving habitat and resources for wildlife in the area. Proposed trees and shrubs will provide organic material sources to wetlands and waters in and adjacent to the mitigation site. In addition to the proposed plants that will absorb and filter stormwater runoff from impervious surfaces upland of the WRA, several water quality facilities are proposed near the bridge that will also reduce the amount of sediment and pollutants that enter McLoughlin Creek and the Willamette River. A large upland biofiltration swale is proposed near OR 43 that will treat 1.309 acres of non-Project area, providing additional stormwater treatment. A biofiltration swale is proposed within WRA 5, which will treat 12.393 acres of contributing impervious area. Full treatment of the ODOT facility as well as treatment of non-Project stormwater will improve water quality for native and resident fish in the Willamette River, some of which are listed under the Endangered Species Act as threatened or endangered. Newly planted vegetation will also help to prevent erosion, providing bank stabilization. The proposed mitigation at the bridge has been reviewed and approved by both DSL and USACE for a shorter version of the I-205 Project extending from OR 213 to OR 43. The Applicant is currently in progress with a revision to the permits to expand the Project to just west of 10th Street and account for impacts to wetland W-32.

C. Identify and discuss site design and methods of development as they relate to WRA functions.

Applicant Response: The mitigation site under and adjacent to the Abernethy Bridge will mitigate for all proposed permanent WRA impacts and was designed to benefit McLoughlin Creek, the wetland adjacent to McLoughlin Creek, and the Willamette River, since these are the water resources currently providing the most and highest quality functions in the Project area. In total, 190,732 square feet of mitigation is proposed in the form of restoration planting, which will provide the functions listed in Table 32-4, including stream flow moderation from the increase in density of vegetation that will increase stormwater infiltration, and sediment and pollution retention. Stormwater facilities are proposed, as described in the applicant response above, that would absorb and filter stormwater from impervious upland surfaces. Once the restoration plants mature, they will be a source of both large wood recruitment and organic material sources to the Willamette River. The mature shrubs and trees will also provide shade to both McLoughlin Creek and the Willamette River, helping to regulate in-stream temperatures. Before any plants are planted, all invasive species will be removed from the mitigation site. The removal of invasive species and addition of native species will improve the quality and amount of habitat for birds and wildlife.

D. Address the approval criteria of CDC 32.060, with the exception of CDC 32.060(D).

Applicant Response: See applicant responses to CDC 32.060 below.

32.060 APPROVAL CRITERIA (STANDARD PROCESS)

No application for development on property containing a WRA shall be approved unless the approval authority finds that the proposed development is consistent with the following approval criteria, or can satisfy the criteria by conditions of approval:

A. <u>WRA protection/minimizing impacts</u>.

1. Development shall be conducted in a manner that will avoid or, if avoidance is not possible, minimize adverse impact on WRAs.

Applicant Response: Attachment P identifies the WRAs in the Project area, and there are six WRAs present (see Table 3 below). The Applicant avoided and minimized impacts on WRAs to the extent possible, but some disturbance is necessary in order to meet the Project's objectives and as required by accepted engineering practices. The purpose of the Project is to improve traffic safety, provide an earthquake safety route, and to seismically upgrade the Abernethy Bridge to withstand a Cascadia seismic event. ODOT designated I-205 as a Phase I statewide north-south lifeline route, which means it must be operational quickly after a disaster renders other roadways unusable or impassable. To avoid congestion and associated pollution, an additional lane will be added, which needs to be contiguous with the existing lanes, thereby making some impacts to those HCAs located near roadways unavoidable. Attachment Q identifies impacts to WRAs.

Table 3. WRAs in the Project area.

WRA #	Width (feet)	Rationale
1	15-150	The stream has a 15-ft WRA due to being ephemeral and the surrounding slopes are less than 25%. Wetland W-33 has a 65-ft buffer (less than 25% slopes), which extends up to the existing roadway (I-205 SB). Wetland W-34 is adjacent to slopes over 25%, creating a 150-ft buffer. The work proposed at this WRA is exempt according to CDC 32.040.B.1, since the Project consists of maintenance of existing roadways that will not expand beyond the previously disturbed area at grade.
2	200	The water resources are all located at the toe of slope, which is more than 25%. The slope is over 25% for more than 30 feet and has no distinct top of slope for at least 150 feet, creating a 200-ft wide buffer. The work proposed at this WRA is exempt according to CDC 32.040.B.1, since the Project consists of maintenance of existing roadways that will not expand beyond the previously disturbed area at grade.
4	65-100	Based on the slopes adjacent to wetland W-30 and Tanner Creek, the WRA width according to Table 32-2 would be 65 feet around the wetland and 100 feet around Tanner Creek. However, Tanner Creek is partially contained within a culvert and is exempt under CDC 32.040.F.2.
6	65-200	The water resources located within WRA include McLoughlin Creek, the Willamette River, and one wetland (W-37). The WRA associated with McLoughlin Creek varies from 65 to 200 feet, based on the adjacent slope. The slope on the left bank of the creek is less than 25%, so a 65-foot buffer was determined. The slope on the right bank is more than 25% for more than 150 feet, so a 200-foot buffer was determined. The slope adjacent to the Willamette River is less than 25%, resulting in a 100-foot buffer, as it is a fish bearing stream. The slopes adjacent to wetland W-37 are more than 25% for at least 150 feet, resulting in a 200-foot buffer.

2. Mitigation and re-vegetation of disturbed WRAs shall be completed per CDC 32.090 and 32.100, respectively.

Applicant Response: The Applicant proposes mitigation and re-vegetation for all disturbed WRAs compliant with CDC 32.090 and 32.100. See Attachment Q for WRA Impacts, Attachment K for the Mitigation Plan, and Attachment W for the Revegetation Plan. Proposed impacts to WRA are as follows:

WRA 1 is located west of 10th Street, north of I-205 SB and is associated with two wetlands and a stream. No temporary or permanent impacts are proposed to WRA 1, as it is exempt under CDC 32.040.B.1.

WRA 2 is located both east and west of 10th Street, south of I-205 NB and is associated with a stream and two wetlands at the toe of the slope. No temporary or permanent impacts are proposed to WRA 2, as it is exempt under CDC 32.040.B.1.

WRA 3 is located within the existing ODOT maintenance yard north of I-205. Two wetlands (Wetlands W-31 and W-32) and a stream are present that require the WRA. WRA 2 will be permanently impacted due to widening of the roadway and its associated excavation and fill. In addition to impacts to the WRA, permanent wetland impacts to Wetland W-32 are proposed totaling 6,875 square feet. Impacts to wetland W-32 are under the jurisdiction of the Oregon Department of State Lands (DSL) and the U.S. Army Corps of Engineers (USACE);. no impacts are proposed to Wetland W-31. Proposed impacts to the WRA include 6,432 square feet of permanent impacts and 1,839 square feet of temporary impacts. All proposed impacts are adjacent to the existing I-205 SB roadway. See Attachment Q, Figure 2. Mitigation for impacts to WRA 3 will take place underneath and adjacent to the Abernethy Bridge. See Attachment W, Landscaping Plan for proposed mitigation areas. Mitigation banking credits will be used for impacts to Wetland W-32, pending approval from USACE and DSL.

WRA 4 is located north of I-205 SB and south of Imperial Drive near Radcliffe Court. WRA 4 is associated with a stream that is located within a culvert, which is exempt from WRA regulations according to CDC 32.040.F. No permanent or temporary impacts are proposed from the Project, as WRA 4 is located outside of the construction impact area and because it is exempt due to the stream being located within a culvert.

WRA 5 surrounds an existing wetland east of WRA 4 (Attachment Q, Figure 3). Permanent impacts are proposed to the edge of the WRA closest to I-205 SB caused by fill associated with widening of I-205, in the amount of 948 square feet. 1,686 square feet of temporary impacts are proposed adjacent to permanent impacts and will be revegetated after construction is complete. Mitigation is proposed for permanent impacts to WRA 5 and will be located underneath and adjacent to the Abernethy Bridge. See Attachment W, Landscaping Plan for proposed mitigation areas.

WRA 6 will have both temporary and permanent impacts due to removal and replacement of piers supporting the Abernethy Bridge. The WRA buffer surrounds the Willamette River, McLoughlin Creek, and Wetland-37. No reductions in the WRA are proposed. Permanent impacts proposed to WRA 6 are equal to 10,538 square feet and result from excavation and fill associated with drilled shafts and piers for the bridge, excavation to balance fill in the floodplain, and construction of a stormwater facility. Although impacts are avoided and minimized to the extent possible, permanent impacts are proposed to WRA 6 that are necessary in order to seismically upgrade the bridge so it can withstand a Cascadia subduction zone earthquake. Temporary impacts in the amount of 159,831 square feet are proposed from construction access and staging, temporary excavation and fill associated with removal and replacement of shafts, all of which will be revegetated upon completion of construction in that area. Mitigation for permanent impacts will take place on-site in the existing WRA. See Attachment Q, Figure 4 for WRA impacts and Attachment W, Landscaping Plan for proposed mitigation areas.

B. *Storm water and storm water facilities.*

1. Proposed developments shall be designed to maintain the existing WRAs and utilize them as the primary method of storm water conveyance through the project site unless:

a. The surface water management plan calls for alternate configurations (culverts, piping, etc.); or

b. Under CDC 32.070, the applicant demonstrates that the relocation of the water resource will not adversely impact the function of the WRA including, but not limited to, circumstances where the WRA is poorly defined or not clearly channelized.

Re-vegetation, enhancement and/or mitigation of the re-aligned water resource shall be required as applicable.

Applicant Response: The WRAs would be maintained at current locations. See Attachment R for the WRA and water quality facility (WQF) map.

2. Public and private storm water detention, storm water treatment facilities and storm water outfall or energy dissipaters (e.g., rip rap) may encroach into the WRA if:

a. Accepted engineering practice requires it;

b. Encroachment on significant trees shall be avoided when possible, and any tree loss shall be consistent with the City's Tree Technical Manual and mitigated per CDC 32.090;

c. There shall be no direct outfall into the water resource, and any resulting outfall shall not have an erosive effect on the WRA or diminish the stability of slopes; and

d. There are no reasonable alternatives available.

A geotechnical report may be required to make the determination regarding slope stability.

Applicant Response: 11 water quality facilities (WQFs) are proposed for the Project, one of which encroaches a WRA. As shown on Attachment R, Figure 3, WQF A is located entirely within WRA 6. WQF A is a water quality swale 3,740 square feet in area. It will be vegetated if there are species that can survive in the shade, since the WQF is located underneath the bridge and will not receive any sunlight. The proposed WQFs have been designed according to current engineering practices by a registered professional engineer. No trees associated with construction of WQFs will be removed, no direct outfall into the water resources is proposed, and the WQF will not cause erosion within the WRA. See Attachment Y for the Stormwater Site Plan and Attachment R for a map of WQFs relative to WRAs.

3. Roadside storm water conveyance swales and ditches may be extended within rights-of-way located in a WRA. When possible, they shall be located along the side of the road furthest from the water resource. If the conveyance facility must be located along the side of the road closest to the water resource, it shall be located as close to the road/sidewalk *as possible and include habitat friendly design features (treatment train, rain gardens, etc.).*

Applicant Response: Roadside stormwater conveyance swales are proposed in the right-of-way, but none will encroach WRAs. The swales were designed to be located as far as possible from the WRA while meeting accepted engineering practice. See Attachment Y for the Stormwater Site Plan and Attachment R for a map of WRAs and WQFs.

4. Storm water detention and/or treatment facilities in the WRA shall be designed without permanent perimeter fencing and shall be landscaped with native vegetation.

Applicant Response: See Attachment Y for the Stormwater Site Plan and See Attachment W for the Revegetation Plan. Storm water detention and/or treatment facilities in the WRA are proposed to be landscaped with native vegetation in accordance with ODOT standard practices with a water quality vegetation mix, which is comprised of a mix of the following species: California oatgrass (*Danthonia califonica*), tufted hairgrass (*Deschampsia cespitosa*), slender hairgrass (*Deschampsia elongata*), red fescue (*Festuca rubra var. rubra*), meadow barley (*Hordeum brachyantherum*), dense sedge (*Carex densa*), slough sedge (*Carex obnupta*), slender rush (*Juncus patens*), spreading rush (*Juncus tenuis*), broadleaf lupine (*Lupinus latifolis*), and graceful cinquefoil (*Potentilla gracilis*). No perimeter fencing is proposed.

5. Access to public storm water detention and/or treatment facilities shall be provided for maintenance purposes. Maintenance driveways shall be constructed to minimum width and use water permeable paving materials. Significant trees, including roots, shall not be disturbed to the degree possible. The encroachment and any tree loss shall be mitigated per CDC 32.090. There shall also be no adverse impacts upon the hydrologic conditions of the site.

Applicant Response: Access to public stormwater detention and treatment facilities will be provided. Access roads will be made of gravel and will be 16 feet in width. The facilities shown on the following sheets in Attachment Y (Stormwater Plan) are proposed to have gravel access roads: HA06, HA11, HA12, and HA13. The remaining facilities will be accessed by sidewalks, multiuse trails, or from the roadway shoulder.

6. Storm detention and treatment and geologic hazards. Per the submittals required by CDC 32.050(F)(3) and 92.010(E), all proposed storm detention and treatment facilities must comply with the standards for the improvement of public and private drainage systems located in the West Linn Public Works Design Standards, there will be no adverse off-site impacts caused by the development (including impacts from increased intensity of runoff downstream or constrictions causing ponding upstream), and the applicant must provide sufficient factual data to support the conclusions of the submitted plan.

Applicant Response: All facilities were designed to meet both ODOT and West Linn Standards. Adverse impacts will be avoided through detention for the basins that don't discharge to the Willamette River. Details supporting stormwater data can be found in Attachment G, Stormwater Report.

C. *Repealed by Ord. 1647.*

Applicant Response: The Applicant acknowledges the repeal of this section.

D. WRA width. Except for the exemptions in CDC 32.040, applications that are using the alternate review process of CDC 32.070, or as authorized by the approval authority consistent with the provisions of this chapter, all development is prohibited in the WRA as established in Table 32-2 below:

Table 32-2. Required Width of WRA

Protected WRA Resource (see Chapter 2 CDC, Definitions)	***Slope Adjacent to Protected Water Resource[1, 3]***	***Starting Point for Measurements from Water Resource[1, 3]***	***Width of WRA on Each Side of the Water Resource***
A. Water Resource	*0% - 25%*	*OHW or delineated edge of wetland*	*65 feet*
B. Water Resource (Ravine)	*over 25% to a distinct top of slope[2]*	*OHW or delineated edge of wetland*	*From water resource to top of slope[2] (30-foot minimum), plus an additional 50 feet[4]*
C. Water Resource	*Over 25% for more than 30 feet, and no distinct top of slope for at least 150 feet*	*OHW or delineated edge of wetland*	*200 feet*
D. Riparian Corridor	*Any*	*OHW*	*100 feet*
E. Formerly Closed Drainage Channel Reopened	*Any*	*OHW*	*15 feet*
F. Ephemeral Stream	*Any*	*Stream thread or centerline*	*15 feet with treatment or vegetation (see CDC 32.050(G)(1))*
G. Fish Bearing Streams per Oregon Department of Fish and Wildlife (ODFW) or 2003-2004 Survey	*Applies to all that stream section where fish were inventoried and upstream to the first known barrier to fish passage.*	*OHW or delineated edge of wetland*	*100 feet when no greater than 25% slope. See B or C above for steeper slopes*
H. Re-aligned Water Resource	*See A, B, C, D, F, or G, above*	*OHW or delineated edge of wetland*	*See A, B, C, D, F, or G, above*

[1] *The slope is the average slope in the first 50 feet as measured from bankfull stage or OHW.*

[2] *Where the protected water resource is confined by a ravine or gully, the top of slope is the location (30-foot minimum) where the slope breaks to less than 15 percent for at least 50 feet.*

[3] *At least three slope measurements along the water resource, at no more than 100-foot increments, shall be made for each property for which development is proposed. Depending upon topography, the width of the protected corridor may vary.*

[4] *The 50-foot distance may be reduced to 25 feet if a geotechnical study by a licensed engineer or similar accredited professional demonstrates that the slope is stable and not prone to erosion.*

Applicant Response: The Applicant has determined the width of four WRAs (WRA 1, 2, 4, and 6) within the Project area based on Table 32-2. The other two WRA widths (WRA 3 and 5) were determined using the alternate review process (CDC 32.070-32.080). See Table 1 above for widths and rationales for each WRA. See applicant responses to CDC 32.070 above and Attachment P for the WRA map.

E. Per the submittals required by CDC 32.050(F)(4), the applicant must demonstrate that the proposed methods of rendering known or potential hazard sites safe for development, including proposed geotechnical remediation, are feasible and adequate to prevent landslides or other damage to property and safety. The review authority may impose conditions, including limits on type or intensity of land use, which it determines are necessary to mitigate known risks of landslides or property damage.

Applicant Response: Geotechnical reports were written for the Project which demonstrate that the proposed site is safe for development. See Attachment O, Geotechnical Report.

F. Roads, driveways and utilities.

1. New roads, driveways, or utilities shall avoid WRAs unless the applicant demonstrates that no other practical alternative exists. In that case, road design and construction techniques shall minimize impacts and disturbance to the WRA by the following methods:

a. New roads and utilities crossing riparian habitat areas or streams shall be aligned as close to perpendicular to the channel as possible.

b. Roads and driveways traversing WRAs shall be of the minimum width possible to comply with applicable road standards and protect public safety. The footprint of grading and site clearing to accommodate the road shall be minimized.

c. Road and utility crossings shall avoid, where possible:

1) Salmonid spawning or rearing areas;

2) Stands of mature conifer trees in riparian areas;

3) Highly erodible soils;

4) Landslide prone areas;

5) Damage to, and fragmentation of, habitat; and

6) Wetlands identified on the WRA Map.

Applicant Response: A temporary construction access road is proposed from Willamette Drive (OR 43) to the bridge pier construction area (see Attachment V). This temporary access road will be constructed to a minimum width that will allow for bidirectional construction traffic necessary to complete the Abernethy Bridge foundation improvements. Proposed widening of existing I-205 roadway to current FHWA standards is proposed, which will impact portions of several WRAs. Foundation improvements necessary to support the I-205 widening and meet current seismic standards were designed to minimize impacts to WRAs. For example, new foundations will be constructed using drilled shafts as opposed to spread footings, which will drastically reduce the permanent impacts to WRAs. Those WRAs with proposed impacts will have construction techniques and best management practices implemented to further minimize impacts to the WRA. Mitigation is proposed for impacts to WRA; See Attachment K for the Mitigation Plan and Attachment W for the Revegetation Plan.

2. Crossing of fish bearing streams and riparian corridors shall use bridges or arch-bottomless culverts or the equivalent that provides comparable fish protection, to allow passage of wildlife and fish and to retain the natural stream bed.

Applicant Response: All proposed development activities crossing of fish bearing streams and riparian corridors are bridges. No new crossings are proposed.

3. New utilities spanning fish bearing stream sections, riparian corridors, and wetlands shall be located on existing roads/bridges, elevated walkways, conduit, or other existing structures or installed underground via tunneling or boring at a depth that avoids tree roots and does not alter the hydrology sustaining the water resource, unless the applicant demonstrates that it is not physically possible or it is cost prohibitive. Bore pits associated with the crossings shall be restored upon project completion. Dry, intermittent streams may be crossed with open cuts during a time period approved by the City and any agency with jurisdiction.

Applicant Response: No new utilities are proposed.

4. No fill or excavation is allowed within the ordinary high water mark of a water resource, unless all necessary permits are obtained from the City, U.S. Army Corps of Engineers and Oregon Department of State Lands (DSL).

Applicant Response: All proposed work within the ordinary high water mark of any water resources has been approved by DSL and the Corps. See Attachment H for permits.

5. Crossings of fish bearing streams shall be aligned, whenever possible, to serve multiple properties and be designed to accommodate conduit for utility lines. The applicant shall, to the extent legally permissible, work with the City to provide for a street layout and crossing location that will minimize the need for additional stream crossings in the future to serve surrounding properties.

Applicant Response: No new crossings of fish bearing streams are proposed. Proposed work on existing crossings will follow the existing alignment. The Abernethy Bridge will continue to support existing utilities, include the West Linn water supply line.

G. <u>Passive recreation</u>. Low impact or passive outdoor recreation facilities for public use including, but not limited to, multi-use paths and trails, not exempted per CDC <u>32.040</u>(B)(2), viewing platforms, historical or natural interpretive markers, and benches in the WRA, are subject to the following standards:

1. Trails shall be constructed using non-hazardous, water permeable materials with a maximum width of four feet or the recommended width under the applicable American Association of State Highway and Transportation Officials (AASHTO) standards for the expected type and use, whichever is greater.

Applicant Response: No trails are proposed within WRAs.

2. Paved trails are limited to the area within 20 feet of the outer boundary of the WRA, and such trails must comply with the storm water provisions of this chapter.

Applicant Response: No paved trails are proposed within WRAs.

3. All trails in the WRA shall be set back from the water resource at least 30 feet except at stream crossing points or at points where the topography forces the trail closer to the water resource.

Applicant Response: No trails are proposed within WRAs.

4. Trails shall be designed to minimize disturbance to existing vegetation, work with natural contours, avoid the fall line on slopes where possible, avoid areas with evidence of slope failure and ensure that trail runoff does not create channels in the WRA.

Applicant Response: No trails are proposed within WRAs.

5. Foot bridge crossings shall be kept to a minimum. When the stream bank adjacent to the foot bridge is accessible (e.g., due to limited vegetation or topography), where possible, fences or railings shall be installed from the foot bridge and extend 15 feet beyond the terminus of the foot bridge to discourage trail users and pets from accessing the stream bank, disturbing wildlife and habitat areas, and causing vegetation loss, stream bank erosion and stream turbidity. Bridges shall not be made of continuous impervious materials or be treated with toxic substances that could leach into the WRA.

Applicant Response: No foot bridge crossings are proposed within WRAs.

6. Interpretive facilities (including viewpoints) shall be at least 10 feet from the top of the water resource's bankfull flow/OHW or delineated wetland edge and constructed with a fence between users and the resource. Interpretive signs may be installed on footbridges.

Applicant Response: No interpretive facilities are proposed or exist within the Project area.

H. <u>Daylighting Piped Streams</u>.

1. As part of any application, covered or piped stream sections shown on the WRA Map are encouraged to be "daylighted" or opened. Once it is daylighted, the WRA will be limited to 15 feet on either side of the stream. Within that WRA, water quality measures are required which may include a storm water treatment system (e.g., vegetated *bioswales), continuous vegetative ground cover (e.g., native grasses) at least 15 feet in width that provides year round efficacy, or a combination thereof.*

Applicant Response: No impacts to piped streams are proposed, including daylighting piped streams.

2. The re-opened stream does not have to align with the original piped route but may take a different route on the subject property so long as it makes the appropriate upstream and downstream connections and meet the standards of subsections (H)(3) and (4) of this section.

Applicant Response: No daylighting of piped streams is proposed.

3. A re-aligned stream must not create WRAs on adjacent properties not owned by the applicant unless the applicant provides a notarized letter signed by the adjacent property owner(s) stating that the encroachment of the WRA is permitted.

Applicant Response: No streams are proposed to be permanently re-aligned that would create WRAs on adjacent properties.

4. The evaluation of proposed alignment and design of the reopened stream shall consider the following factors:

a. The ability of the reopened stream to safely carry storm drainage through the area without causing significant erosion.

b. Continuity with natural contours on adjacent properties, slope on site and drainage patterns.

c. Continuity of adjacent vegetation and habitat values.

d. The ability of the existing and proposed vegetation to filter sediment and pollutants and enhance water quality.

e. Provision of water temperature conducive to fish habitat.

Applicant Response: No reopened streams are proposed.

5. Any upstream or downstream WRAs or riparian corridors shall not apply to, or overlap, the daylighted stream channel.

Applicant Response: No daylighting of piped streams is proposed.

6. When a stream is daylighted the applicant shall prepare and record a legal document describing the reduced WRA required by subsections (H)(1) and (5) of this section. The document will be signed by a representative of the City and recorded at the applicant's expense to better ensure long term recognition of the reduced WRA and reduced restrictions for the daylighted stream section.

Applicant Response: No daylighting of piped streams is proposed.

I. The following habitat friendly development practices shall be incorporated into the design of any improvements or projects in the WRA to the degree possible:

1. Restore disturbed soils to original or higher level of porosity to regain infiltration and storm water storage capacity.

Applicant Response: The landscaping plan proposes an application of compost blanket and hydroseed on top of disturbed soils throughout the Project area. For mitigation areas, replanting efforts will inoculate the soil with mycorrhizae and beneficial bacteria by including PermaMatrix in backfill on bare root stock. The shrub and tree plantings will be individually mulched with arbor chips to prevent compaction, naturally suppress weeds, and develop the soil to encourage root growth and porosity. Soil roughness will be achieved by using ODOT Method D: Rough Areas for Seeded Revegetation or Erosion Control (ODOT standard Specifications). The mitigation areas will have a rough treatment of the surface of all future planted areas. Downed wood is also proposed in restoration areas to interrupt water and provide ecological benefit.

2. Apply a treatment train or series of storm water treatment measures to provide multiple opportunities for storm water treatment and reduce the possibility of system failure.

Applicant Response: The applicant has designed a series of stormwater treatment swales. Where possible, when swales are near WRAs, vegetation plantings will be brought up to the swales in case of overflow in storm events. See Attachment R for a map of WRAs and proposed stormwater facilities.

3. Incorporate storm water management in road rights-of-way.

Applicant Response: Stormwater treatment swales are proposed in the I-205 right-of-way spanning from the Abernethy Bridge west to 10th Street.

4. Landscape with rain gardens to provide on-lot detention, filtering of rainwater, and groundwater recharge.

Applicant Response: Only stormwater swales and detention ponds are proposed. No rain gardens are proposed.

5. Use multi-functional open drainage systems in lieu of conventional curb-and-gutter systems.

Applicant Response: The applicant proposes several swales as opposed to conventional curb-and-gutter systems where feasible. In some areas, such as along the Abernethy Bridge, conventional curb-and-gutter systems are necessary to direct stormwater to treatment facilities.

6. Use green roofs for runoff reduction, energy savings, improved air quality, and enhanced aesthetics.

Applicant Response: The Applicant's proposal does not include any structure with a roof.

7. Retain rooftop runoff in a rain barrel for later on-lot use in lawn and garden watering.

Applicant Response: The Applicant's proposal does not include any structure with a roof.

8. Disconnect downspouts from roofs and direct the flow to vegetated infiltration/filtration areas such as rain gardens.

Applicant Response: The Applicant's proposal does not include any structure with a roof.

9. Use pervious paving materials for driveways, parking lots, sidewalks, patios, and walkways.

Applicant Response: The Applicant's proposal does not include driveways, parking lots, sidewalks, patios, and walkways within WRAs.

10. Reduce sidewalk width to a minimum four feet. Grade the sidewalk so it drains to the front yard of a residential lot or retention area instead of towards the street.

Applicant Response: The Applicant's proposal does not include sidewalks within WRAs.

11. Use shared driveways.

Applicant Response: The Applicant's proposal does not include driveways within WRAs.

12. Reduce width of residential streets and driveways, especially at WRA crossings.

Applicant Response: The Applicant's proposal does not include residential streets or driveways.

13. Reduce street length, primarily in residential areas, by encouraging clustering.

Applicant Response: The Applicant's proposal does not include residential streets.

14. Reduce cul-de-sac radii and use pervious and/or vegetated islands in center to minimize impervious surfaces.

Applicant Response: The Applicant's proposal does not include cul-de-sac development.

15. Use previously developed areas (PDAs) when given an option of developing PDA versus non-PDA land.

Applicant Response: The Applicant's proposal is a transportation improvement Project in an existing transportation corridor. Where possible, the Project has widened I-205 to the center to minimize impacts to non-PDA areas located outside the roadway prism.

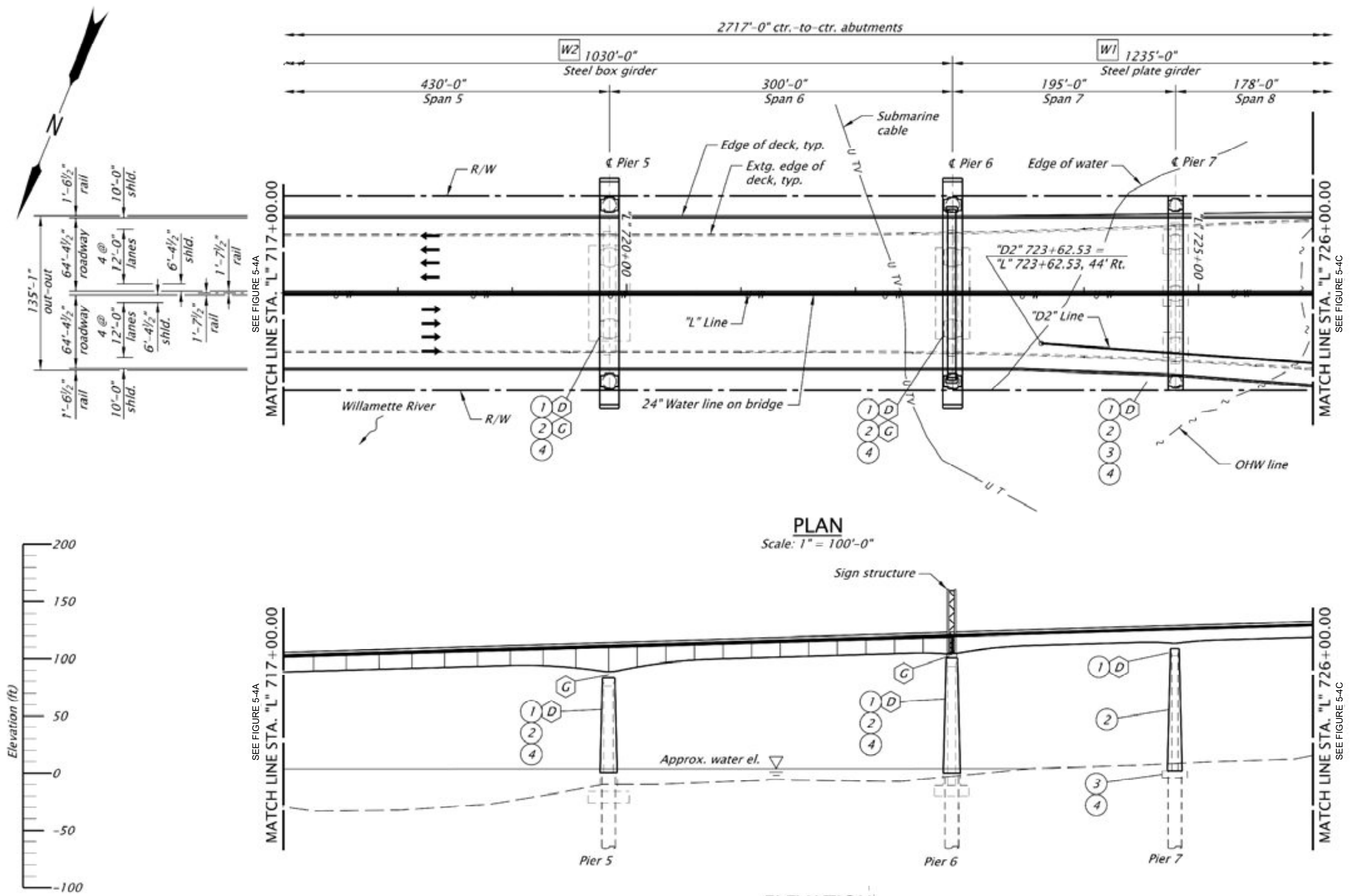
16. Minimize the building, hardscape and disturbance footprint.

Applicant Response: The Applicant's proposal is designed to minimize the disturbance footprint in the WRA to the extent practicable.

17. Consider multi-story construction over a bigger footprint. (Ord. 1623 § 1, 2014; Ord. 1635 § 19, 2014; Ord. 1647 § 5, 2016; Ord. 1662 § 7, 2017)

Applicant Response: To reduce the construction footprint by stacking highway lanes would require extensive reconstruction of the existing highway, resulting in greater environmental impacts and prohibitive costs.

Attachment A. Figures



PLAN
Scale: 1" = 100'-0"

ELEVATION
Scale: 1" = 100'-0"

Notes:
1. Elevations shown are based on North American Vertical Datum (1988).

SEISMIC DEFICIENCY
- 1 Crossbeam flexural/shear strength (LL)
- 2 Column flexural/shear strength (LL)
- 3 Lack of top mat pile cap reinforcing (LL)
- 4 Insufficient pile anchorage (LL)
- 5 Spread footing overturning/strength (LL)

SEISMIC RETROFIT
- A Crossbeam enlargement
- B Column enlargement
- C Pile cap enlargement
- D Substructure replacement
- E Micropiles
- F Spread footing enlargement
- G Bearing replacement
- H Diaphragm replacement
- J Large diameter drilled shafts

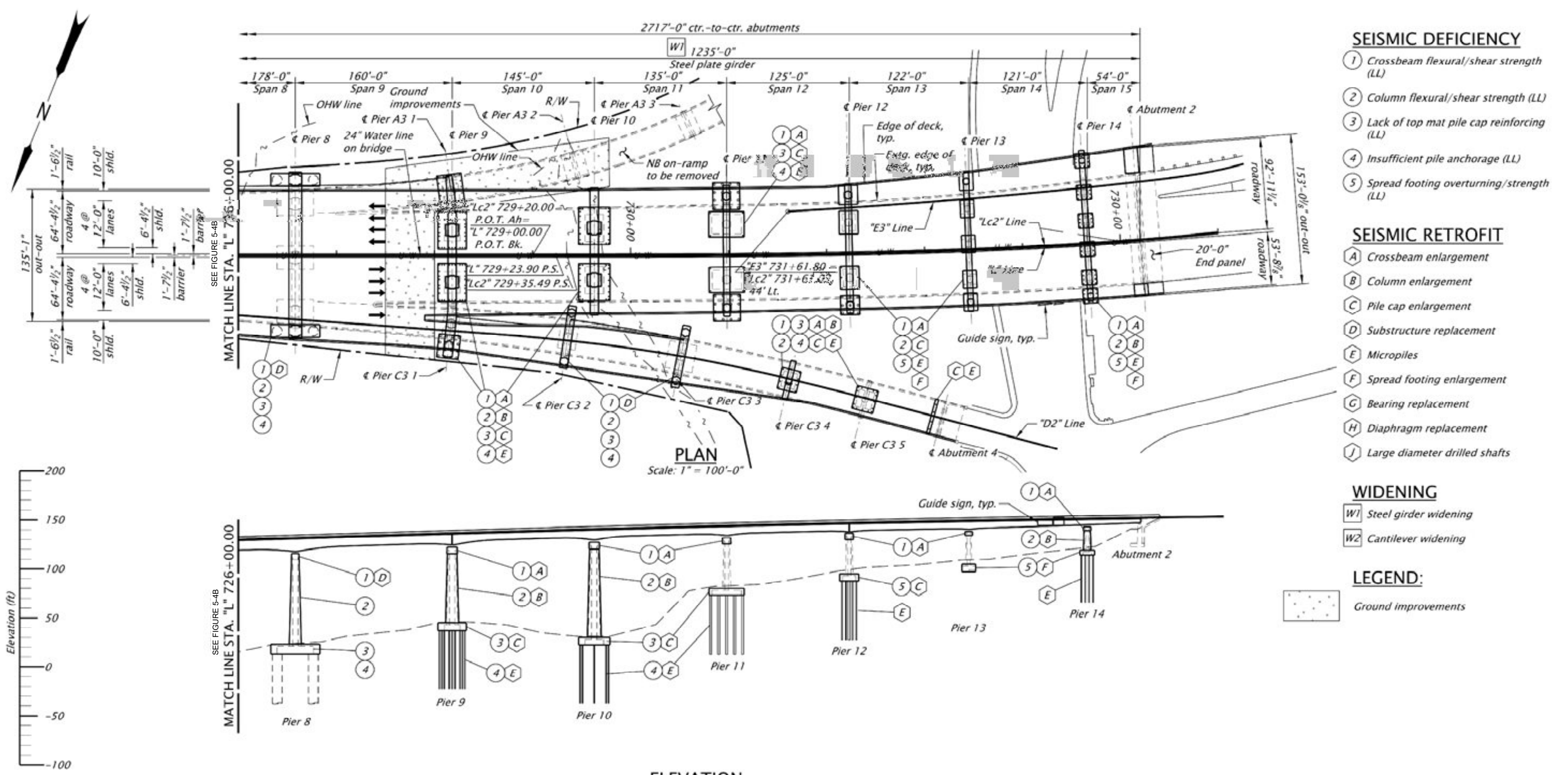
WIDENING
- W1 Steel girder widening
- W2 Cantilever widening

HDR

DATA SOURCE: HDR 2019

I-205 ABERNETHY
WIDENING AND SEISMIC RETROFIT
FIGURE 5-3B

PATH: C:\PROJECTS\STAGING_WORKFROMHOME\I205\JPA\MAP_DOCS\JPA\F5 IMPACTS_SHEET5_3B.MXD - USER: JBEARD - DATE: 4/16/2019



Notes:
1. Elevations shown are based on North American Vertical Datum (1988).

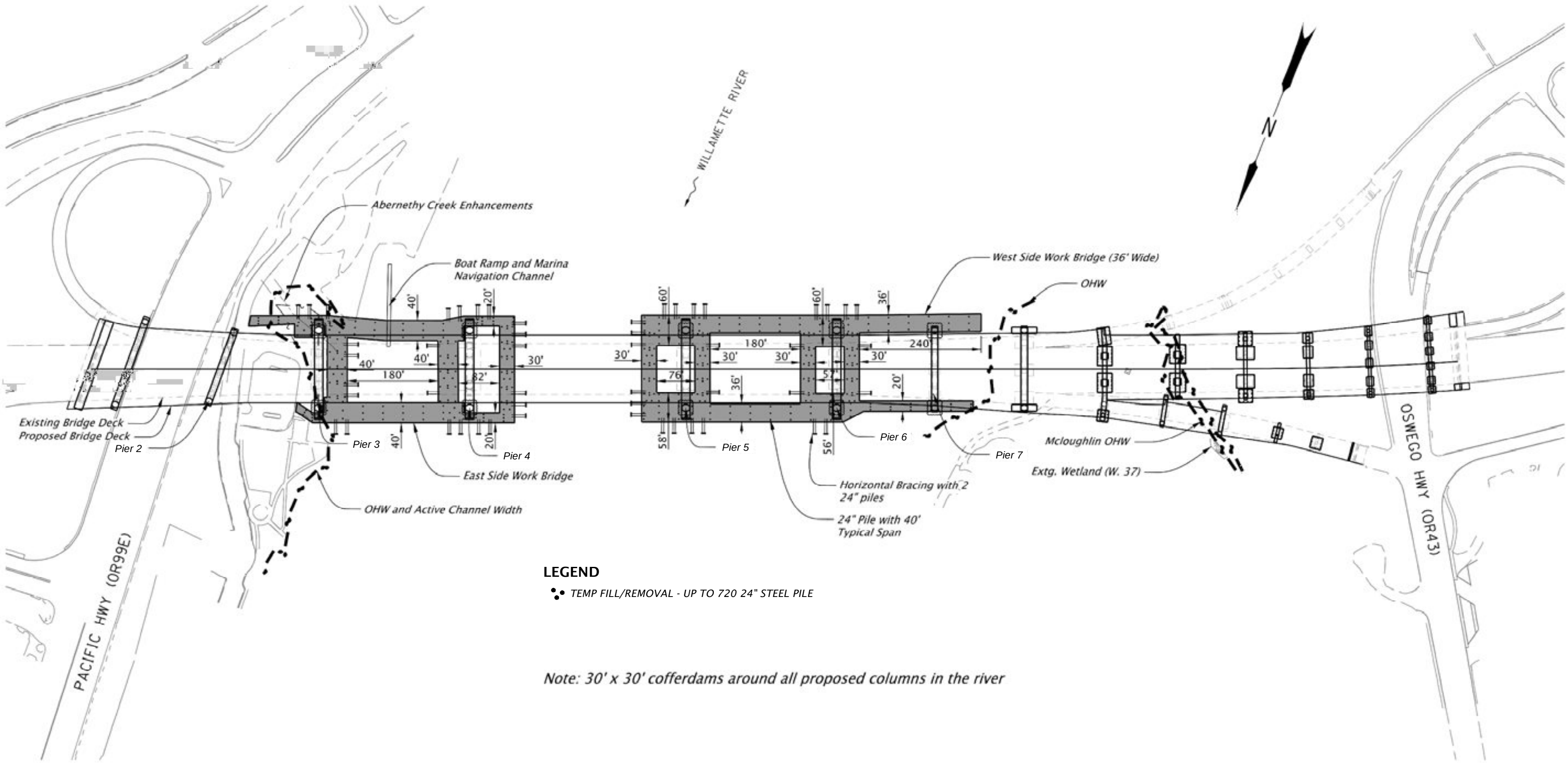
I-205 ABERNETHY

WIDENING AND SEISMIC RETROFIT

FIGURE 5-3C

DATA SOURCE: HDR 2019

PATH: C:\PROJECTS\STAGING_WORKFROMHOME\I205\JPA\MAP_DOCS\JPA\F5 IMPACTS_SHEET5_3C.MXD - USER: JBEARD - DATE: 4/16/2019



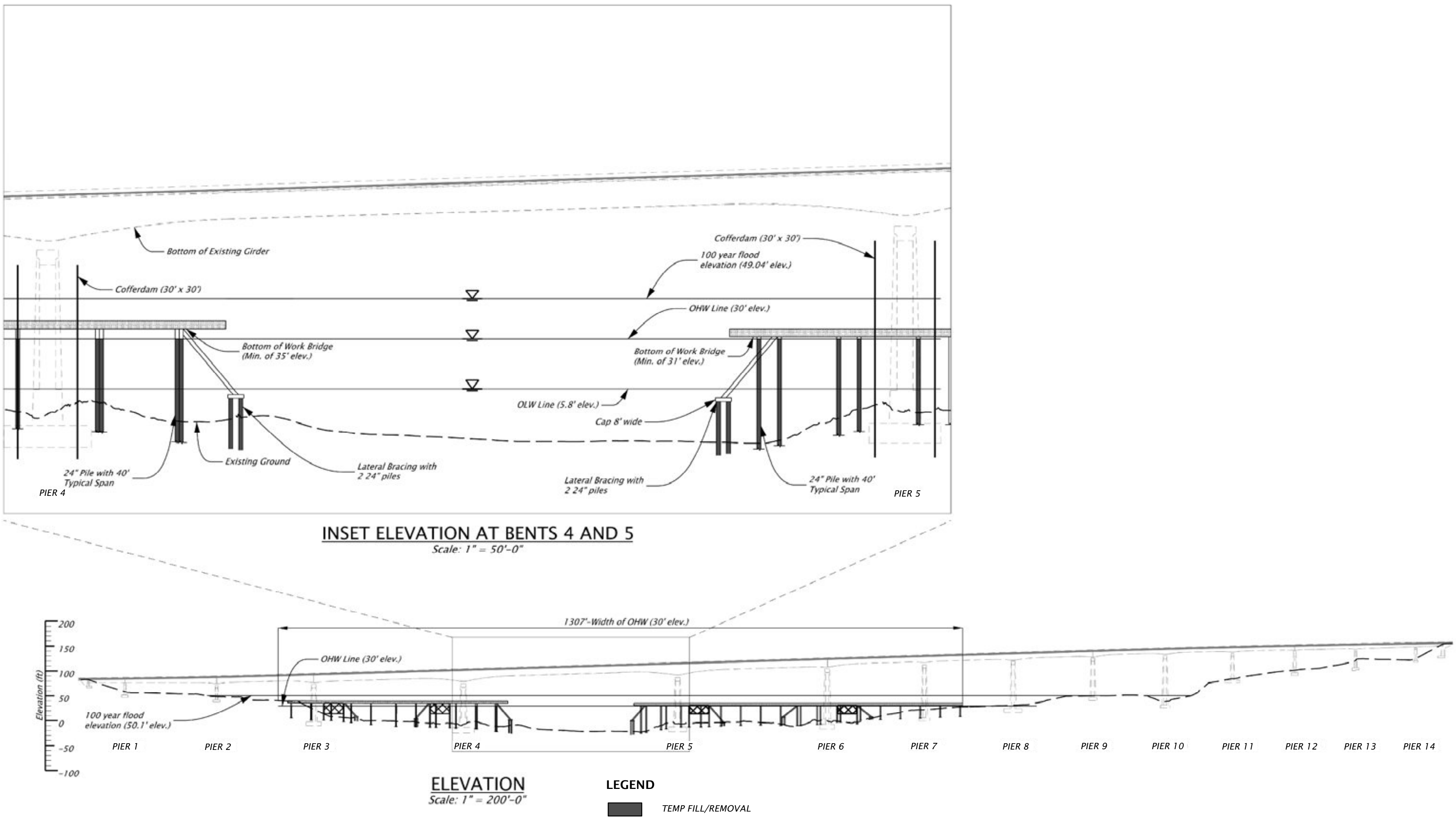
HDR

I-205 ABERNETHY
TEMPORARY WORK BRIDGE

FIGURE 5-7

DATA SOURCE: HDR 2019

PATH: C:\PROJECTS\STAGING_WORKFROMHOME\I205\JPA\MAP_DOCS\JPA\F5 IMPACTS_SHEET_5_7.MXD - USER: JBEARD - DATE: 4/16/2019



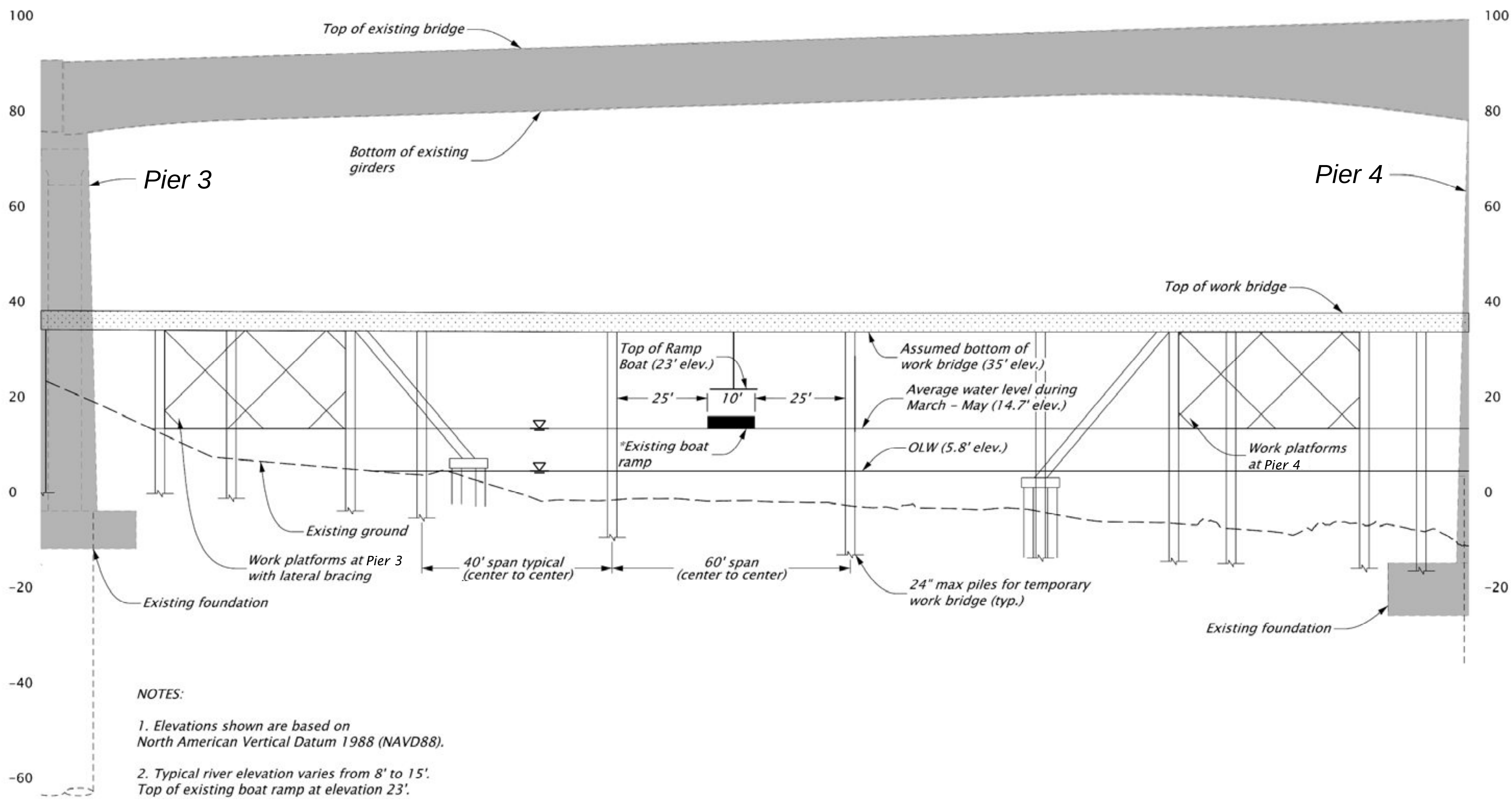
I-205 ABERNETHY

TEMPORARY WORK BRIDGE

FIGURE 5-8

DATA SOURCE: HDR 2019

PATH: C:\PROJECTS\STAGING_WORKFROMHOME\I205\JPA\MAP_DOCS\JPA\F5 IMPACTS_SHEET_5_8.MXD - USER: JBEARD - DATE: 4/16/2019



I-205 ABERNETHY

TEMPORARY CLEARANCE CONSTRAINT OVER SPORTSCRAFT LANDING BOAT RAMP

FIGURE 5-9

DATA SOURCE: HDR 2019

PATH: C:\PROJECTS\STAGING_WORKFROMHOME\I205\JPA\MAP_DOCS\JPA\F5 IMPACTS_SHEET_5_9.MXD - USER: JBEARD - DATE: 4/16/2019

Attachment B. Pre-App Notes

City of West Linn

PRE-APPLICATION CONFERENCE MEETING
SUMMARY NOTES

June 20, 2019

SUBJECT: Proposed I-205 Widening and Seismic Improvements to Abernethy Bridge

FILE: PA-19-15

ATTENDEES:
Applicant: Tom Hamstra, Scott Turnoy (ODOT), Karen Tatman (Quincy Eng.), Michael Bertram, Rachel Barksdale, Brian Bauman (HDR)
Public: Kathie Halicki (WNA), Andrew Robins (WES)
Staff: Darren Wyss (Planning), Amy Pepper (Engineering)

The following is a summary of the meeting discussion provided to you from staff meeting notes. Additional information may be provided to address any "follow-up" items identified during the meeting. <u>These comments are PRELIMINARY in nature</u>. Please contact the Planning Department with any questions regarding approval criteria, submittal requirements, or any other planning-related items. Please note disclaimer statement below.

<u>Site Information</u>

Site Address:	I-205 Corridor
Tax Not No.:	ODOT Right-of-Way
Site Area:	~3.5 miles
Neighborhood:	Bolton, Sunset, and Willamette Neighborhood Associations
Comp. Plan:	NA
Zoning:	NA
Applicable code:	CDC Chapter 27: Flood Management Areas CDC Chapter 28: Willamette and Tualatin River Protection CDC Chapter 32: Water Resource Area Protection

<u>Project Details</u>

The applicant proposes to widen I-205 to add a third general purpose travel lane in each direction and conduct a seismic retrofit of the Abernethy Bridge. The project will also modify the OR 43 Interchange ramps and replace the Sunset Ave., West A St., and Woodbine Rd. bridges. Seismic upgrades will be performed on the 10th St. and Blankenship Rd. bridges. The Broadway St. Bridge will be permanently removed. Proposed structural upgrades to the Abernethy Bridge include replacement of piers, adding columns, increasing foundation sizes, enlarging columns and beams, and other substructure improvements. A drill rig will be used to strengthen subsurface soils. A temporary bridge will be installed to facilitate construction activities. The project includes work in the floodplain and water resource areas. There are existing sanitary sewer, stormwater, and municipal water infrastructure traversing the I-205 right-of-way.

<u>Public Comments</u>

Concern about getting freight through the roundabouts, particularly trucks with double and triple trailer loads (ODOT staff responded that triples are not allowed on Willamette Falls Drive and the roundabout is designed to accommodate doubles with rolled curbs/wide inside lanes). Questions about the sound wall voting process and contention in the neighborhood.

Clackamas County Water Environment Services wanted to ensure the project located the sanitary sewer line running under the Abernethy Bridge on the West Linn side of river and provided a contact for stormwater review.

Engineering Division Comments
Contact Amy Pepper at apepper@westlinnoregon.gov or 503-722-3437 for engineering requirements.

Tualatin Valley Fire & Rescue Comments
Contact Jason Arn at jason.arn@tvfr.com or 503-259-1510

Process
The proposal requires a flood management area permit (FMA), a water resource area permit (WRA), and a Willamette and Tualatin River protection review (WRG). The land use process for all three reviews is performed by the Planning Manager. No public hearing is required. For the proposal, address the submittal requirements and standards for decision-making in Community Development Code (CDC) Chapters 27, 28, and 32. N/A is not an acceptable response to the approval criteria.

The submittal requirements may be waived under CDC 99.035.B, but the applicant must first identify the specific submittal requirement and request, in letter form, that it be waived by the Planning Manager and must identify the specific grounds for that waiver.

There is a deposit of $1,700 for the WRG review, $1,850 deposit for the WRA permit, and $1,050 deposit for the FMA permit.

You may access the West Linn Community Development Code (CDC) online at http://westlinnoregon.gov/cdc.

A neighborhood meeting is not required per CDC 99.038.

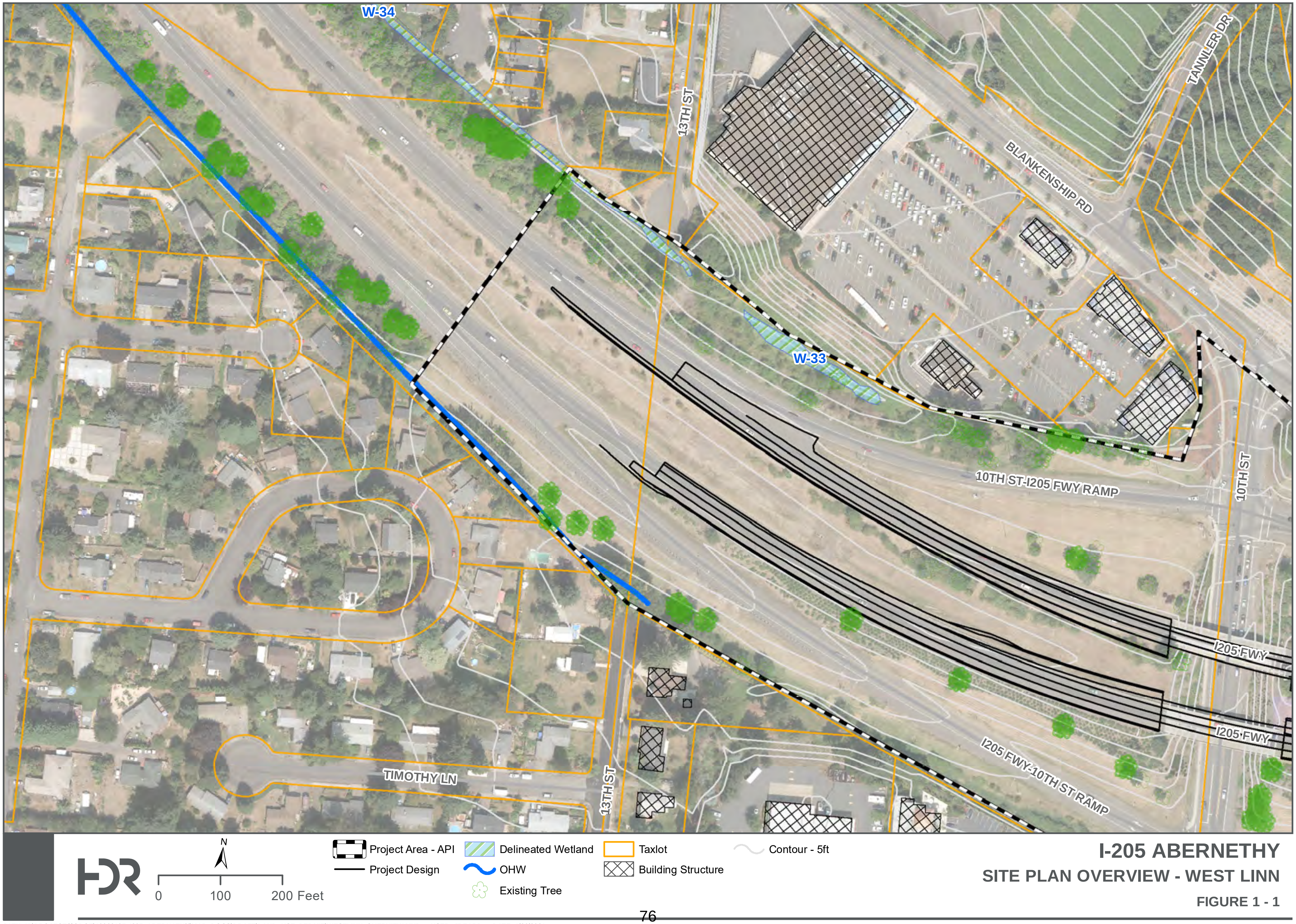
Once the application and deposit/fee is submitted, the City has 30 days to determine if the application is complete or not. If the application is not complete, the applicant has 180 days to make it complete or provide written notice to staff that no other information will be provided.

Once the submittal is deemed complete, staff will provide notice per CDC Chapter 99 and schedule a decision date. Appeals are heard by City Council.

Typical land use applications can take 6-10 months from beginning to end.

DISCLAIMER: This summary discussion covers issues identified to date. It does not imply that these are the only issues. The burden of proof is on the applicant to demonstrate that all approval criteria have been met. These notes do not constitute an endorsement of the proposed application ***or provide any assurance of potential outcomes***. Staff responses are based on limited material presented at this pre-application meeting. New issues, requirements, etc. could emerge as the application is developed. Pre-application notes are void after 18 months. After 18 months with no application approved or in process, a new pre-application conference is required. Any changes to the CDC standards may require a different design or submittal. Substantive changes to the design may require a new pre-application conference.

Attachment C. Site Plan Overview

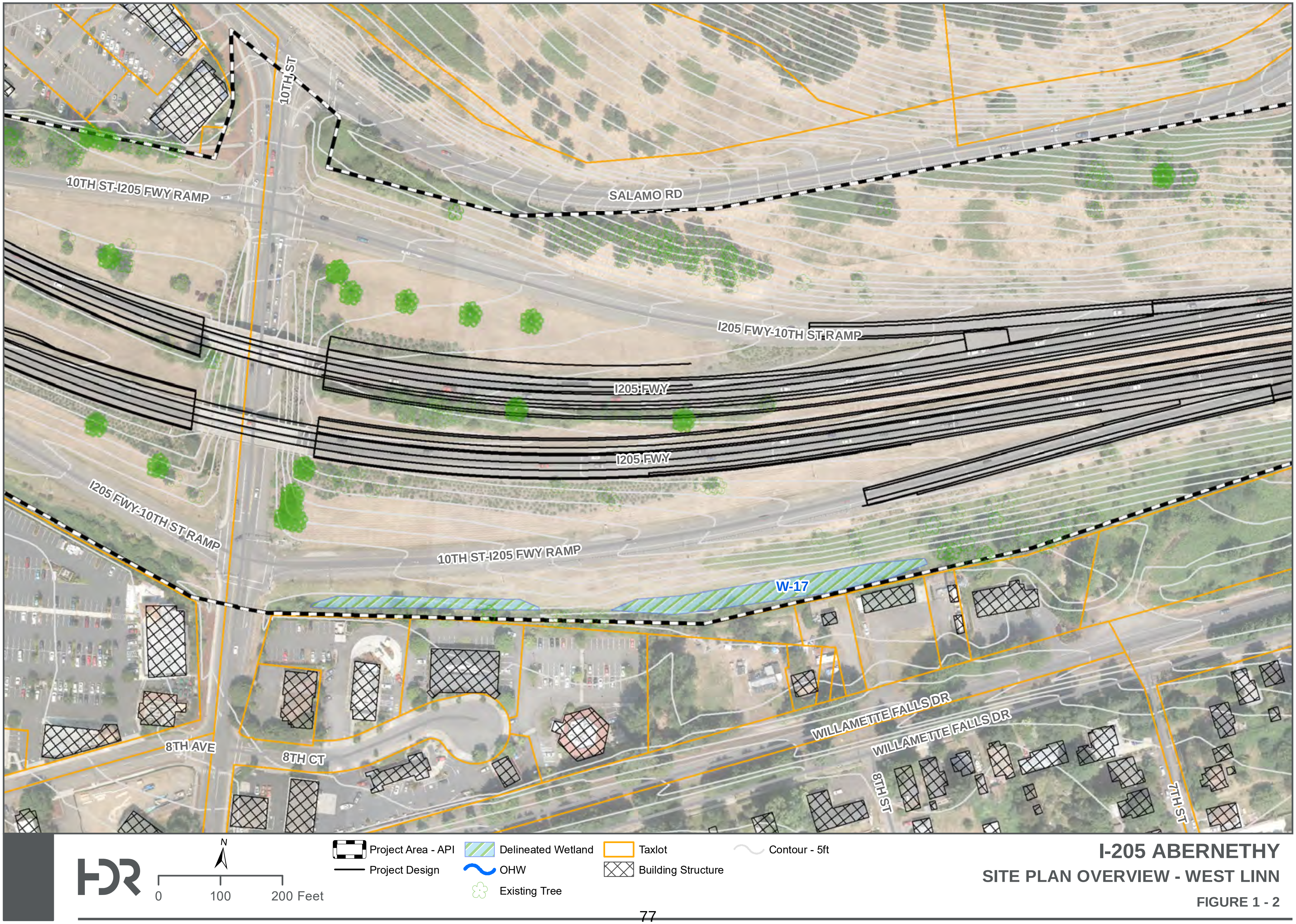


I-205 ABERNETHY

SITE PLAN OVERVIEW - WEST LINN

FIGURE 1 - 1

PATH: X:\PROJECTS\ODOT\10063137_I205_ABERNATHY\MAP_DOCS\DRAFT\LAND_USE_PERMIT\WESTLINN_OVERVIEW.MXD - USER: JBEARD - DATE: 1/26/2021



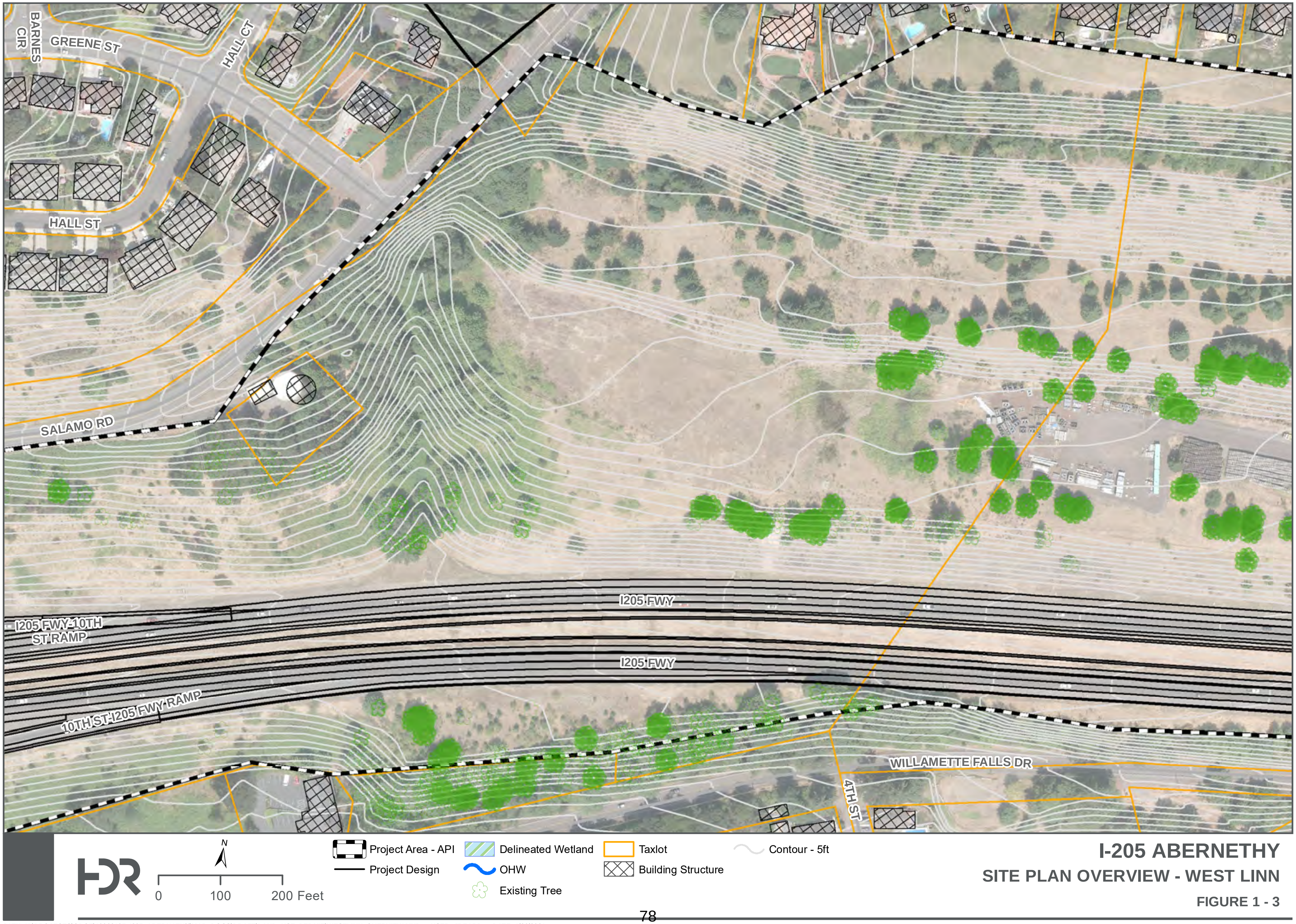
I-205 ABERNETHY

SITE PLAN OVERVIEW - WEST LINN

FIGURE 1 - 2

77

PATH: X:\PROJECTS\ODOT\10063137_I205_ABERNATHY\MAP_DOCS\DRAFT\LAND_USE_PERMIT\WESTLINN_OVERVIEW.MXD - USER: JBEARD - DATE: 1/26/2021



I-205 ABERNETHY

SITE PLAN OVERVIEW - WEST LINN

FIGURE 1 - 3

78

PATH: X:\PROJECTS\ODOT\10063137_I205_ABERNATHY\MAP_DOCS\DRAFT\LAND_USE_PERMIT\WESTLINN_OVERVIEW.MXD - USER: JBEARD - DATE: 1/26/2021

HDR

N

0 100 200 Feet

Project Area - API
Project Design
Delineated Wetland
OHW
Existing Tree
Taxlot
Building Structure
Contour - 5ft

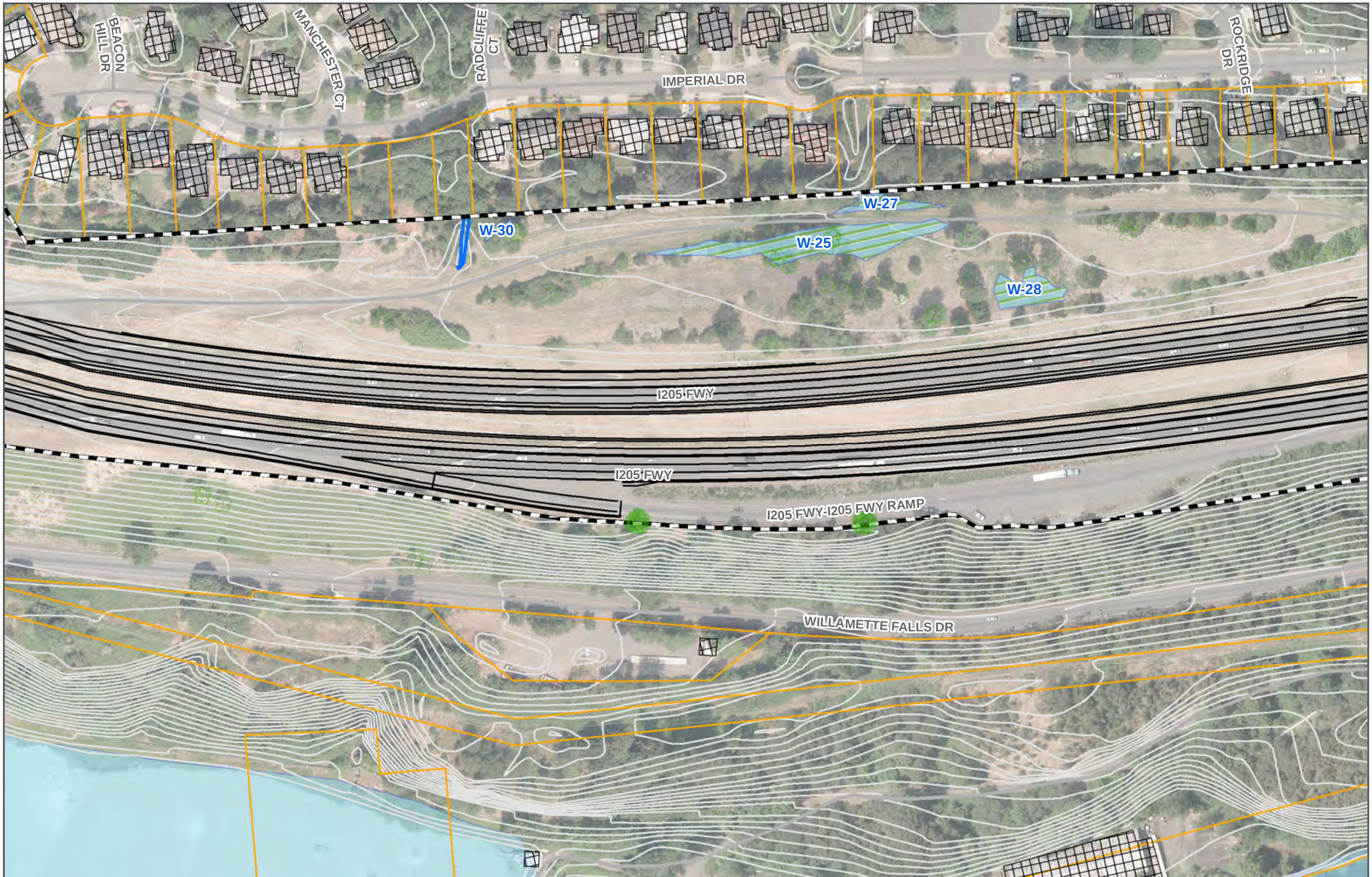
I-205 ABERNETHY

SITE PLAN OVERVIEW - WEST LINN

FIGURE 1 - 4

79

PATH: X:\PROJECTS\ODOT\10063137_I205_ABERNATHY\MAP_DOCS\DRAFT\LAND_USE_PERMIT\WESTLINN_OVERVIEW.MXD - USER: JBEARD - DATE: 1/26/2021



HDR

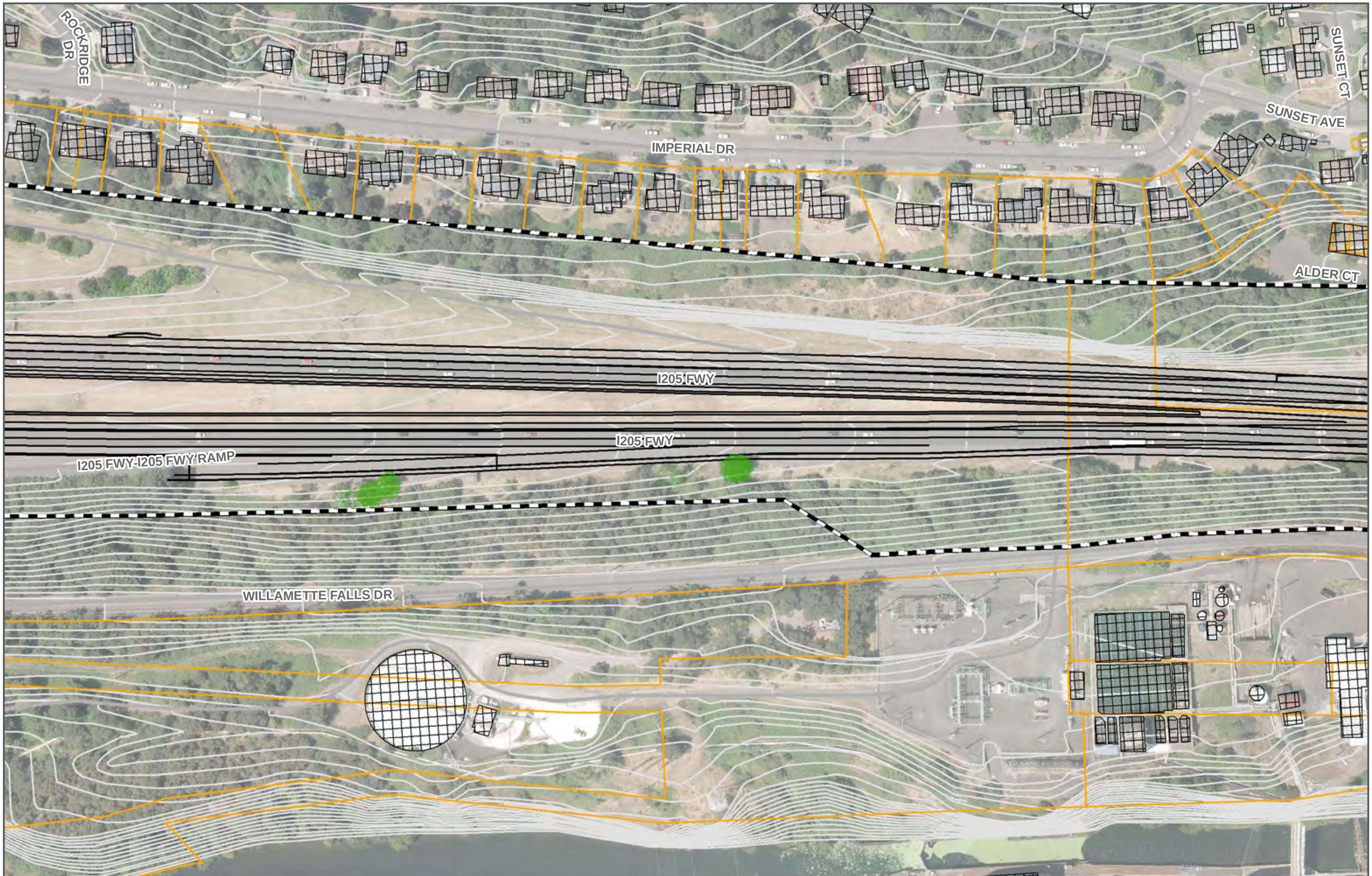
I-205 ABERNETHY

SITE PLAN OVERVIEW - WEST LINN

FIGURE 1 - 5

80

PATH: X:\PROJECTS\ODOT\10063137_I205_ABERNATHY\MAP_DOCS\DRAFT\LAND_USE_PERMIT\WESTLINN_OVERVIEW.MXD - USER: JBEARD - DATE: 1/26/2021

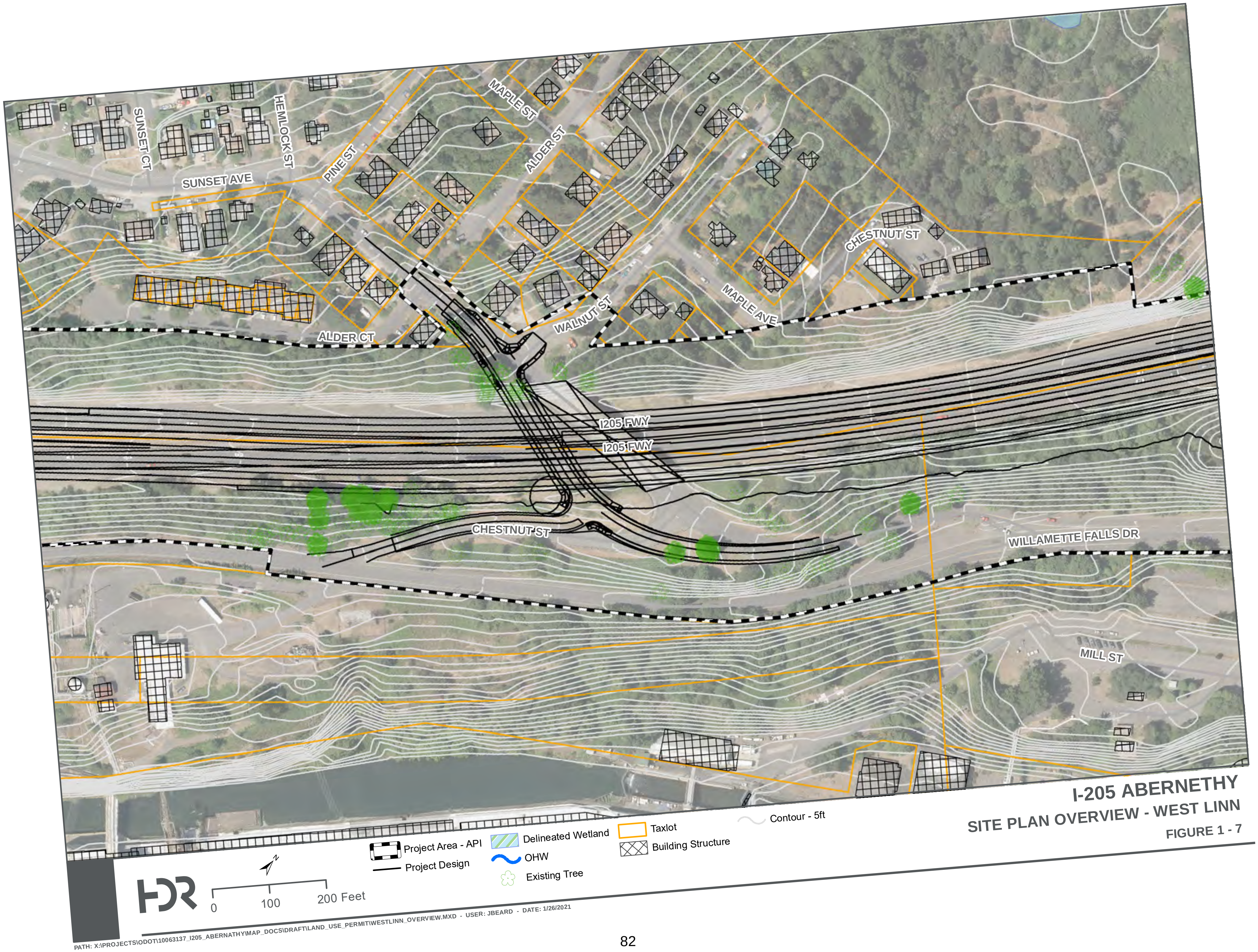


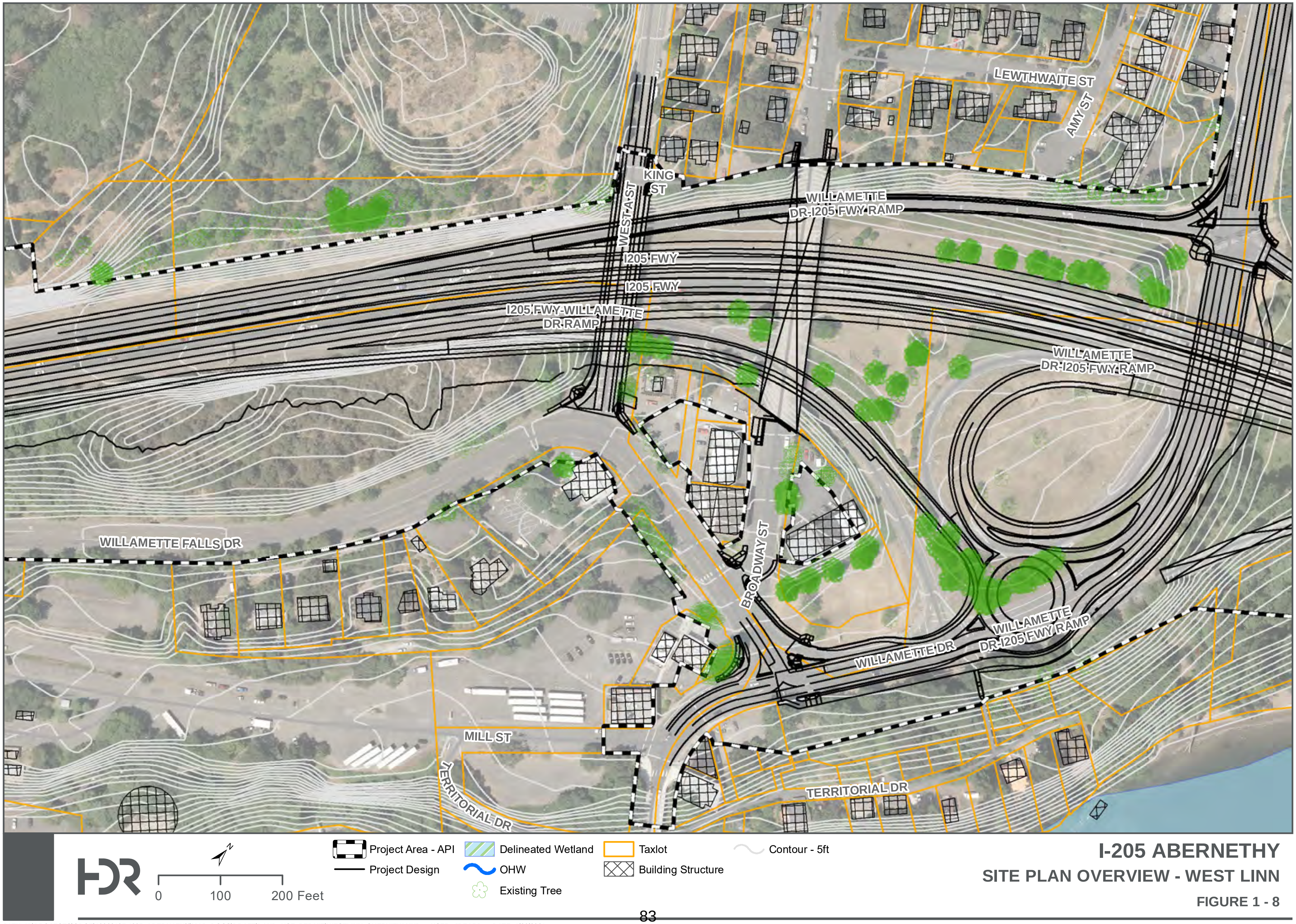
Project Area - API
Project Design
Delineated Wetland
OHW
Existing Tree
Taxlot
Building Structure
Contour - 5ft

0 100 200 Feet

I-205 ABERNETHY
SITE PLAN OVERVIEW - WEST LINN
FIGURE 1 - 6

PATH: X:\PROJECTS\ODOT\10063137_I205_ABERNATHY\MAP_DOCS\DRAFT\LAND_USE_PERMIT\WESTLINN_OVERVIEW.MXD - USER: JBEARD - DATE: 1/26/2021


SUNSET CT
HEMLOCK ST
SUNSET AVE
PINE ST
MAPLE ST
ALDER ST
ALDER CT
WALNUT ST
MAPLE AVE
CHESTNUT ST
I205 FWY
I205 FWY
CHESTNUT ST
WILLAMETTE FALLS DR
MILL ST
I-205 ABERNETHY
SITE PLAN OVERVIEW - WEST LINN
FIGURE 1 - 7
Project Area - API
Project Design
Delineated Wetland
OHW
Existing Tree
Taxlot
Building Structure
Contour - 5ft
0
100
200 Feet
PATH: X:\PROJECTS\ODOT\10063137_I205_ABERNATHY\MAP_DOCS\DRAFT\LAND_USE_PERMIT\WESTLINN_OVERVIEW.MXD - USER: JBEARD - DATE: 1/26/2021



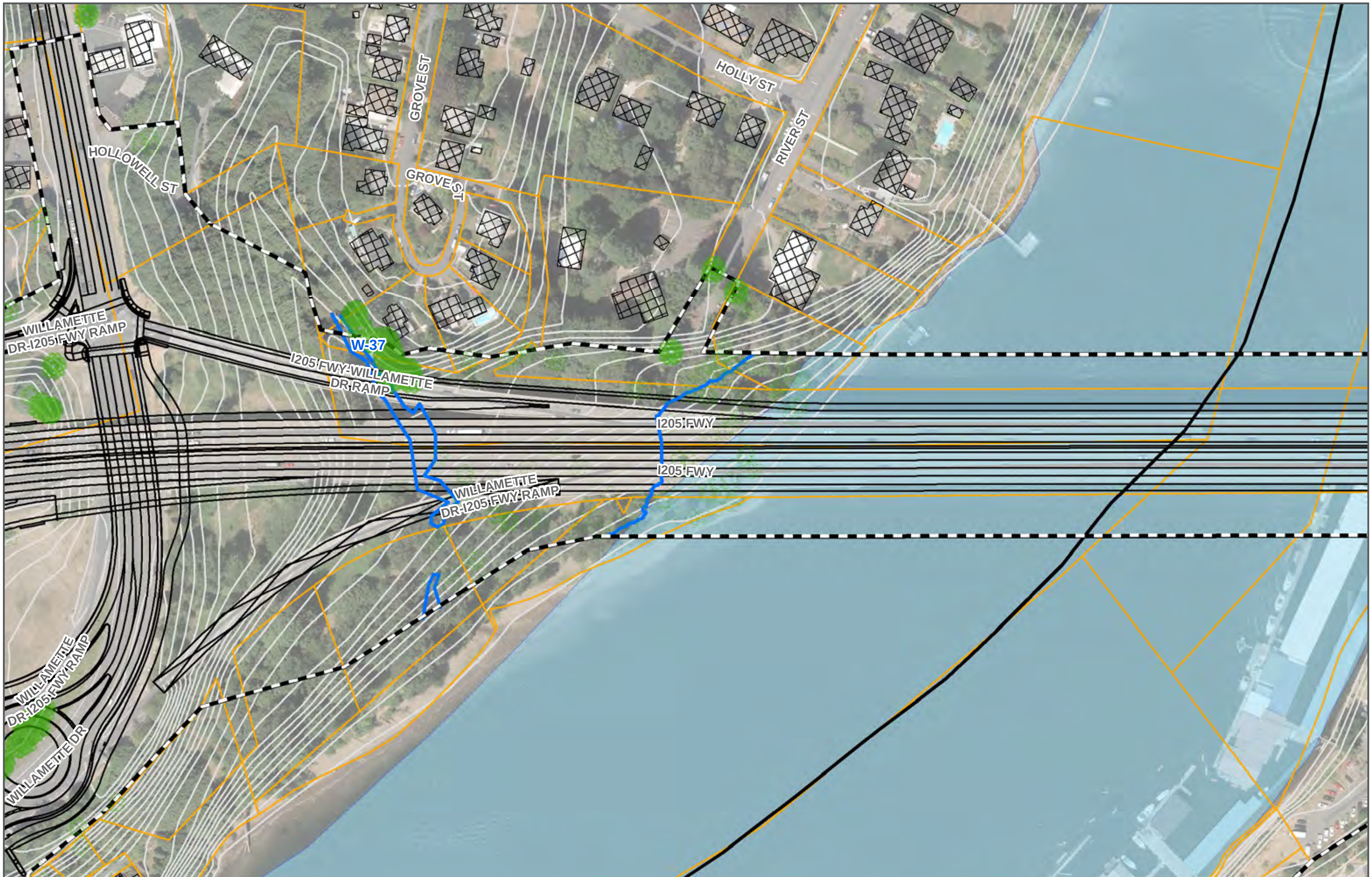
I-205 ABERNETHY

SITE PLAN OVERVIEW - WEST LINN

FIGURE 1 - 8

83

PATH: X:\PROJECTS\ODOT\10063137_I205_ABERNATHY\MAP_DOCS\DRAFT\LAND_USE_PERMIT\WESTLINN_OVERVIEW.MXD - USER: JBEARD - DATE: 1/26/2021



0 100 200 Feet

Project Area - API
Project Design
Delineated Wetland
OHW
Existing Tree
Taxlot
Building Structure
Contour - 5ft

I-205 ABERNETHY

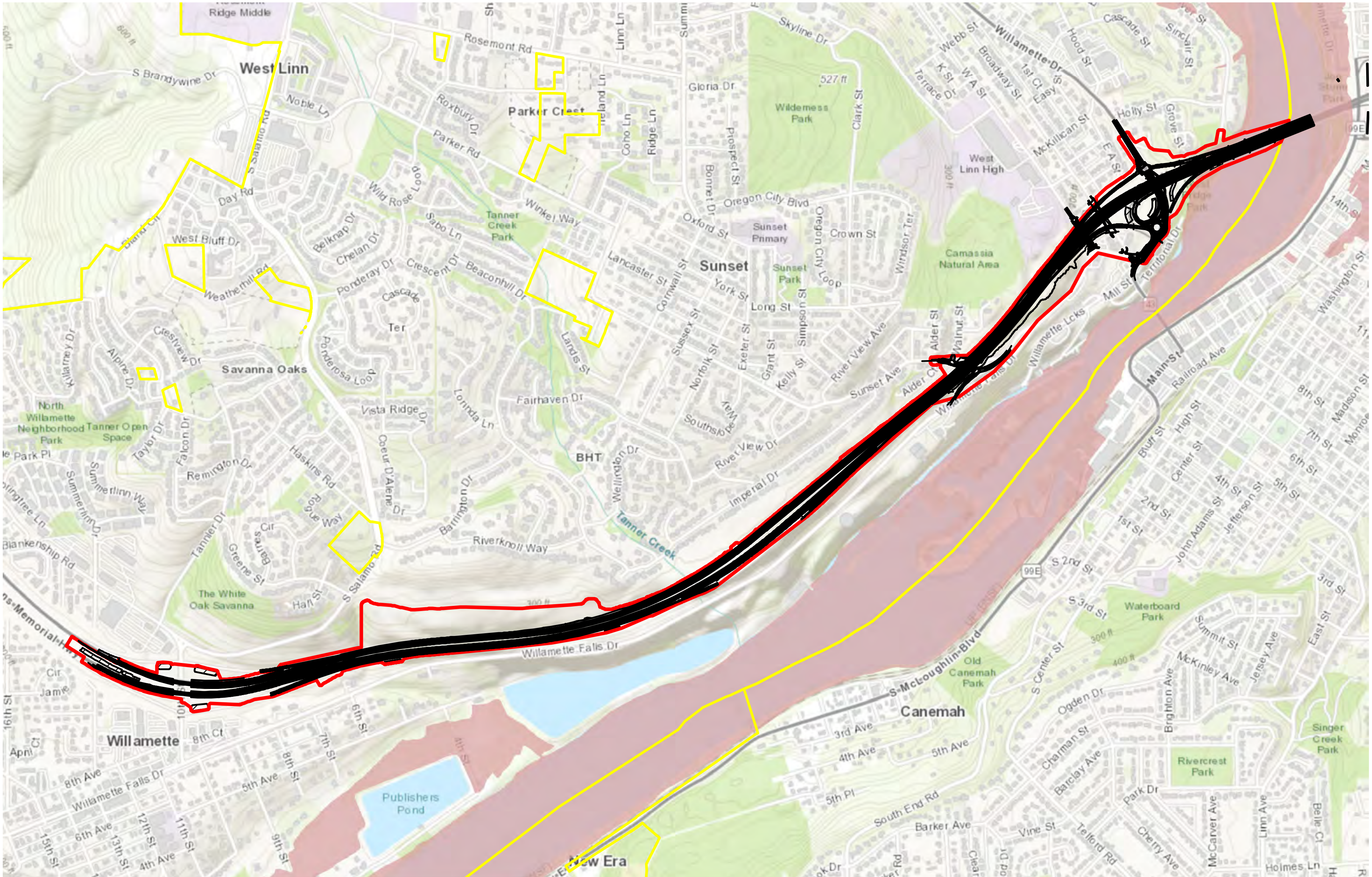
SITE PLAN OVERVIEW - WEST LINN

FIGURE 1 - 9

84

PATH: X:\PROJECTS\ODOT\10063137_I205_ABERNATHY\MAP_DOCS\DRAFT\LAND_USE_PERMIT\WESTLINN_OVERVIEW.MXD - USER: JBEARD - DATE: 1/26/2021

Attachment D. Ch. 27 Flood Management Area Site Map



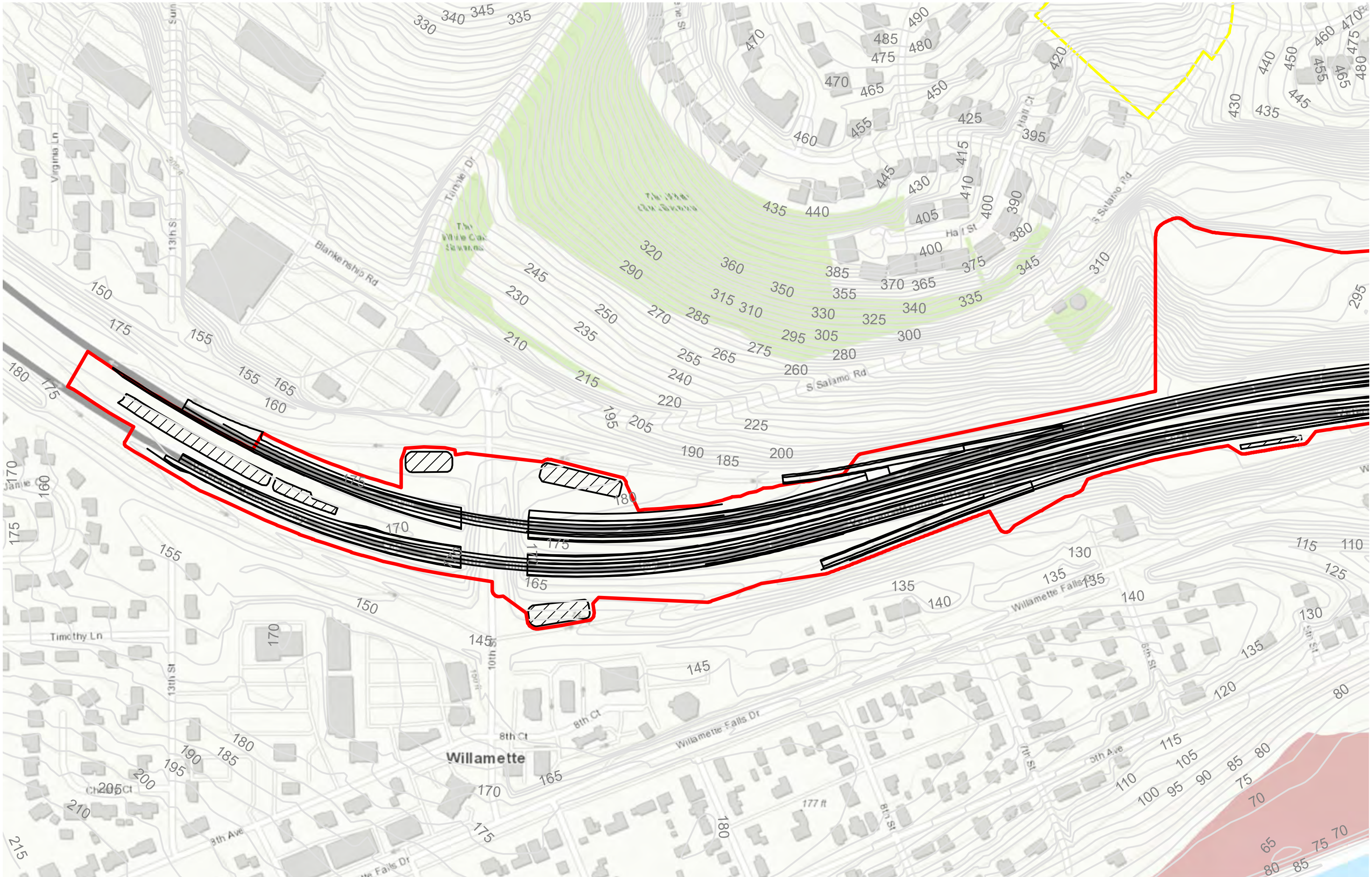
FLOOD MANAGEMENT AREA

SITE MAP

FIGURE 1

87

PATH: C:\USERS\RBARKSDALE\DOCUMENTS\PROJECTS\205 - 10063137\WEST LINN\FLOOD MGMT AREA.MXD - USER: RBARKSDALE - DATE: 1/27/2021



FDR

0 Miles 0.08

Construction Impact Area

City Limits

5-ft contours

Project Design

Flood Management Area

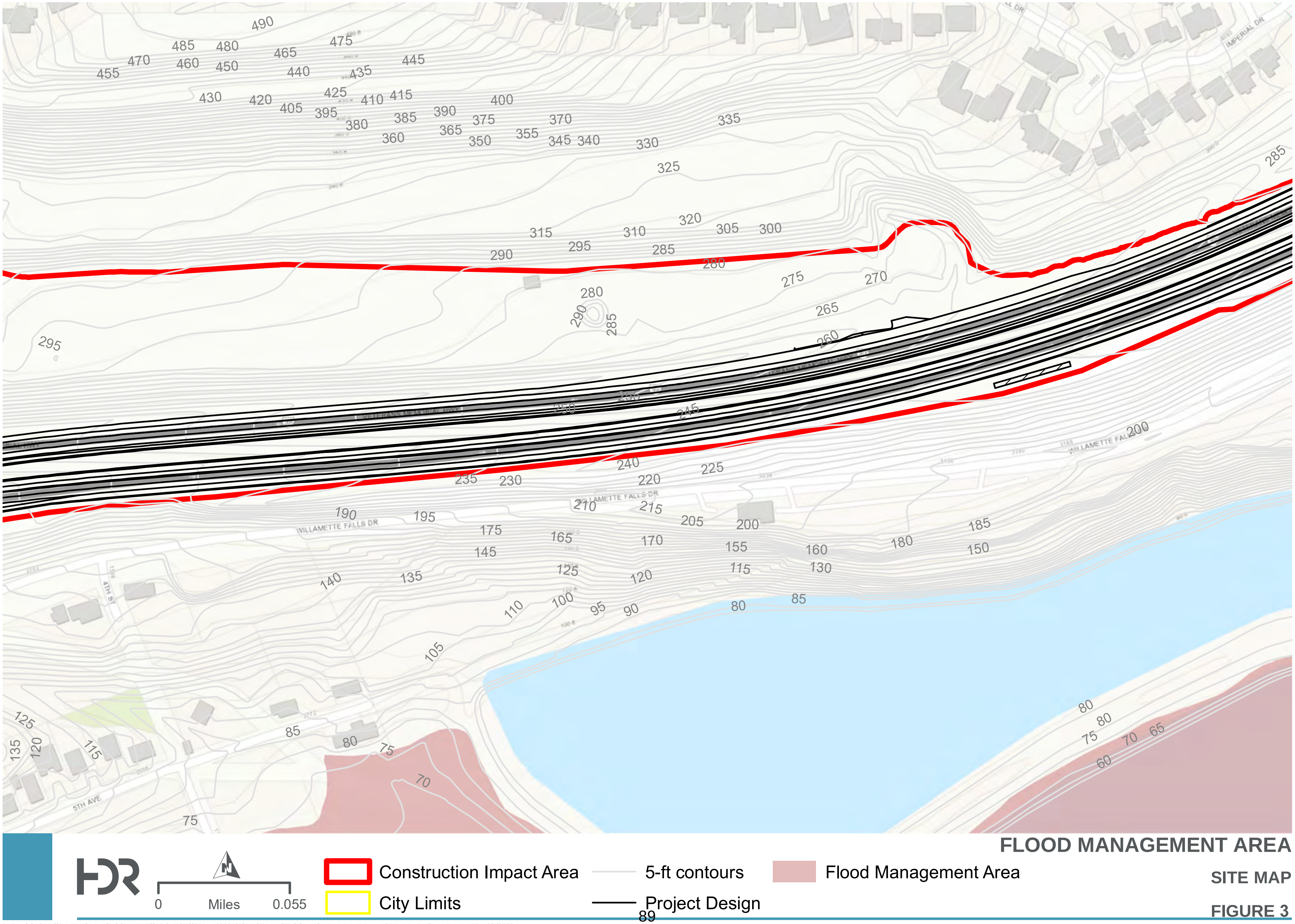
FLOOD MANAGEMENT AREA

SITE MAP

FIGURE 2

88

PATH: C:\USERS\RBARKSDALE\DOCUMENTS\PROJECTS\205 - 10063137\WEST LINN\FLOOD MGMT AREA.MXD - USER: RBARKSDALE - DATE: 1/27/2021

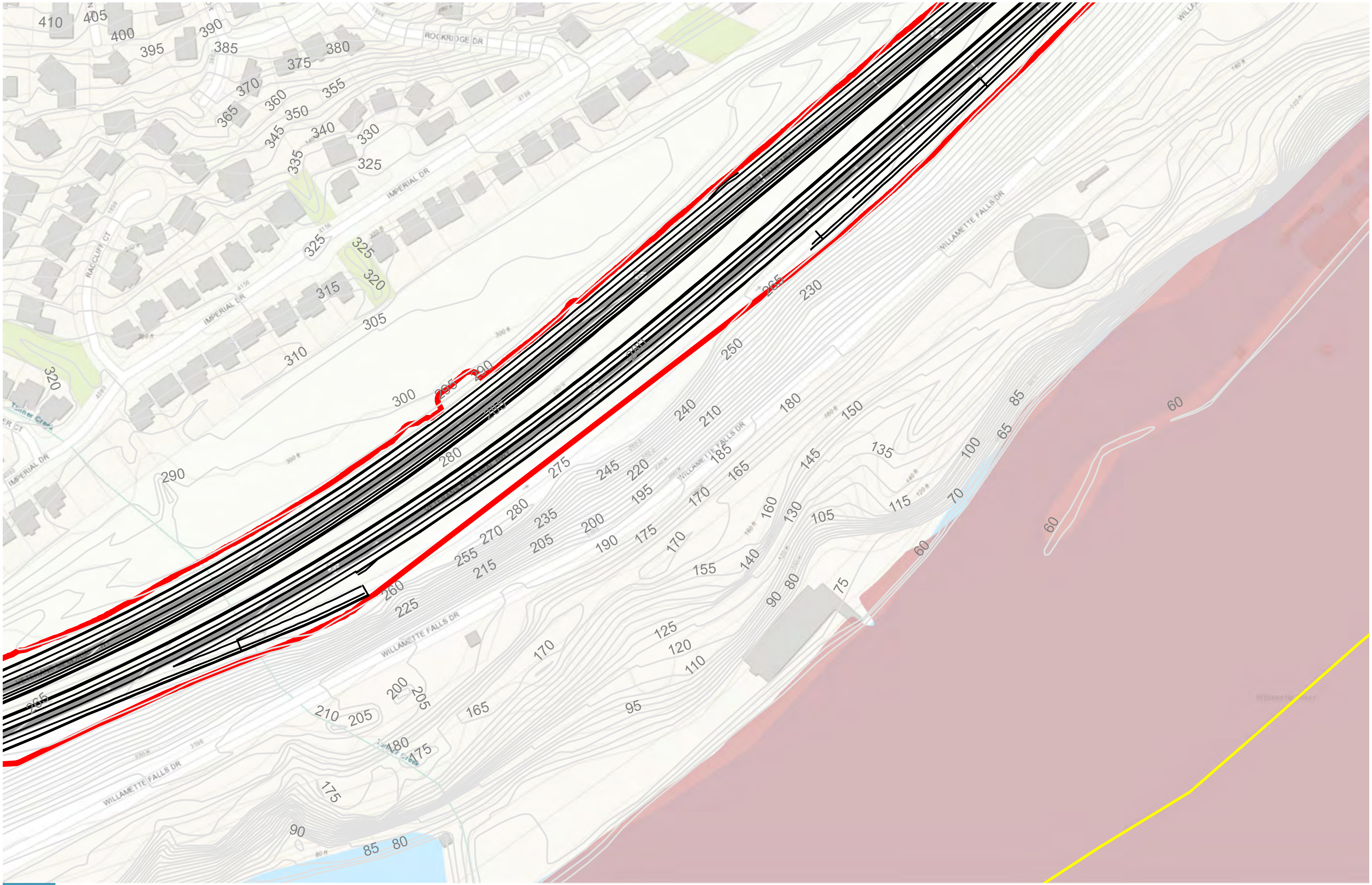


FLOOD MANAGEMENT AREA

SITE MAP

FIGURE 3

PATH: C:\USERS\RBARKSDALE\DOCUMENTS\PROJECTS\205 - 10063137\WEST LINN\FLOOD MGMT AREA.MXD - USER: RBARKSDALE - DATE: 12/5/2020



FLOOD MANAGEMENT AREA

SITE MAP

FIGURE 4

HDR

0 Miles 0.055

Construction Impact Area

City Limits

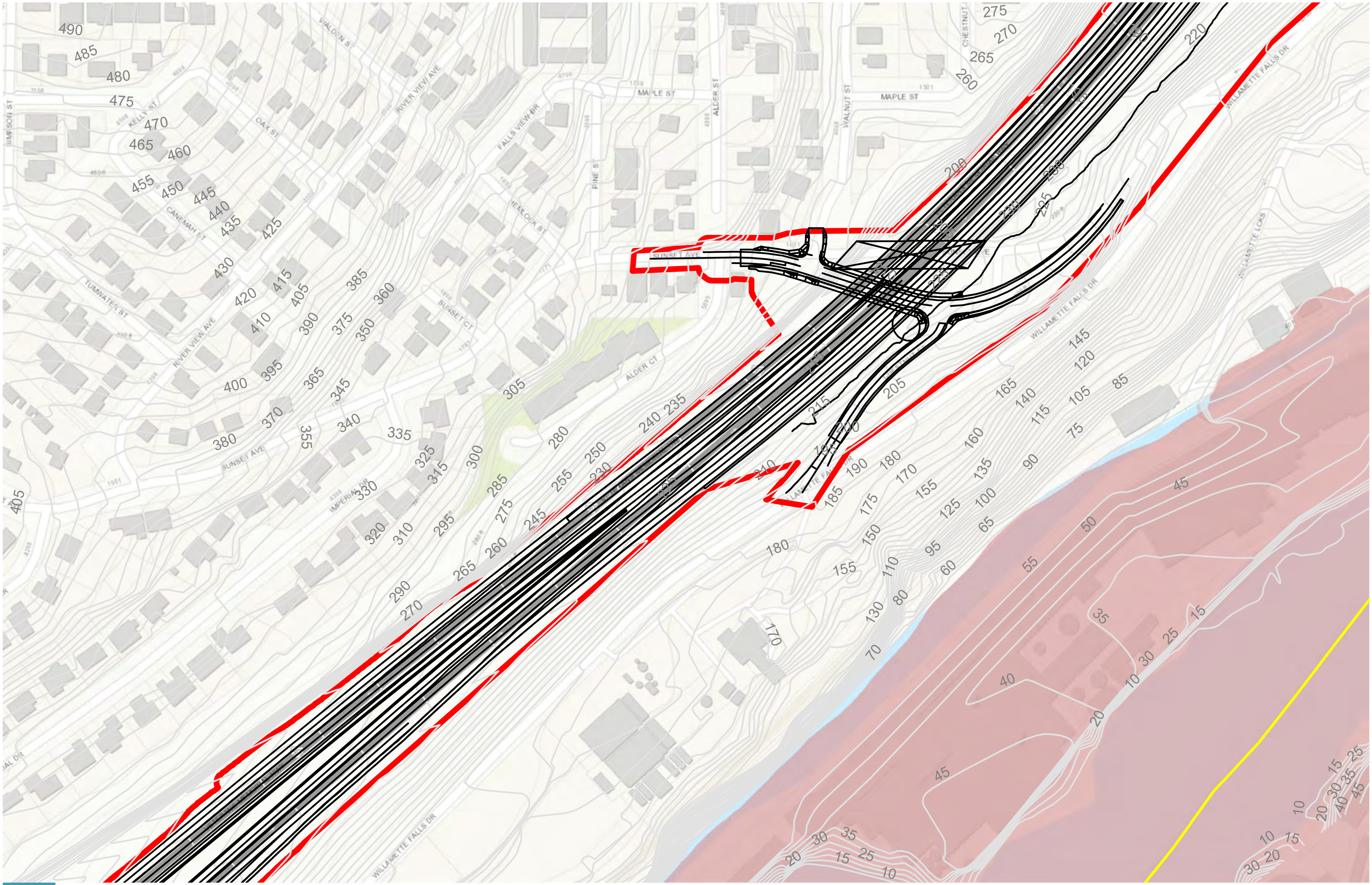
5-ft contours

Project Design

Flood Management Area

90

PATH: C:\USERS\RBARKSDALE\DOCUMENTS\PROJECTS\205 - 10063137\WEST LINN\FLOOD MGMT AREA.MXD - USER: RBARKSDALE - DATE: 12/5/2020



FLOOD MANAGEMENT AREA

SITE MAP

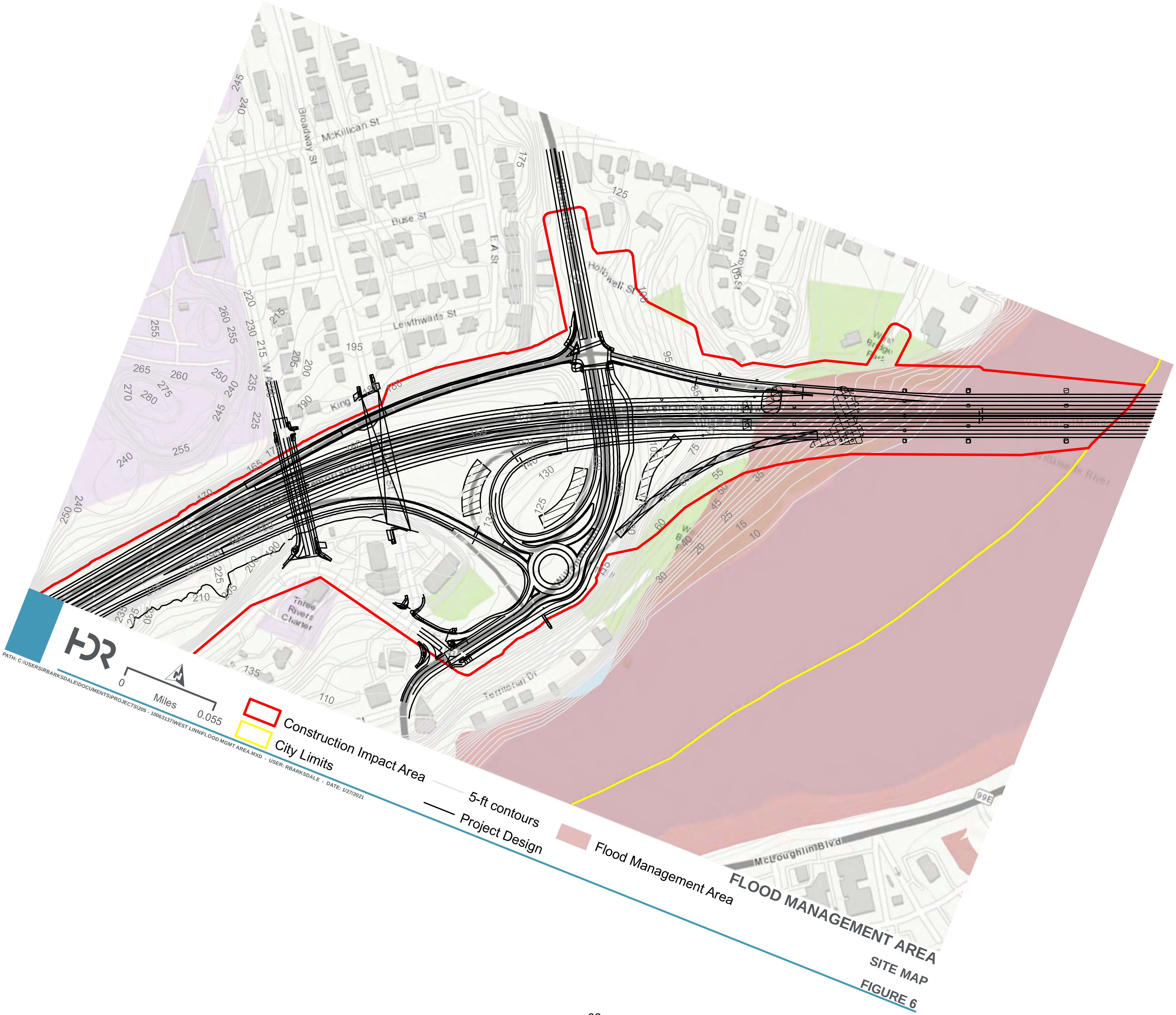
FIGURE 5

Construction Impact Area	City Limits
5-ft contours	Project Design
Flood Management Area	

0 Miles 0.055

91

PATH: C:\USERS\RBARKSDALE\DOCUMENTS\PROJECTS\205 - 10063137\WEST LINN\FLOOD MGMT AREA.MXD - USER: RBARKSDALE - DATE: 12/5/2020


FLOOD MANAGEMENT AREA
SITE MAP
FIGURE 6
Construction Impact Area
City Limits
5-ft contours
Project Design
Flood Management Area
0
Miles
0.055
Broadway St
McKillican St
Buse St
E A St
Holly St
Lewthwaite St
King St
W A St
Three Rivers Charter
Territorial Dr
McLoughlin Blvd
Willamette River
West Bridge Park
99E

Attachment E. Floodplain Cut-Fill Memo

Memorandum

Date:	Thursday, December 03, 2020
Project:	ODOT | K19786 I-205 Improvements: Stafford Road to OR 213
To:	Mike Bertram, HDR PM
From:	Brian Reis, PE - HDR Cory Gieseke, PE - HDR
Subject:	**Willamette River Floodplain Cut and Fill Analysis – West Linn**

The Oregon Department of Transportation's proposed improvements to I-205 extend from Stafford Road in Clackamas County, through the City of West Linn, to OR 213 in Oregon City. This memorandum addresses the City of West Linn's Community Development Code requirements with respect to development in the City's flood management areas. The Community Development Code requires that development, excavation, and fill be performed in a manner to maintain or increase flood storage and conveyance and not increase design flood elevations, 27.060(A). Specifically, with respect to the placement of fill, the Community Development Code requires:

> *No net fill increase in any floodplain is allowed. All fill placed in a floodplain shall be balanced with an equal amount of soil material removal. Excavation areas shall not exceed fill areas by more than 50 percent of the square footage. Any excavation below the ordinary high-water line shall not count toward compensating for fill. 27.060(B)*

> *Excavation to balance a fill shall be located on the same lot or parcel as the fill unless it is not reasonable or practicable to do so. In such cases, the excavation shall be located in the same drainage basin and as close as possible to the fill site, so long as the proposed excavation and fill will not increase flood impacts for surrounding properties as determined through hydrologic and hydraulic analysis. 27.060(C)*

The ordinary high water (OHW) elevation near the Abernethy Bridge is 30.0 feet and the 100-year flood elevation of 48.4 feet on Willamette River is taken from the Flood Insurance Study dated June 17, 2008. Elevations are based on the North American Vertical Datum of 1988.

The proposed project includes replacement of four sets of bridge piers within the City's flood management area (Figure 1). Existing piers 5, 6, 7 and 8 (ten columns in total) will be replaced with eight columns. Figure 2 and Figure 3 illustrate the proposed improvements at piers 7 and 8, respectively. The pier designs at 5 and 6 are similar to that of pier 7. The columns at pier 8 will rest on rectangular shaft caps.

Figure 1. Site Layout

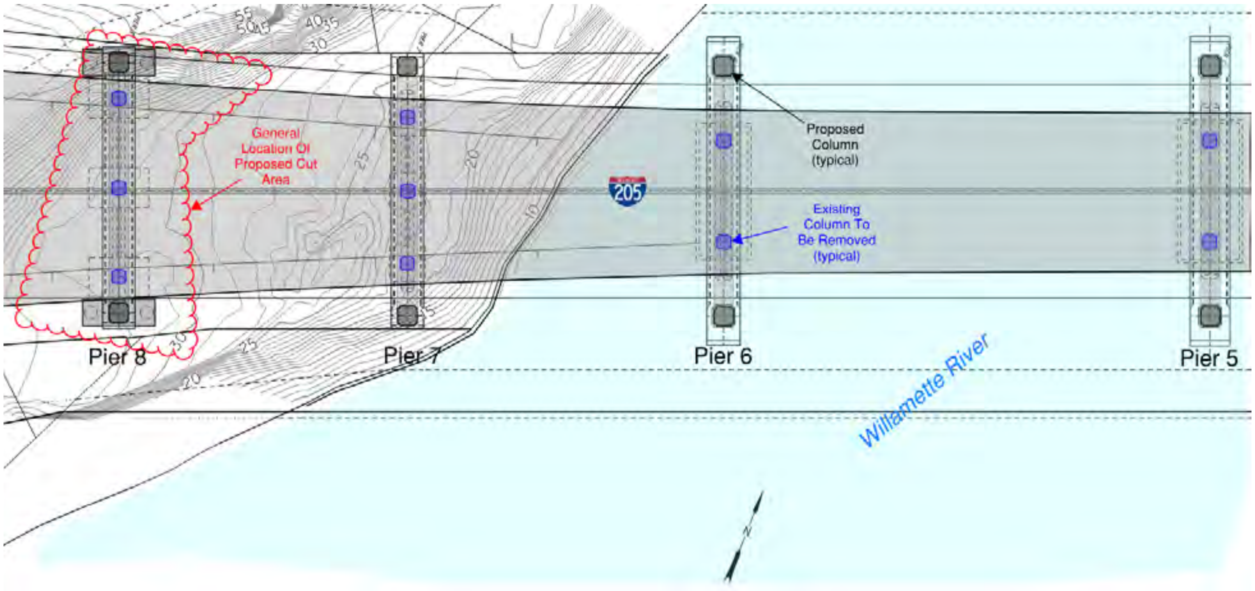


Figure 2. Plan and Elevation View - Pier 7

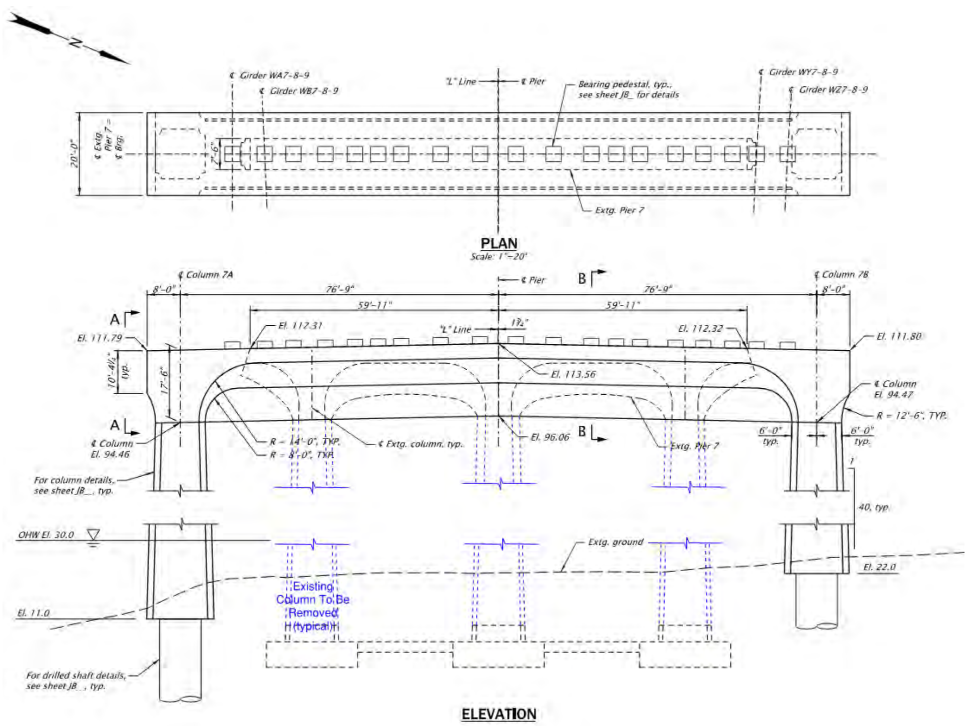


Figure 3. Plan and Elevation View - Pier 8

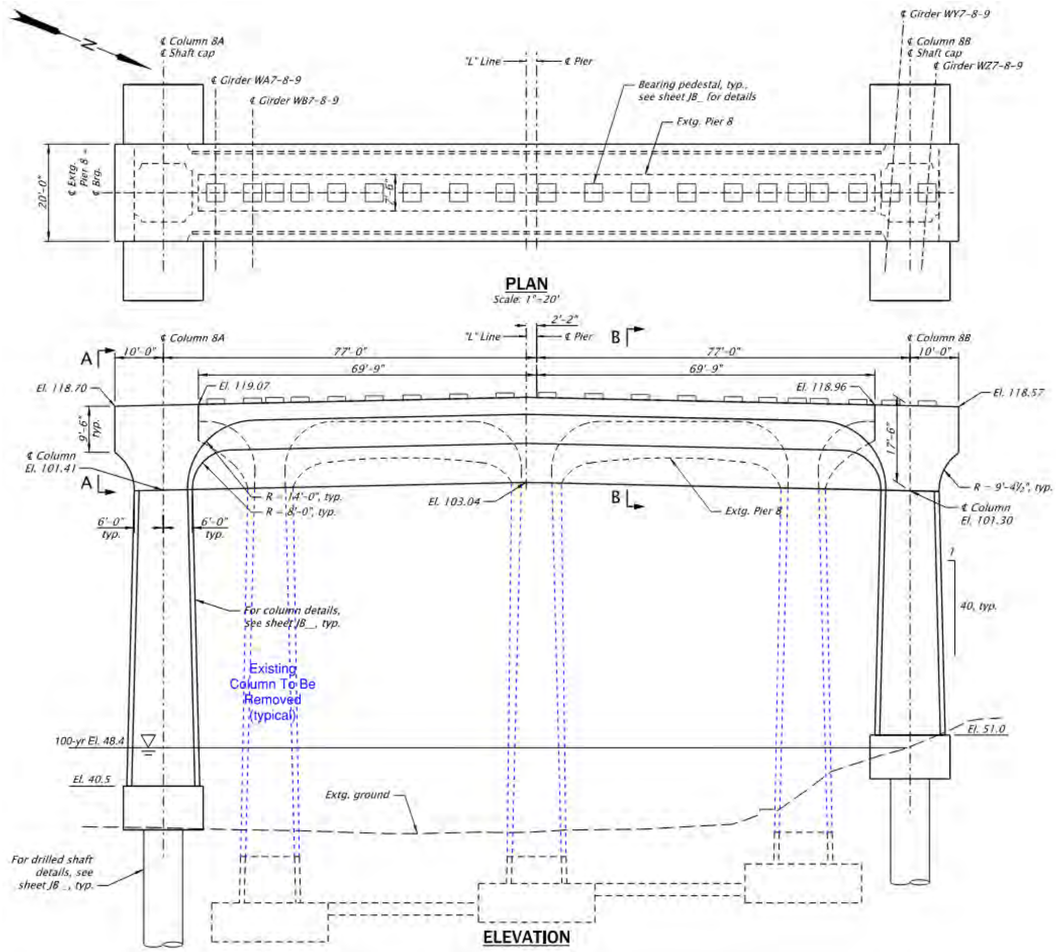


Table 1 includes a summary of existing and proposed volumes between the OHW (30.0 feet) and the 100-year flood elevation (48.4 feet) for piers 5, 6, 7 and 8. The total increase in volume between these elevations is approximately 120 cubic yards. To mitigate the loss of floodplain storage, 120 cubic yards of material will be excavated near pier 8 (Figure 1).

Table 1. Summary of Fill Volumes between Elevations 30.0 Feet and 48.4 Feet

	Volume of Concrete (CY)		
	Existing	**Proposed**	**Difference**
Pier 5	225.3	225.8	--
Pier 6	270.6	225.8	--
Pier 7	254.9	238.7	--
Pier 8	257.3	437.5	--
Total	**1,008.1**	**1,127.8**	**119.7**

Attachment F. No-Rise Memo

Abernethy Bridge No-Rise Memorandum

Date:	Wednesday, September 04, 2019
Project:	ODOT | K19786 I-205 Improvements: Stafford Road to OR 213
To:	Tom Hamstra, ODOT – PM
From:	Mike Bertram, HDR – PM Cory Gieseke, HDR – Hydraulics
Subject:	Task 7.4 Hydraulic Analysis - DRAFT

This memorandum summarizes the approach, analysis, and results associated with the I-205: I-5 to OR 213, Phase 1 project (Project) to satisfy a No-Rise Condition. The Abernethy Bridge crosses the Willamette River between West Linn and Oregon City, Oregon. The Oregon Department of Transportation is currently in the design phase of the Project that includes replacement of piers 3-8, and seismically retrofitting the columns on piers 9 and 10. The proposed construction requires improvements within the Federal Emergency Management Agency (FEMA) 100-year floodway. The Abernethy Bridge has four piers located within the Willamette River channel. Modifications to the structure are limited to one pier located on the west bank of the river.

Because the project features lie within the regulatory floodway as shown on the FEMA Floodway Boundary and Floodway Map (Panel 41005C0276D, dated June 17, 2008 in Attachment A), this project represents an encroachment into the regulatory floodway, requiring it to conform to the requirements of:

Federal Regulation 44 CFR 60.3 (d)(3)

> *(3) Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge.*

Oregon City Regulation: 17.42.190 (A)

> *(A) Encroachments, including fill, new construction, substantial improvements and other development shall be prohibited unless certification by a registered professional engineer or architect is provided demonstrating through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.*

West Linn Regulation: 27.060 (f)

> *(f) Prohibit encroachments, including fill, new construction, substantial improvements, and other development in floodways unless certification by a professional civil engineer licensed to practice in*

the State of Oregon is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.

To demonstrate compliance with the requirements of the cited regulations, the existing FEMA effective model was updated following standard procedures to include the additional cross sections and new project survey information necessary to model the proposed pier modifications under the Abernethy Bridge. Existing and proposed conditions results were compared to determine no rise in the 100-year flood elevation and/or the regulatory floodway elevations would occur as the result of the I-205: I-5 to OR 213, Phase 1 project.

The proposed seismic retrofit bridge modifications in the floodway of the Willamette River at the Abernethy Bridge will meet the requirements of 44 CFR 60.3 (d)(3) based on the analyses performed using the FEMA effective model.

Abernethy Bridge

The Project will replace or modify existing piers located within the floodplain with piers at the same roadway stationing, but spaced farther apart than existing columns to support the widened roadway surface. The proposed diameter of the columns within the river channel (piers 3-6) will be slightly increased. Three existing columns for each pier (piers 7 and 8) on the left overbank will be removed and replaced with two columns per pier. Pier 9 will not be modified, pier C3-1 will be replaced with a slightly larger pier, and pier 10 will be fortified by increasing the size of the existing columns. The proposed construction requires improvements within the FEMA floodway.

In relation to the FEMA cross sections shown on the FIRM panels, the Abernethy Bridge is located approximately 3,400 feet upstream of cross section R in the Flood Insurance Study (FIS), measuring along the river centerline. Cross section S is the closest FEMA cross section located approximately 9,500 feet upstream of the Abernethy Bridge. Attachment A provides the effective FIRM panels, floodway and floodplain maps, and model cross sections.

Effective Model

The FEMA Engineering Library provided the effective model, which represents the data published in the latest FIS for Clackamas County dated June 17, 2008. The effective model was completed for a study that concluded in June 1978 using Hydrologic Engineering Center's HEC-2 software. The model was developed using the National Geodetic Vertical Datum of 1929 (NGVD29); however, the FIS provides elevations in the North American Vertical Datum of 1988 (NAVD88). To convert from NGVD29 to NAVD88, FIS added 3.5 feet to NGVD29 values.

FIS elevations and the converted elevations from the effective model are compared in Table 1. The FIS reports water surface elevations to the nearest tenth of a foot. To stay consistent with the values listed in the FIS, the comparative values extracted from the effective model are also provided to the nearest tenth of a foot.

The Abernethy Bridge was not included in the effective model of the Willamette River, but was added to the corrected effective and existing conditions models. Details of the changes made to include the bridge are covered in the Corrected Effective Model and Existing Conditions Model Sections.

Table 1. FEMA FIS Results Compared to the Effective (HEC-2, Nov. 1976 Version) Model Results – Willamette River

Cross Section	River Station	River Mile	Water Surface Elevations NAVD888 (ft)					
			FIS Results without Floodway	Effective Model Results without Floodway	Difference	FIS Results with Floodway	Effective Model Results with Floodway	Difference
M	118034	22.35	44.0	44.0	0.0	44.7	44.7	0.0
N	122034	23.10	46.1	46.1	0.0	46.8	46.8	0.0
O	125434	23.79	46.2	46.2	0.0	46.9	46.9	0.0
P	126834	24.06	46.8	46.8	0.0	47.5	47.5	0.0
Q	129034	24.50	47.2	47.2	0.0	47.9	47.9	0.0
R	131034	24.90	47.7	47.7	0.0	48.4	48.4	0.0

[a] Feet from Columbia River confluence

Duplicate Effective Model

The effective model was imported from a HEC-2 format into HEC-RAS Version 5.0.7 and rerun to create the duplicate effective model. No revisions were made to the imported effective model. There are five cross sections within the effective model not reported in the FIS. These cross sections were added to Table 2 for comparison purposes.

When comparing the models, the duplicate effective model has slightly higher water surface elevations than the effective model. The differences range from 0.0 feet at the downstream end of the model, to 0.3 feet at the upstream end of the reach. These differences can be attributed to the variation (especially near bridges) of the calculation methods and algorithms used by the different programs.

Table 2. Effective (HEC-2, Nov. 1976 Version) model Compared to Duplicate Effective (HEC-RAS Version 5.0.7) Model Results – Willamette River

Cross Section	River Mile	Water Surface Elevations NAVD88 (ft)					
		Effective Model Results without Floodway	Duplicate Effective Model Results without Floodway	Difference	Effective Model Results with Floodway	Duplicate Effective Model Results with Floodway	Difference
M	22.35	44.02	44.02	0.00	44.72	44.72	0.00
N	23.10	46.06	46.10	0.04	46.78	46.81	0.03
O	23.79	46.24	46.30	0.06	46.89	46.91	0.02
P	24.06	46.82	46.89	0.07	47.48	47.52	0.04
Q	24.50	47.20	47.26	0.06	47.91	47.94	0.03
R	24.90	47.69	47.77	0.08	48.38	48.41	0.03
Not included in FIS, but included in the effective model	25.32	48.25	48.39	0.14	48.98	49.01	0.03
	25.73	49.35	49.44	0.09	50.19	50.25	0.06
	25.98	48.79	48.88	0.09	49.64	49.67	0.03
	26.08	49.09	49.20	0.11	49.83	49.92	0.09
	26.42	51.22	51.45	0.23	52.30	52.48	0.18

[a] River miles from Columbia River confluence

Corrected Effective Model

The duplicate effective model was updated to correct known errors and include improved information, creating the corrected effective model. The following updates were made to the duplicate effective model in order to create the corrected effective model:

- Cross sections 22.35 (M), 23.1 (N), 23.79 (O), and 26.42 were removed from the model to condense the number of cross sections to be updated as part of the corrected effective model.
  - This condensed model was rerun and found to match the results of the duplicate effective model.
- Bank stations were adjusted in most cross sections to correct misplaced bank stations (i.e., stations on bottom of river, inconsistent bank station elevations within the same cross sections).
- The Abernethy Bridge was added to the model at Station 25.55.
  - The upstream and downstream cross section geometries, 25.56 and 25.53, respectively, were based on information from the as-built plans for the bridge. The same terrain profile was used for upstream and downstream.

  - Piers were added based on the as-built drawings and existing survey information. A 27-degree skew was assumed. Due to the skew angle, bents were modeled as multiple piers to represent the actual blockages in the direction of flow.
- Cross sections 24.50 and 24.90 (FIS cross sections Q and R) were extended on the right bank to high ground to include the entire flow areas.
- Cross section 26.08 was extended on the left bank to contain the flow. Negative signs at Stations 230 and 370 were removed to correct an assumed error.
- Cross section 25.98 had a station/elevation point removed at Station 250. It was assumed that a negative sign was missed in the original model, there is no evidence that any structure ever protruded out of the water as the cross section represented.
- Cross section 25.73 had a station/elevation point removed at Station 1100. It was assumed that in the original model this feature represented the impact of the floating marinas located in this section of the river, there is no evidence that any structure ever protruded out of the water as the cross section represented. A higher Manning's n value of 0.15 was used for the portion of the cross section where the marina is located.
- At Station 25.53, the downstream face of the Abernethy Bridge had a Manning's n value of 0.15 applied to define a floating marina from an aerial image dated September 13, 1975.
- The encroachment stations for the added bridge cross sections, 25.56 and 25.53, were measured from the published floodway boundaries.

A comparison of the cross sections between the duplicate effective and the corrected effective models are provided in Attachment B. Table 3 compares the modeled water surface elevations between the two models. The most noticeable change in the modeled results is increased water surface elevations in the cross sections directly upstream of the added Abernethy Bridge.

Table 3. Duplicate Effective (HEC-RAS Version 5.0.7) Model Compared to Corrected Effective (HEC-RAS Version 5.0.7) Model Results – Willamette River

Cross Section	River Mile	Water Surface Elevations NAVD88 (ft)					
		Duplicate Effective Model Results without Floodway	Corrected Effective Model Results without Floodway	Difference	Duplicate Effective Model Results with Floodway	Corrected Effective Model Results with Floodway	Difference
P	24.06	46.89	46.89	0.00	47.52	47.52	0.00
Q	24.50	47.26	47.36	0.10	47.94	47.95	0.01
R	24.90	47.77	47.58	-0.19	48.41	48.29	-0.12
*	25.32	48.39	48.17	-0.22	49.01	48.88	-0.13
**	25.53	--	49.51	--	--	50.24	--

Table 3. Duplicate Effective (HEC-RAS Version 5.0.7) Model Compared to Corrected Effective (HEC-RAS Version 5.0.7) Model Results – Willamette River

Cross Section	River Mile	Water Surface Elevations NAVD88 (ft)					
		Duplicate Effective Model Results without Floodway	Corrected Effective Model Results without Floodway	Difference	Duplicate Effective Model Results with Floodway	Corrected Effective Model Results with Floodway	Difference
Abernethy Bridge							
**	25.56	--	49.69	--	--	50.44	--
*	25.73	49.44	49.83	0.39	50.25	50.66	0.41
*	25.98	48.88	49.49	0.61	49.67	50.31	0.64
*	26.08	49.20	49.49	0.29	49.92	49.69	-0.23

[a] River miles from Columbia River confluence
* Not included in FIS, but included in the effective model
** Included to model the Abernethy Bridge

Existing Conditions Model

The existing conditions model was created by updating the corrected effective model with new bathymetric survey data collected between cross sections 24.50 and 26.08. Cross sections at the upstream and downstream faces of the bridge were extracted from the recent bathymetric survey to capture effects of riprap removal. In addition to channel survey data, the overbank areas were updated using available light detection and ranging (LiDAR) information for cross sections 24.06, 24.50, 24.90, 25.32, 25.53, and 25.56. The Manning's n value used to represent a floating marina adjacent to the right bank directly downstream of the Abernethy Bridge was removed, because that feature is not present in existing conditions. The increased Manning's n value remained upstream of the bridge for the existing marina.

There are significant differences in the left overbank in cross section 25.53 between the corrected effective and existing conditions models. The elevations in the existing conditions model are up to 30 feet higher than in the corrected effective model. This difference is attributable to the terrain information from as-built plans used for the bounding cross sections profile of the bridge in the corrected effective model, which only provided the centerline profile of the bridge. The existing conditions model was updated with current channel bathymetry information combined with LiDAR data for the overbank areas. There is a significant hillside located on the downstream face of the bridge on the left overbank. This hillside is captured in the LiDAR data but not in the as-built information.

The channel cross sections located at the upstream and downstream faces of the bridge, cross sections 25.56 and 25.53, respectively are at a skew of 27 degrees to the river. To account for this in the model, the cross sections a skew factor of 27 degrees was applied. This skew factor corrects the cross section to approximate a model cross section normal to the channel.

This model represents the existing condition for the No-Rise Analysis intended to perform a relative comparison of the difference between existing and proposed conditions water surface elevations, not absolute elevations. Table 4 compares the results of the corrected effective and existing conditions models. The largest differences in water surface elevations were found in the cross sections that were updated the most when comparing the original model geometry to recent surveyed cross sections (Attachment B).

Table 4. Corrected Effective (HEC-RAS Version 5.0.7) Model Compared to Existing Conditions (HEC-RAS Version 5.0.7) Model Results – Willamette River

Cross Section	River Mile	Water Surface Elevations NAVD88 (ft)					
		Corrected Effective Model Results without Floodway	Existing Conditions Model Results without Floodway	Difference	Corrected Effective Model Results with Floodway	Existing Conditions Model Results with Floodway	Difference
P	24.06	46.89	46.89	0.00	47.52	47.52	0.00
Q	24.50	47.36	47.54	0.18	47.95	48.26	0.31
R	24.90	47.58	47.26	-0.32	48.29	47.98	-0.31
*	25.32	48.17	47.59	-0.58	48.88	48.36	-0.52
**	25.53	49.51	48.64	-0.87	50.24	49.38	-0.86
Abernethy Bridge							
**	25.56	49.69	48.76	-0.93	50.44	49.54	-0.90
*	25.73	49.83	48.91	-0.92	50.66	49.76	-0.90
*	25.98	49.49	48.70	-0.79	50.31	49.56	-0.75
*	26.08	49.49	47.87	-1.62	49.69	48.61	-1.08

[a] River miles from Columbia River confluence
***** Not included in FIS, but included in the effective model
****** Included to model the Abernethy Bridge

Proposed Conditions Model

The proposed conditions model was created by updating the existing bridge pier geometry to the proposed bridge pier geometry dated August 27, 2019 (Attachment C). Changes included replacing the piers in the river with larger diameter columns spaced farther apart on the same bent; increasing the size of some piers on the left bank of the river to represent fortification of the existing piers; and removing the pier for the northbound entrance ramp that will be removed. Table 5 summarizes and compares the modeled water surface elevations from the existing and proposed conditions models. The observed differences range from no change to a 0.03-foot decrease in the cross sections upstream of the bridge in the model with floodway encroachments.

The proposed design widens the bridge deck; however, this does not affect the proposed results because the deck and low chord of the Abernethy Bridge are situated above the floodplain. The internal bridge cross sections were updated to include the proposed riprap excavation around the existing piers and in proposed pier locations.

Table 5. Existing Conditions (HEC-RAS Version 5.0.7) Model Compared to Proposed Conditions (HEC-RAS Version 5.0.7) Model Results – Willamette River

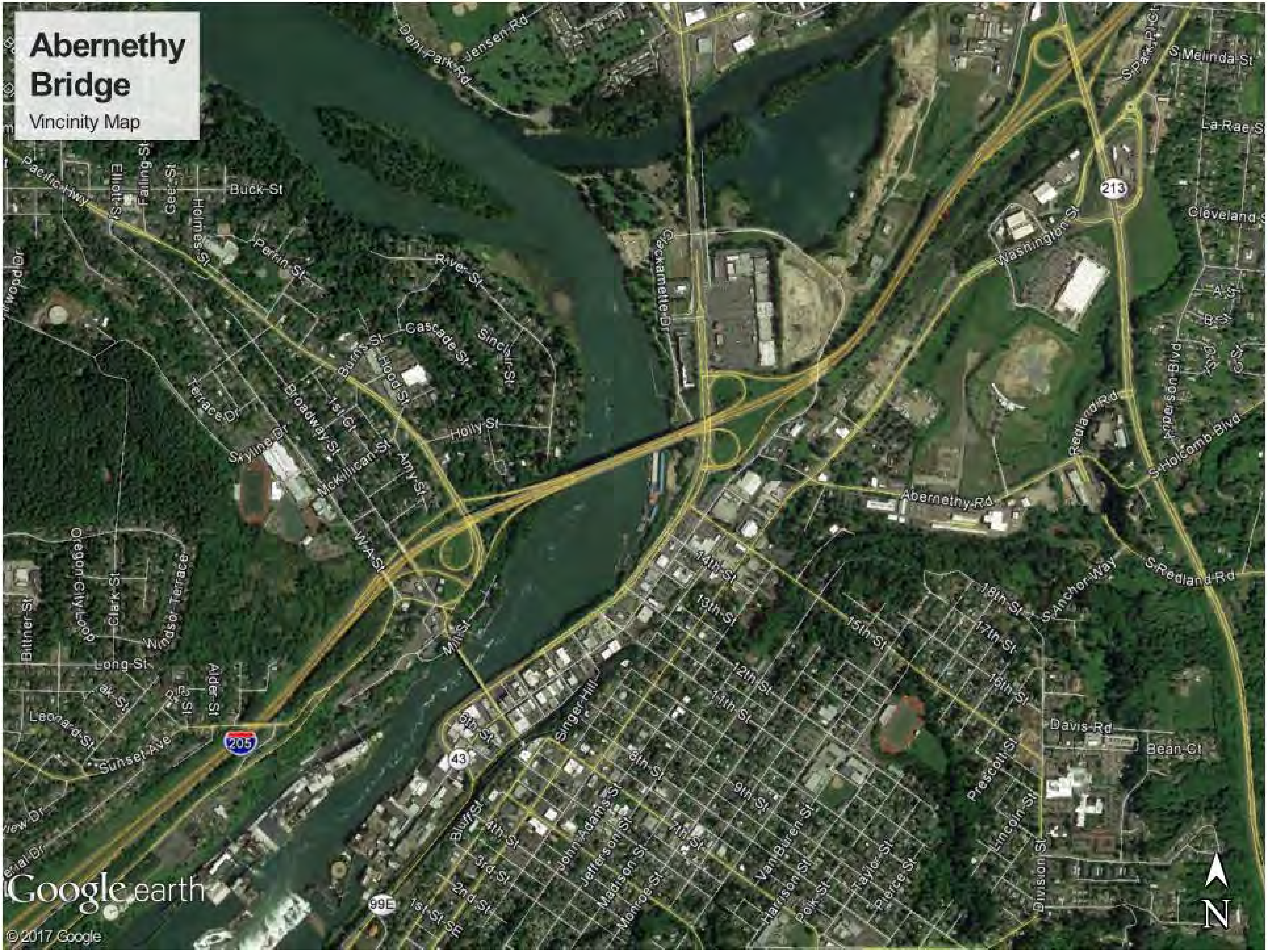
Cross Section	River Mile	Water Surface Elevations NAVD88 (ft)					
		Existing Conditions Model Results without Floodway	Proposed Conditions Model Results without Floodway	Difference	Existing Conditions Model Results with Floodway	Proposed Conditions Model Results with Floodway	Difference
P	24.06	46.89	46.89	0.00	47.52	47.52	0.00
Q	24.50	47.54	47.54	0.00	48.26	48.26	0.00
R	24.90	47.26	47.26	0.00	47.98	47.98	0.00
*	25.32	47.59	47.59	0.00	48.36	48.36	0.00
**	25.53	48.64	48.64	0.00	49.38	49.38	0.00
Abernethy Bridge							
**	25.56	48.76	48.75	-0.01	49.54	49.52	-0.02
*	25.73	48.91	48.90	-0.01	49.76	49.74	-0.02
*	25.98	48.70	48.69	-0.01	49.56	49.53	-0.03
*	26.08	47.87	47.86	-0.01	48.61	48.59	-0.02

[a] River miles from Columbia River confluence
***** Not included in FIS, but included in the effective model
****** Included to model the Abernethy Bridge

Summary and Conclusions

The No-Rise Analysis was performed to verify the project will be in conformance with federal and local regulatory requirements. Oregon City and West Linn are participating communities in the National Flood Insurance Program and have adopted floodplain management ordinances that comply with the minimum federal requirements defined in 44 CFR Part 60. The proposed bridge improvements will result in no rise in FEMA's effective base flood or floodway elevations.

Attachment A. Bridge Location and FIRM Panel


Abernethy
Bridge
Vincinity Map
Pacific Hwy
Elliott St
Falling St
Gee St
Holmes St
Buck St
Perrin St
River St
Cascade St
Sinclair St
Burns St
Hood St
Terrace Dr
Broadway St
1st Ct
Holly St
Skyline Dr
McKillican St
Amy St
W A St
Oregon City Loop
Clark St
Windsor Terrace
Bittner St
Long St
Alder St
Leonard St
Sunset Ave
205
Mill St
43
99E
Dahl Park Rd
Jensen Rd
Clackamette Dr
Washington St
213
S Park Pl Ct
S Melinda St
La Rae St
Cleveland St
A St
B St
Apperson Blvd
S Holcomb Blvd
Redland Rd
Abernethy Rd
S Redland Rd
S Anchor Way
14th St
13th St
15th St
18th St
17th St
16th St
12th St
11th St
Singer Hill
Davis Rd
Bean Ct
Prescott St
Lincoln St
Division St
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2nd St
1st St
Bluff St
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Madison St
Monroe St
Van Buren St
Harrison St
Polk St
Taylor St
Pierce St
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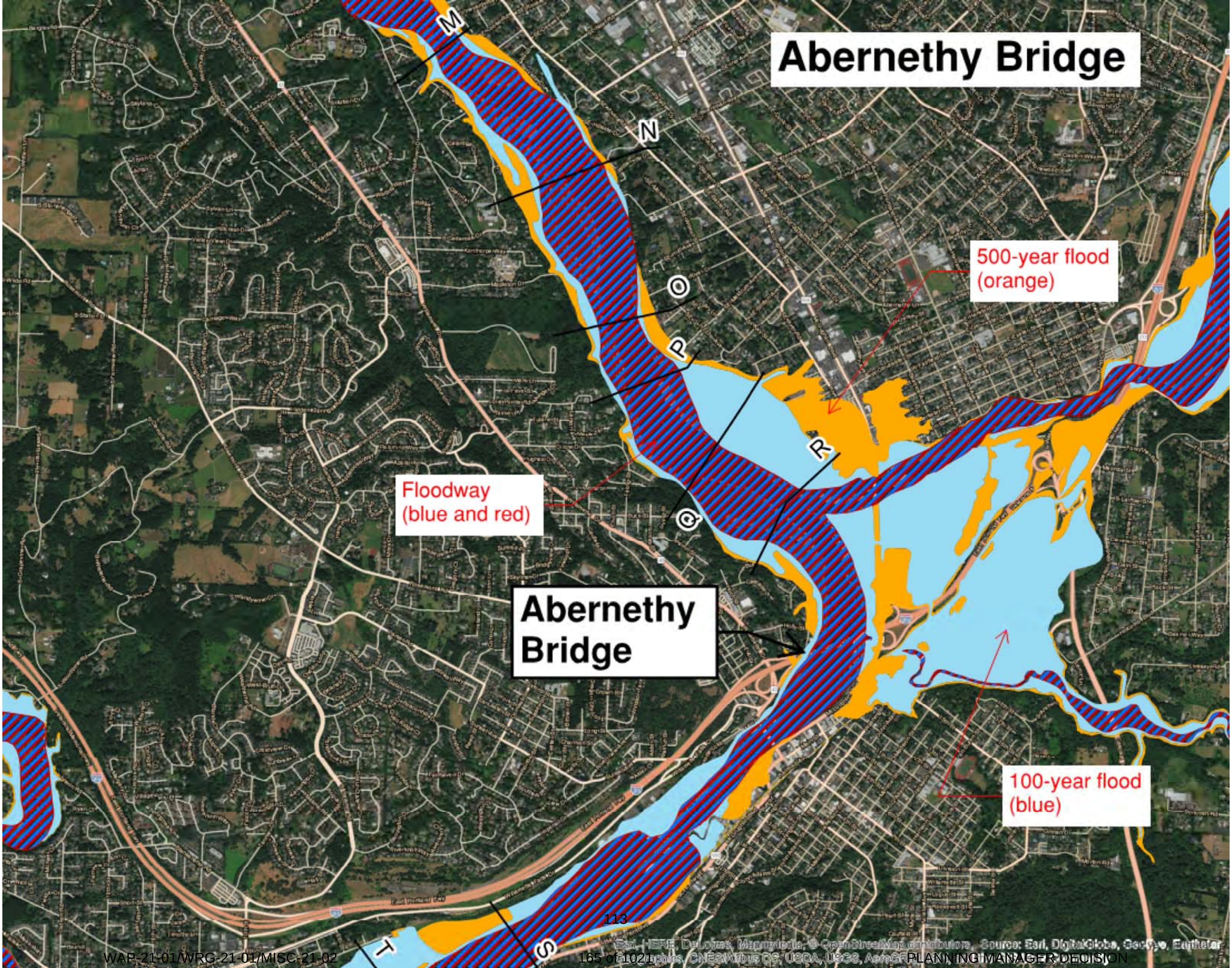

Abernethy Bridge
500-year flood
(orange)
Floodway
(blue and red)
Abernethy
Bridge
100-year flood
(blue)
M
N
O
P
Q
R
S
T

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 10. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was derived from multiple sources. High-resolution color orthophotos produced by Merrick & Co., Pictures, Inc., and Clean Water Services covered portions of the county. USGS Digital Quadrangles at a scale of 1:12000 or less dated 6/20/94 covered the remainder of the county.

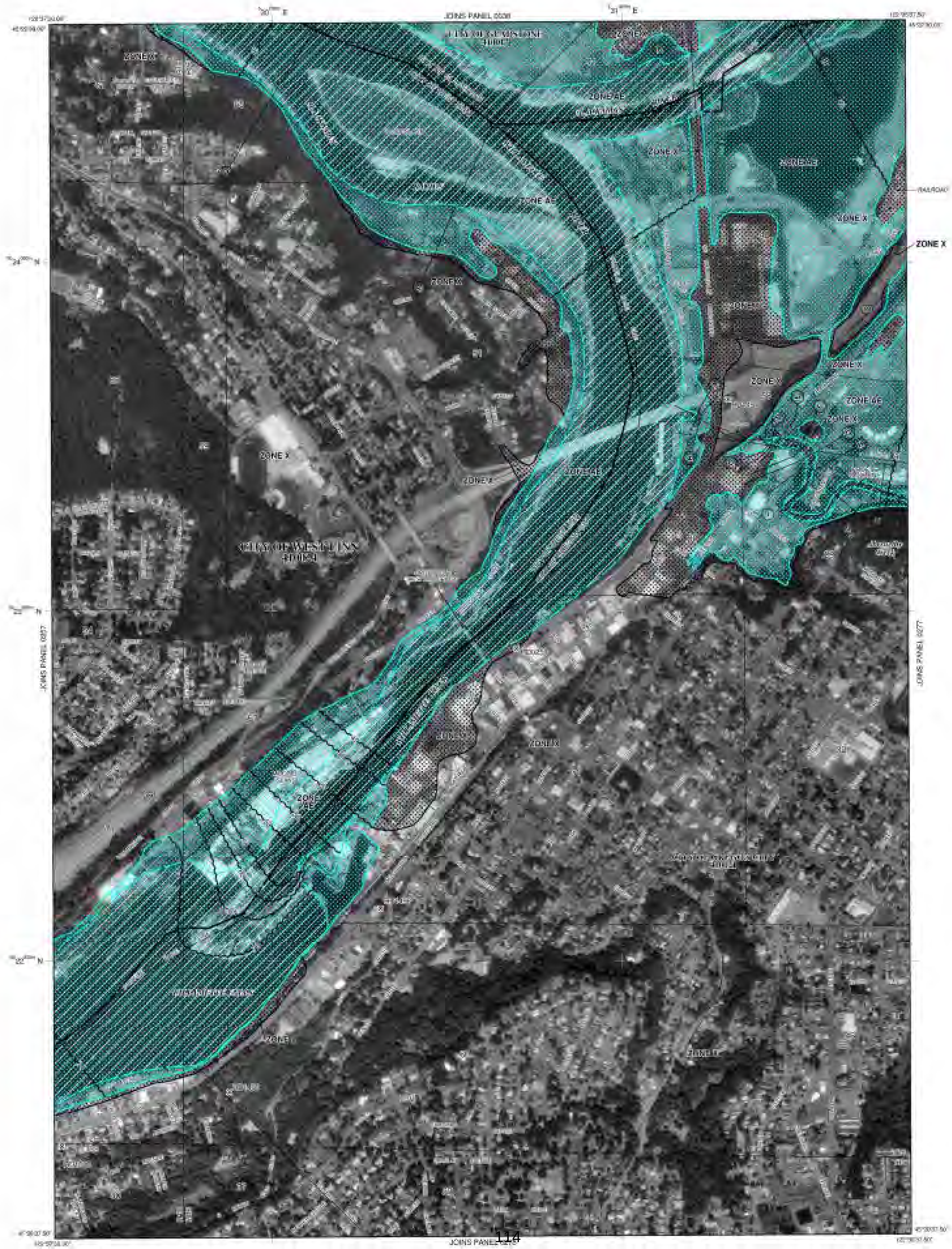
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



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LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
~~ 513 ~~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

(A)——(A)	Cross section line
(23)——(23)	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
^{42}75^{000m}N	1000-meter Universal Transverse Mercator grid ticks, zone 10
6000000 M	5000-foot grid ticks: Oregon State Plane coordinate system, north zone (FIPSZONE 3601), Lambert Conformal Conic
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 17, 2008
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

PANEL 0276D

FIRM
FLOOD INSURANCE RATE MAP
CLACKAMAS COUNTY, OREGON
AND INCORPORATED AREAS

PANEL 276 OF 1175
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GLADSTONE, CITY OF	[illegible]	0276	D
OREGON CITY, CITY OF	[illegible]	0276	D
WEST LINN, CITY OF	[illegible]	0276	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
41005C0276D

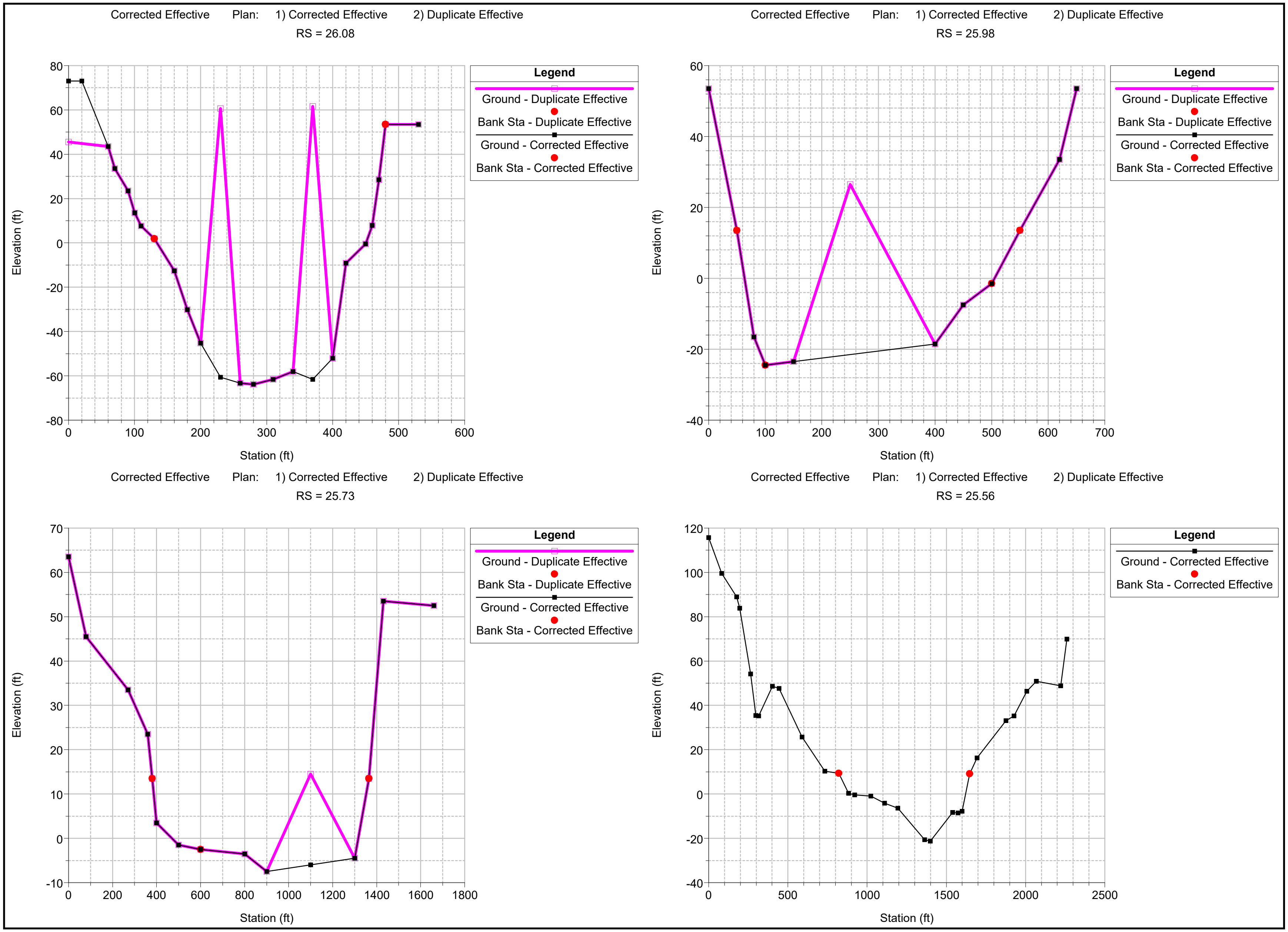
EFFECTIVE DATE
JUNE 17, 2008

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

Attachment B. HEC-RAS Cross Sections

Duplicate Effective Compared to Corrected Effective HEC-RAS Cross Sections



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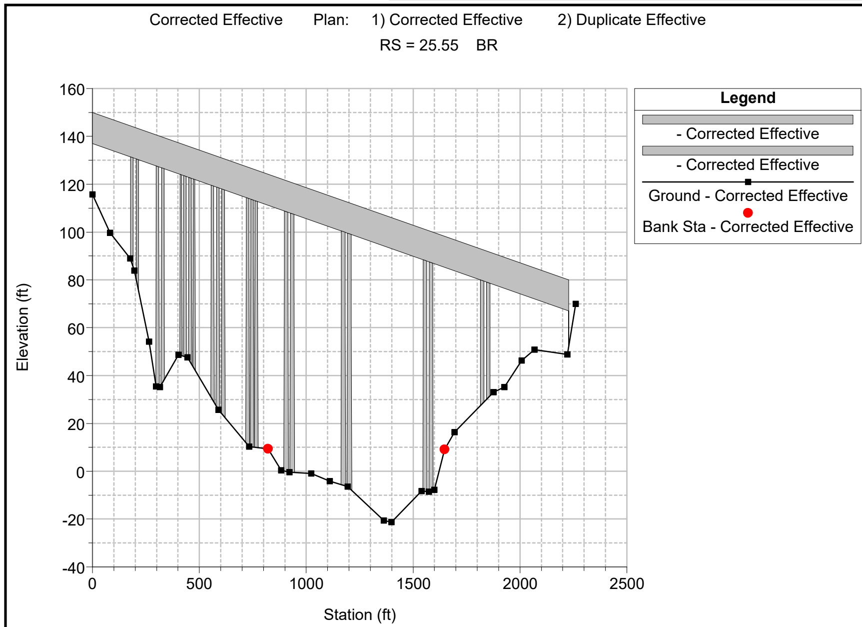
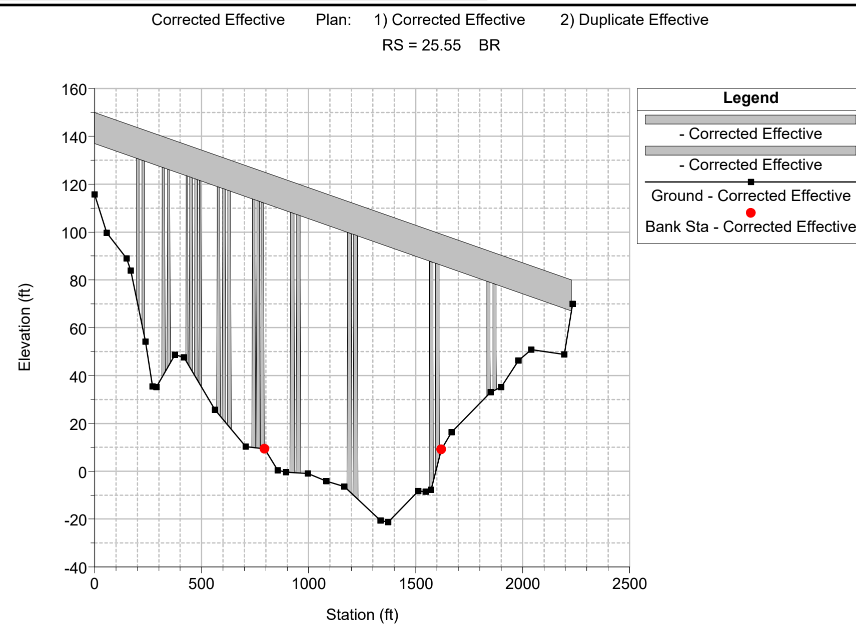
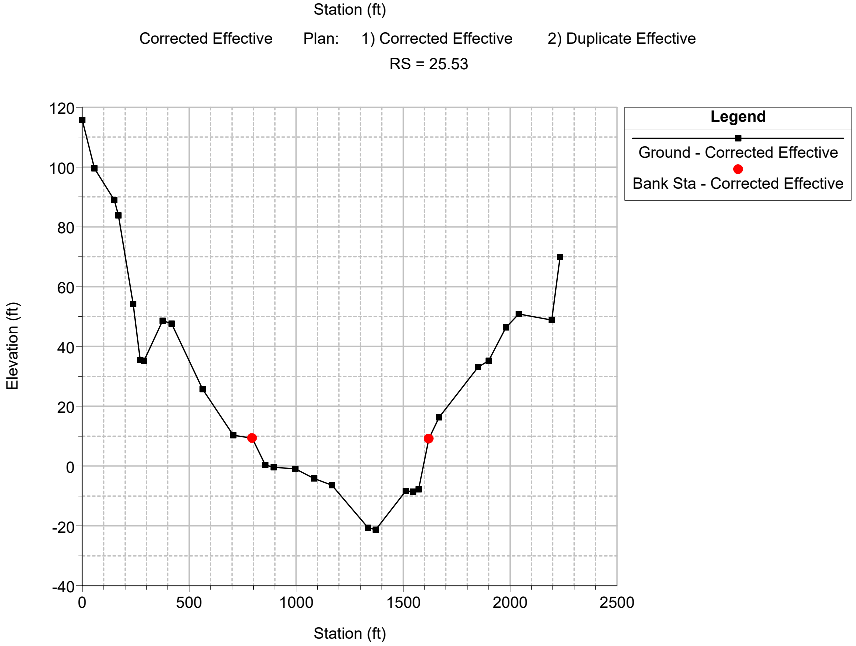
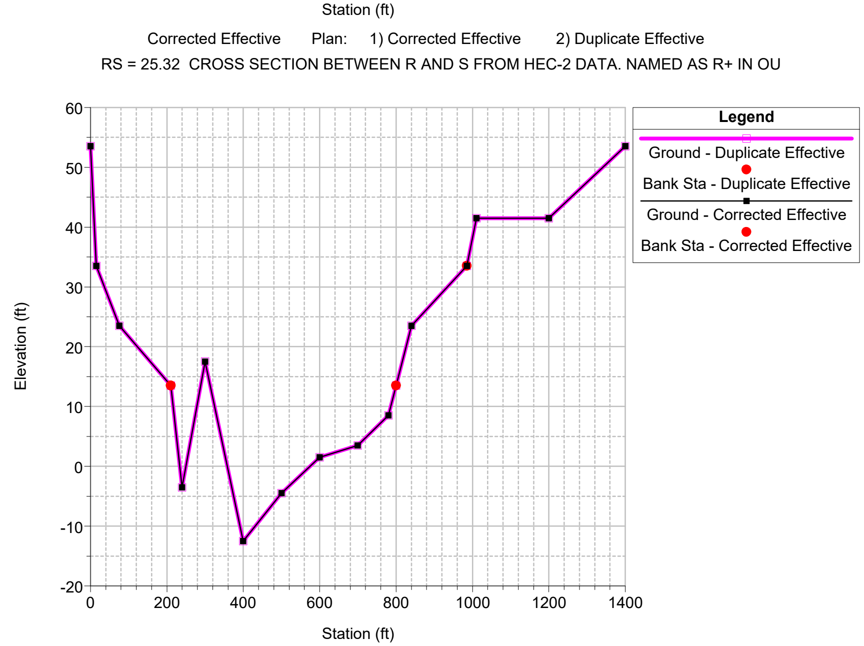
Duplicate Effective Compared to Corrected Effective HEC-RAS Cross Sections









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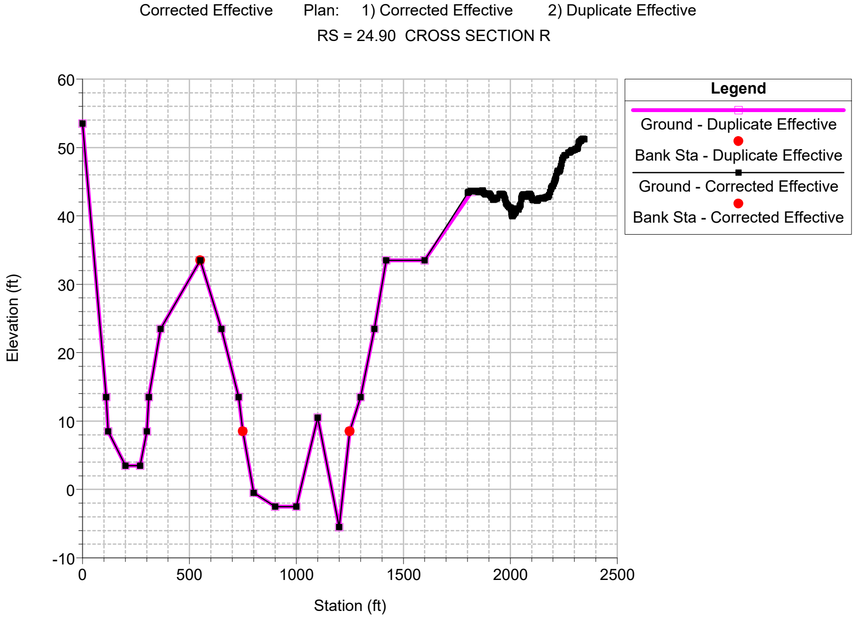
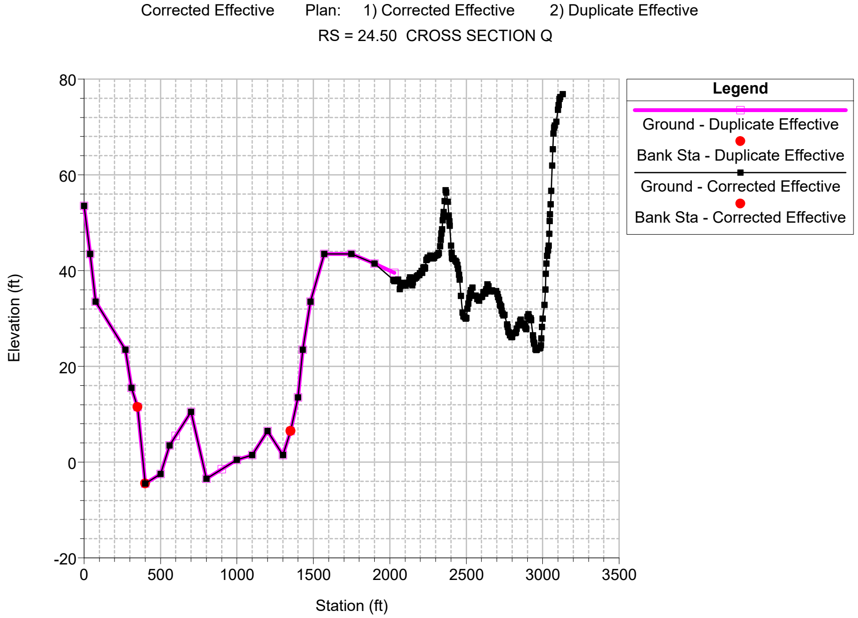
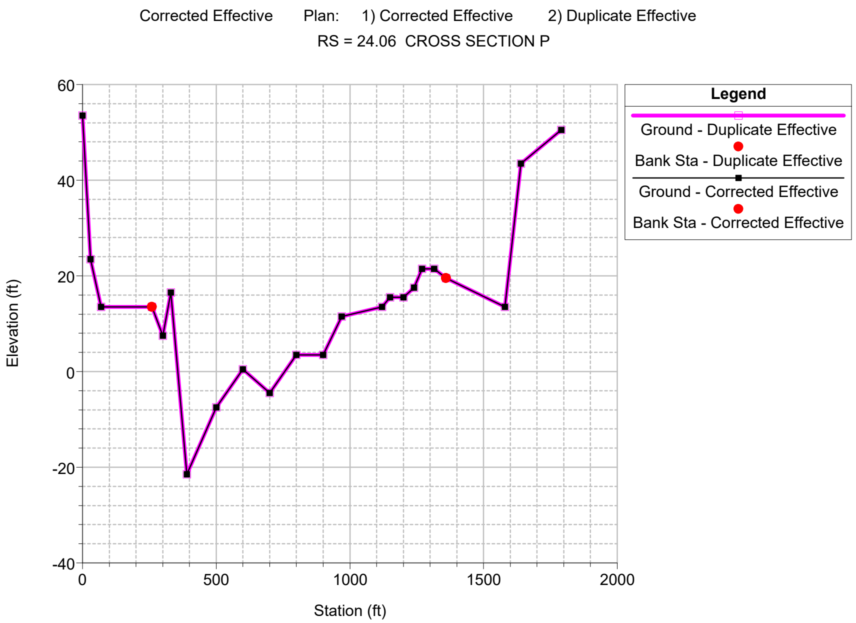
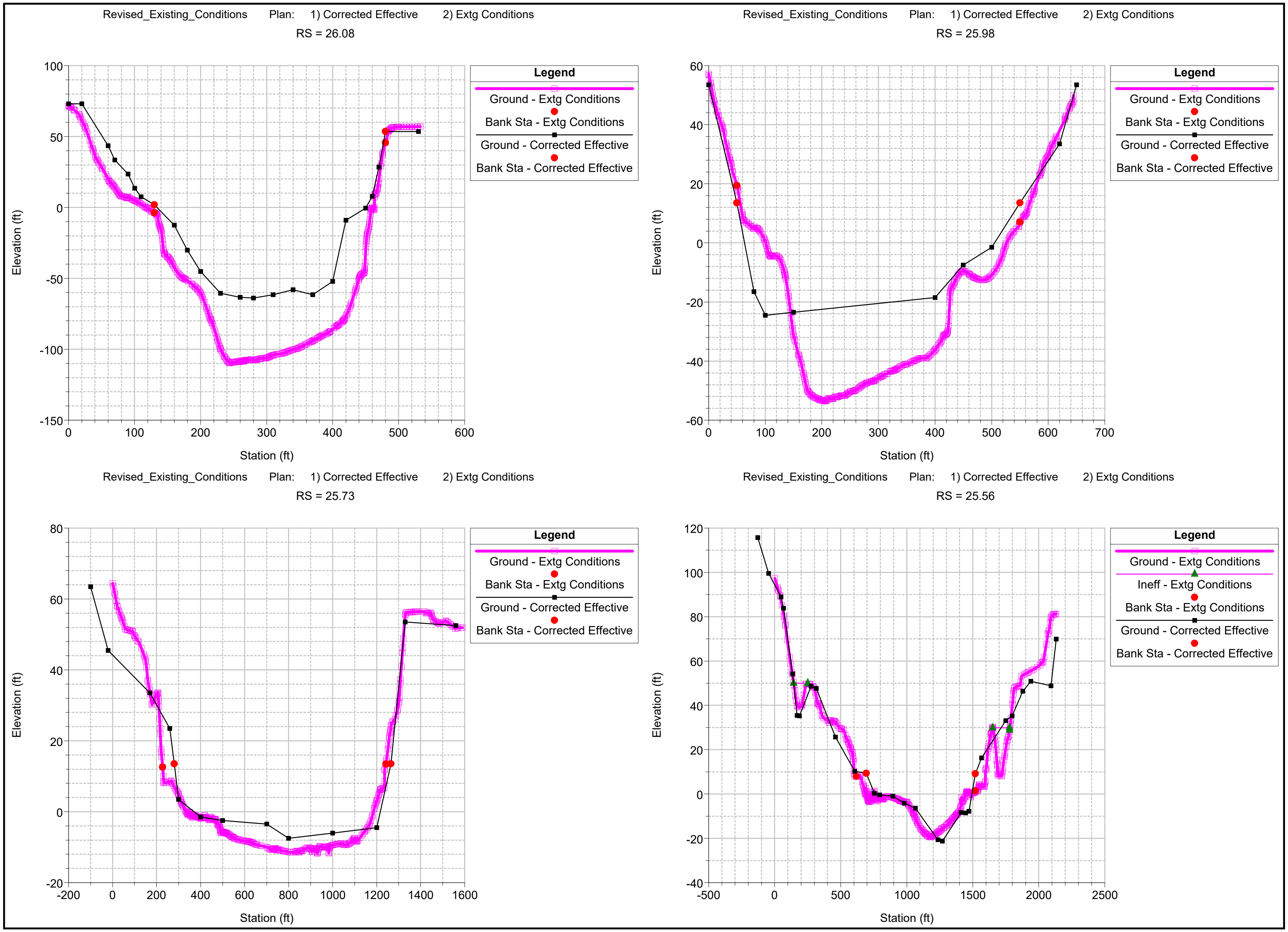






Corrected Effective Compared to Existing Conditions HEC-RAS Cross Sections



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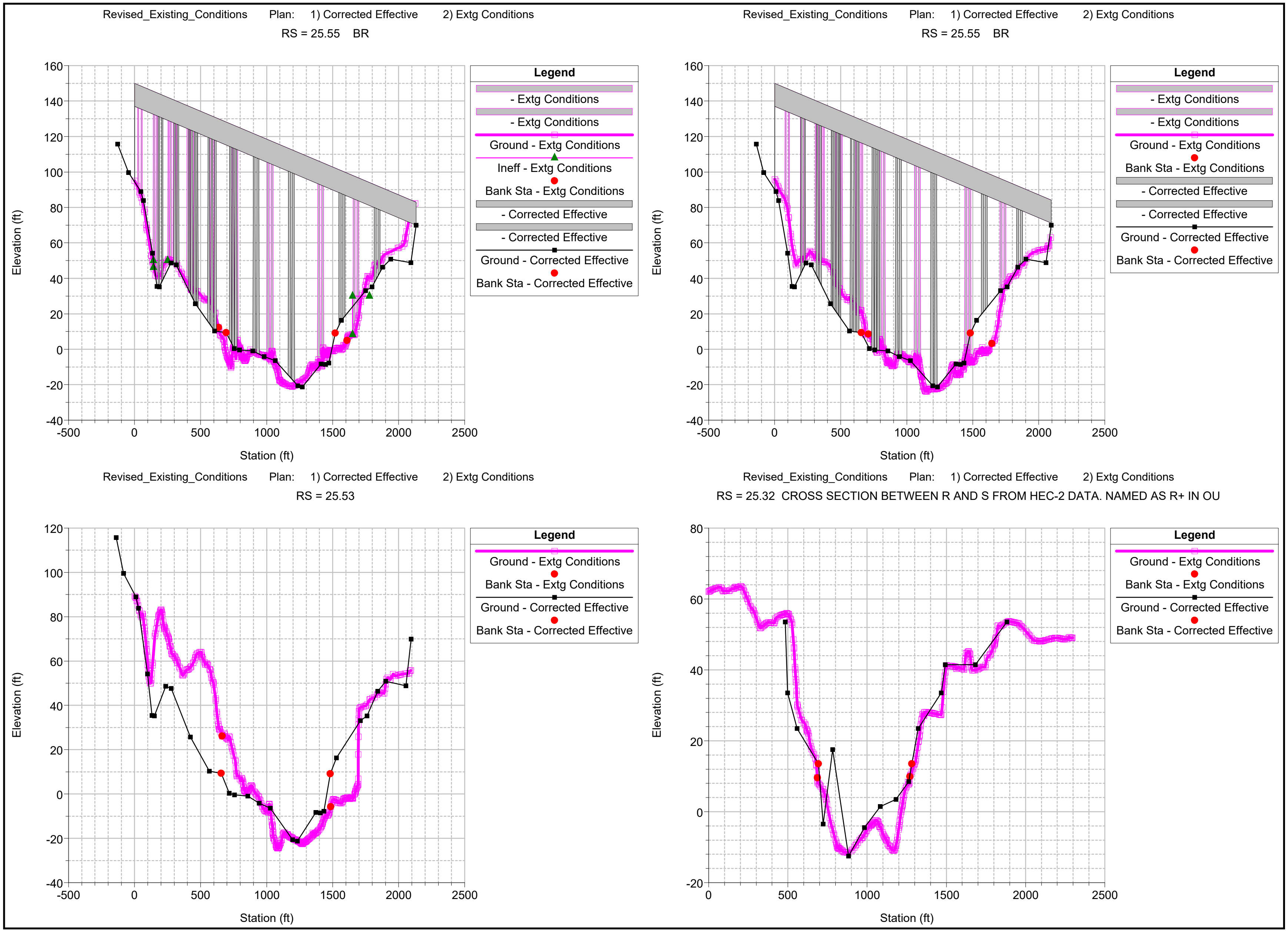

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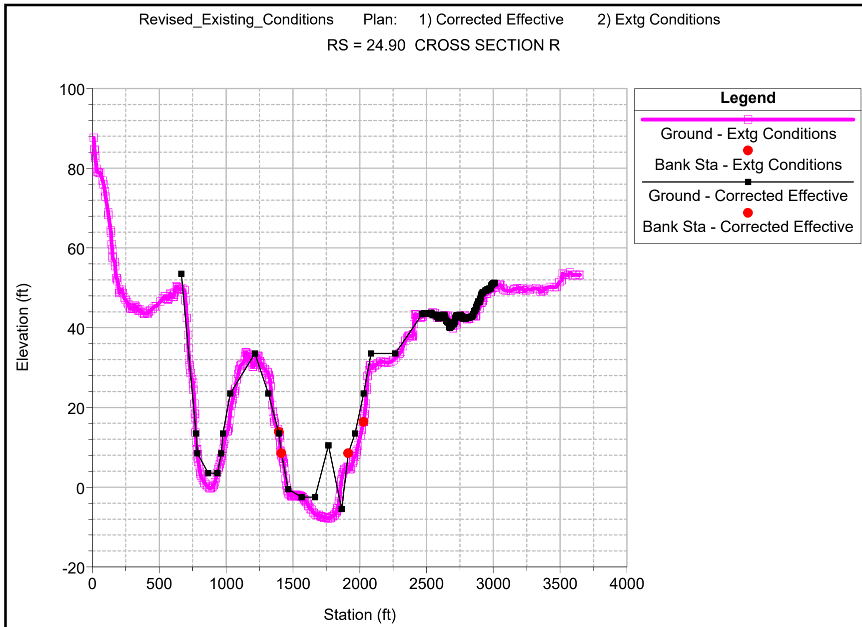
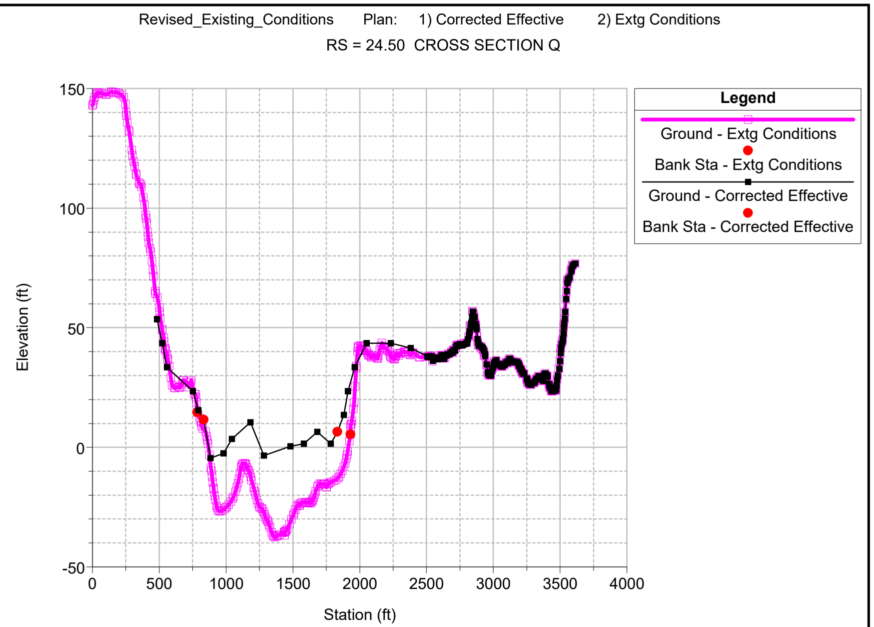
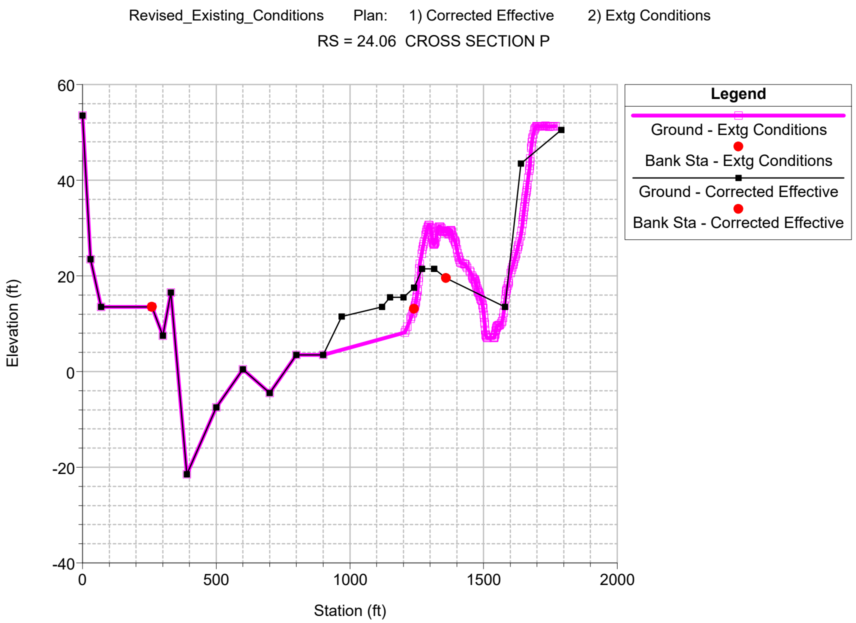
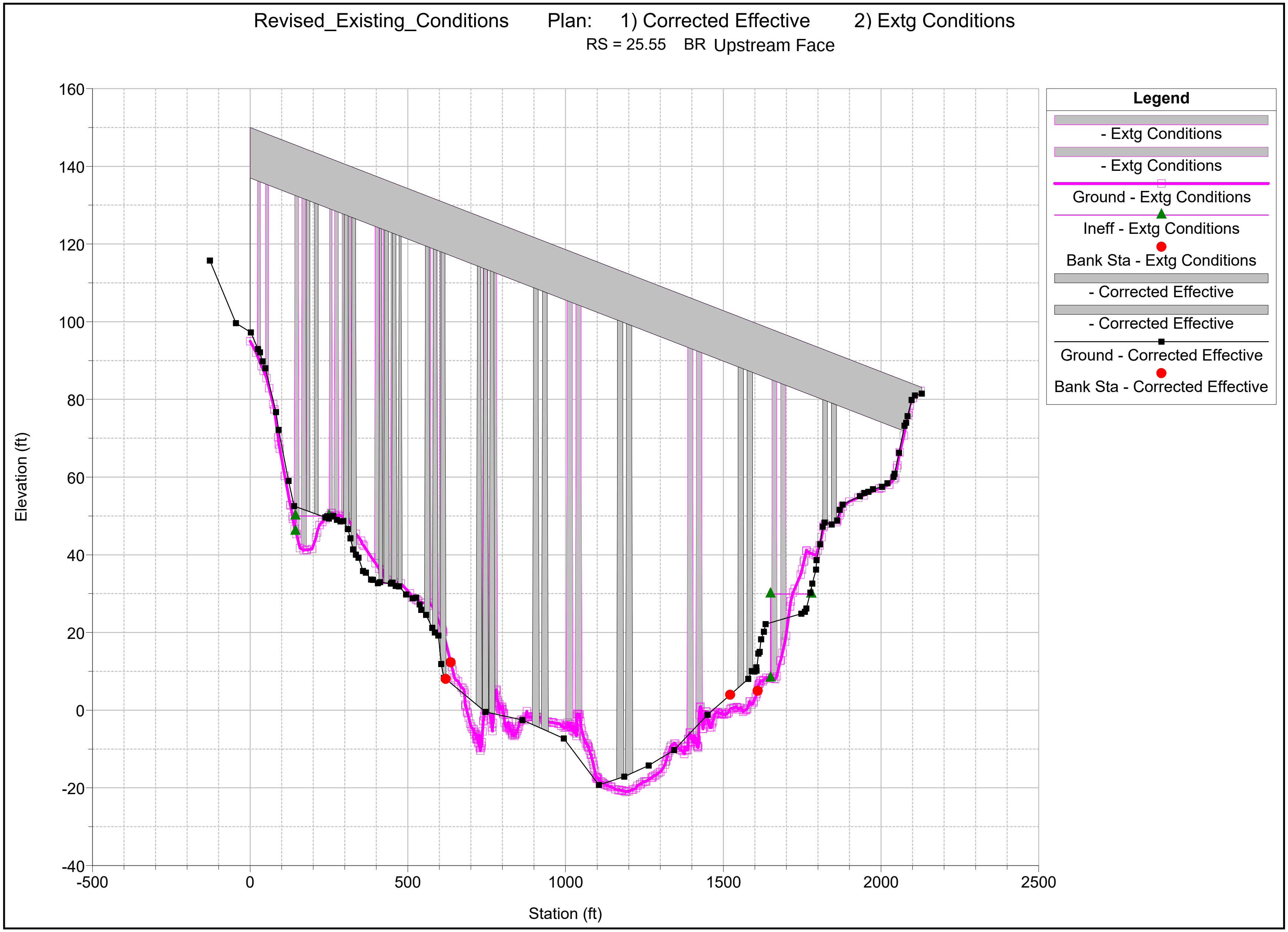


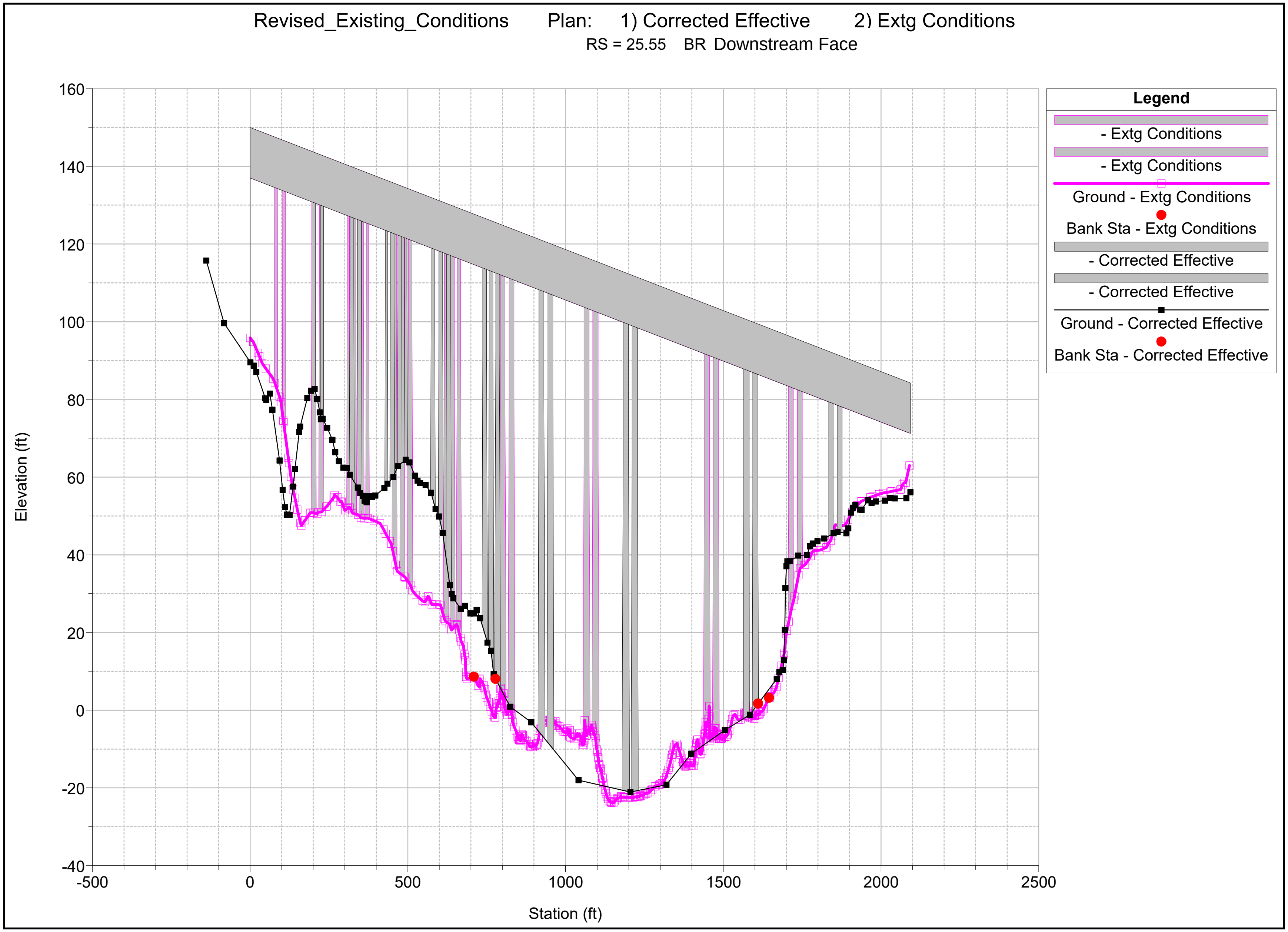




Existing Bridge Compared to Proposed Bridge HEC-RAS Cross Sections



Existing Bridge Compared to Proposed Bridge HEC-RAS Cross Sections



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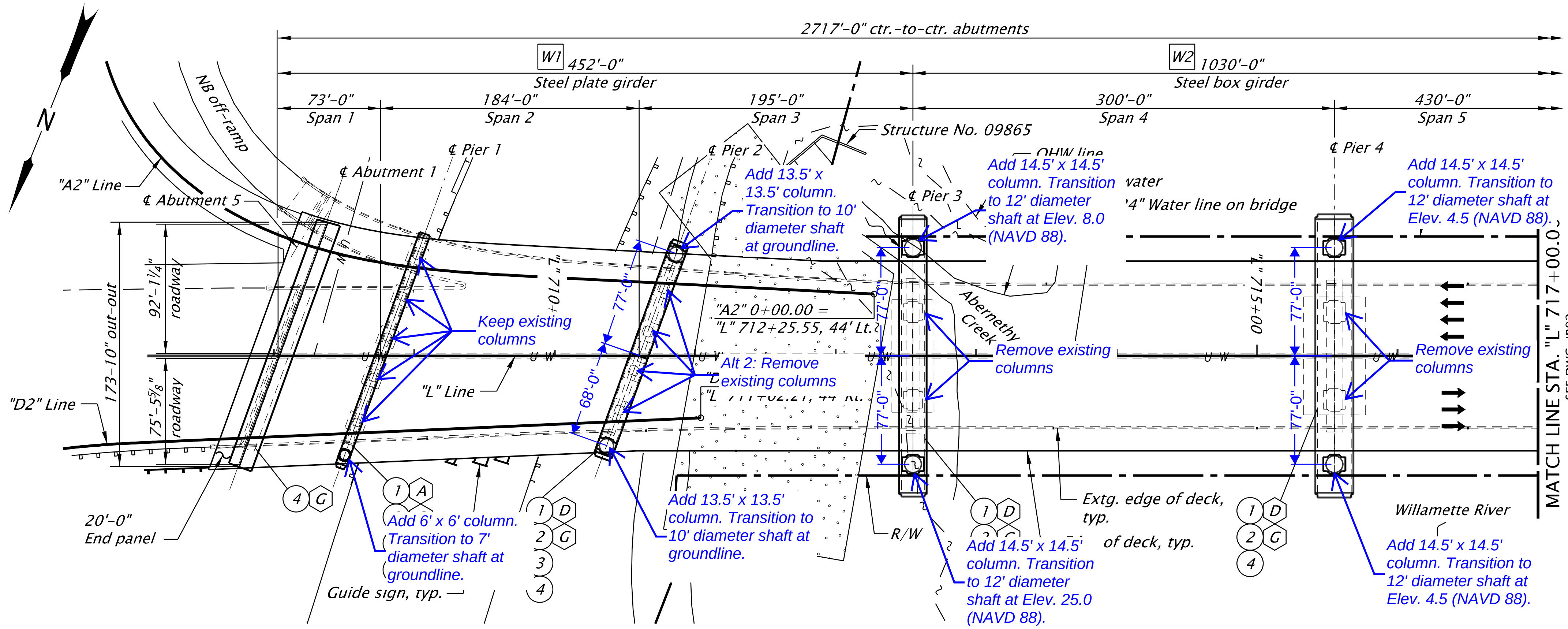
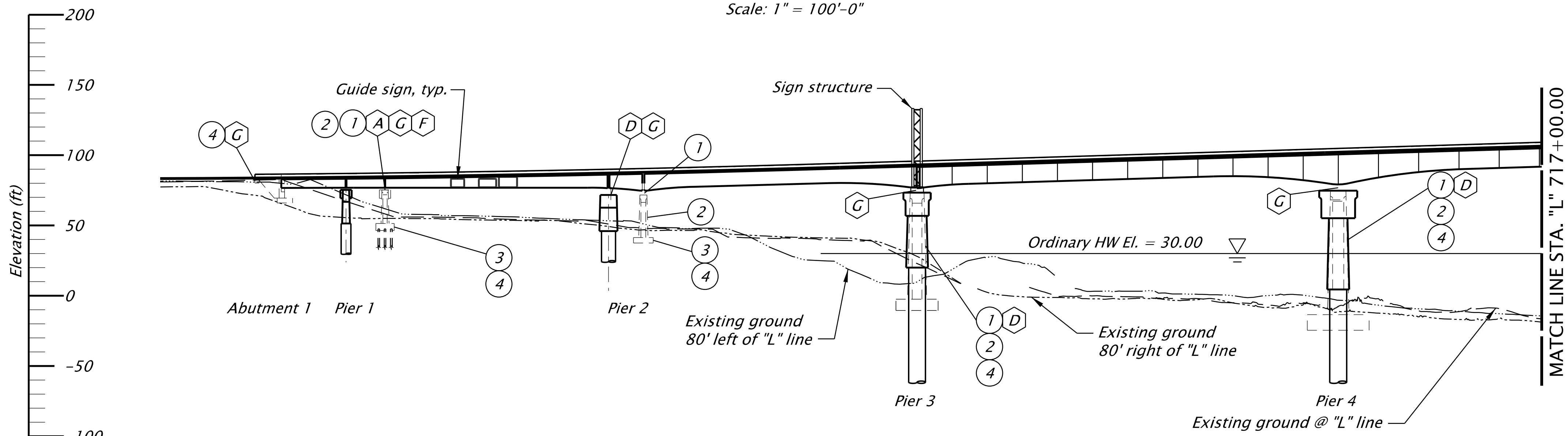
Attachment C. Proposed Bridge Plans

Preliminary - For hydraulic team use - 8/27/2019



PLAN

Scale: 1" = 100'-0"

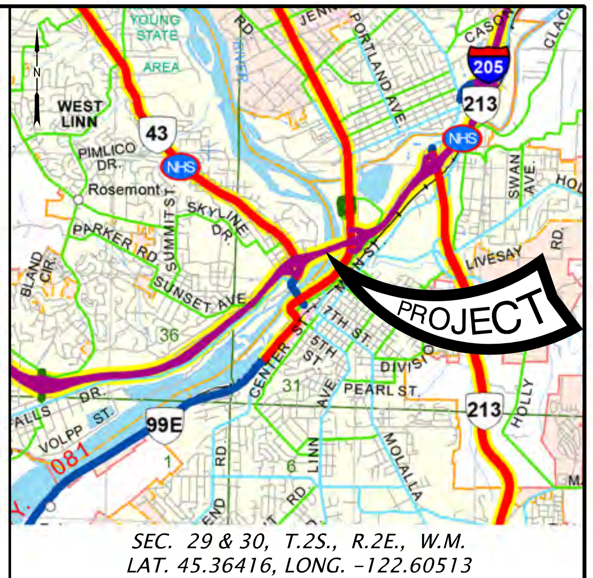


ELEVATION

Scale: 1" = 100'-0"

Existing structure shown approximately at "L" line

Proposed structure shown approximately at right edge of mainline structure



LOCATION MAP

No Scale

SEISMIC RETROFIT

- A Crossbeam enlargement
- B Column enlargement
- C Pile cap enlargement
- D Substructure replacement
- E Micropiles
- F Strengthen footing and pile connection
- G Isolation bearings

SEISMIC DEFICIENCY

1. Crossbeam flexural/shear strength (LL)
2. Column flexural/shear strength (LL)
3. Lack of top mat pile cap reinforcing (LL)
4. Insufficient pile anchorage (LL)
5. Spread footing overturning/strength (LL)

WIDENING

- W1 Steel girder widening
- W2 Cantilever widening

LEGEND:

Ground improvements

Notes:

1. Elevations shown are based on North American Vertical Datum (1988).

SCALE WARNING

If scale bar doesn't measure one inch then drawing is not to scale

ACCOMPANIED BY DWGS.: See sheets JB01 thru JB4.

STRUCTURE NO.	09403
BDS DWG NO.	00000
CALC. BOOK	0000
HWY:	064
M.P.:	9.03
COUNTY	Clackamas
DATE	07/2019

PRELIMINARY COPY INFORMATION ONLY

HDR ENGINEERING, INC
1050 SW 6TH AVENUE, SUITE 1800
PORTLAND, OR 97204-1134
503.423.3700

WILLAMETTE R & HWYS 1E & 3, HWY 64 (GEO ABERNETHY)

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Mikal Mitchell
Reviewer: Jeff Olson
Drafter: Heather Gonsior
Checker: -

WIDENING AND SEISMIC RETROFIT
PLAN AND ELEVATION - 1

SHEET NO. JB01

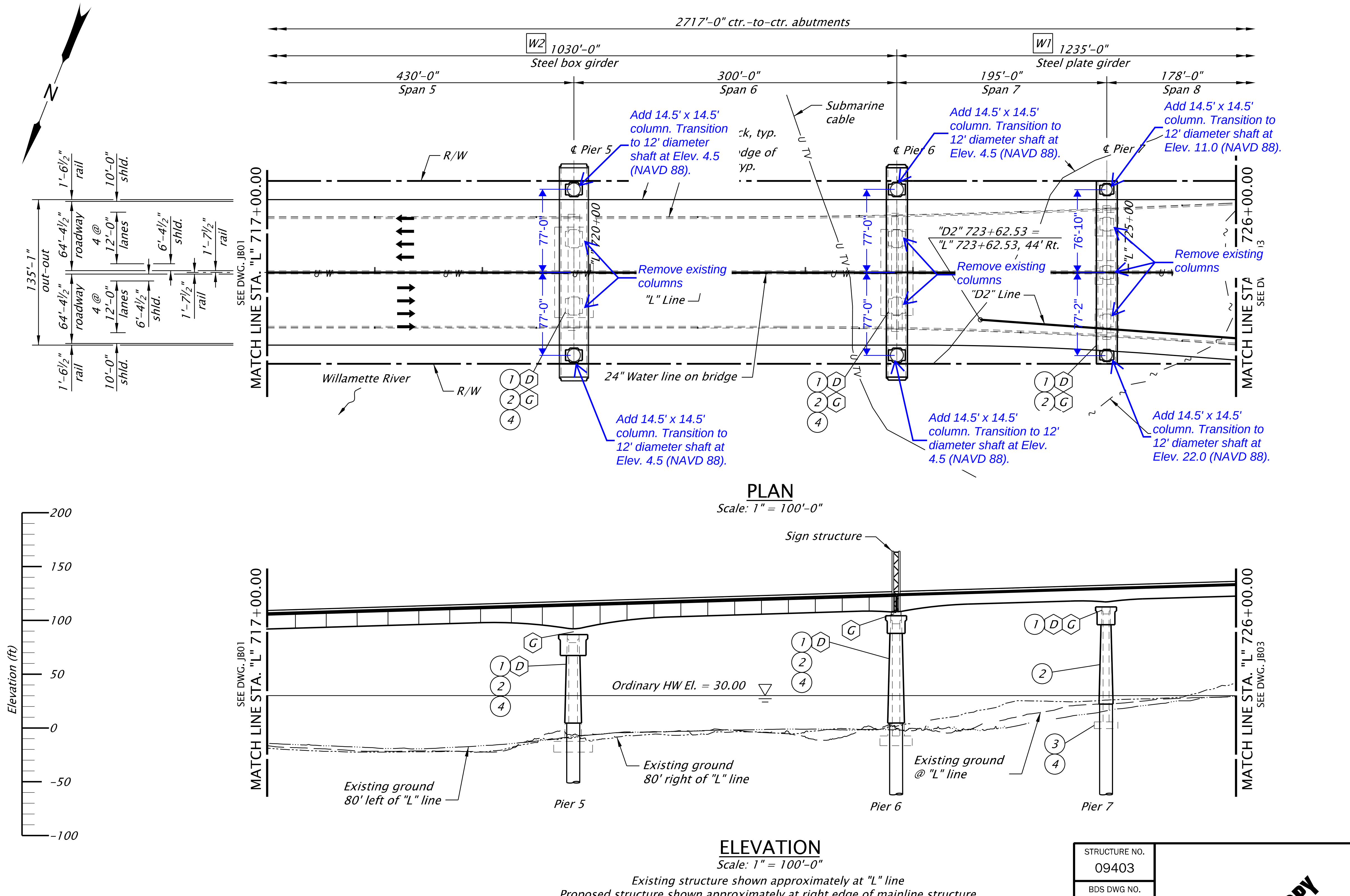
BR_K19786_HDR_pe_01.dgn :: Default 7/16/2019 3:25:21 PM LMODEL

128

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

Rotation: 201.7268° Scale: 1"=100'

Preliminary - For hydraulic team use - 8/27/2019



SEISMIC DEFICIENCY

1. Crossbeam flexural/shear strength (LL)
2. Column flexural/shear strength (LL)
3. Lack of top mat pile cap reinforcing (LL)
4. Insufficient pile anchorage (LL)
5. Spread footing overturning/strength (LL)

SEISMIC RETROFIT

- A Crossbeam enlargement
- B Column enlargement
- C Pile cap enlargement
- D Substructure replacement
- E Micropiles
- F Strengthen footing and pile connection
- G Isolation bearings

WIDENING

- W1 Steel girder widening
- W2 Cantilever widening

Notes:
1. Elevations shown are based on North American Vertical Datum (1988).

SCALE WARNING
If scale bar doesn't measure one inch then drawing is not to scale

ACCOMPANIED BY DWGS.:
See sheets JB01 thru JB04.

STRUCTURE NO.	09403
BDS DWG NO.	00000
CALC. BOOK	0000
HWY: 064 M.P.: 9.03	
COUNTY	Clackamas
DATE	07/2019

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PORTLAND, OR 97204-1134
503.423.3700

WILLAMETTE R & HWYS 1E & 3, HWY 64 (GEO ABERNETHY)

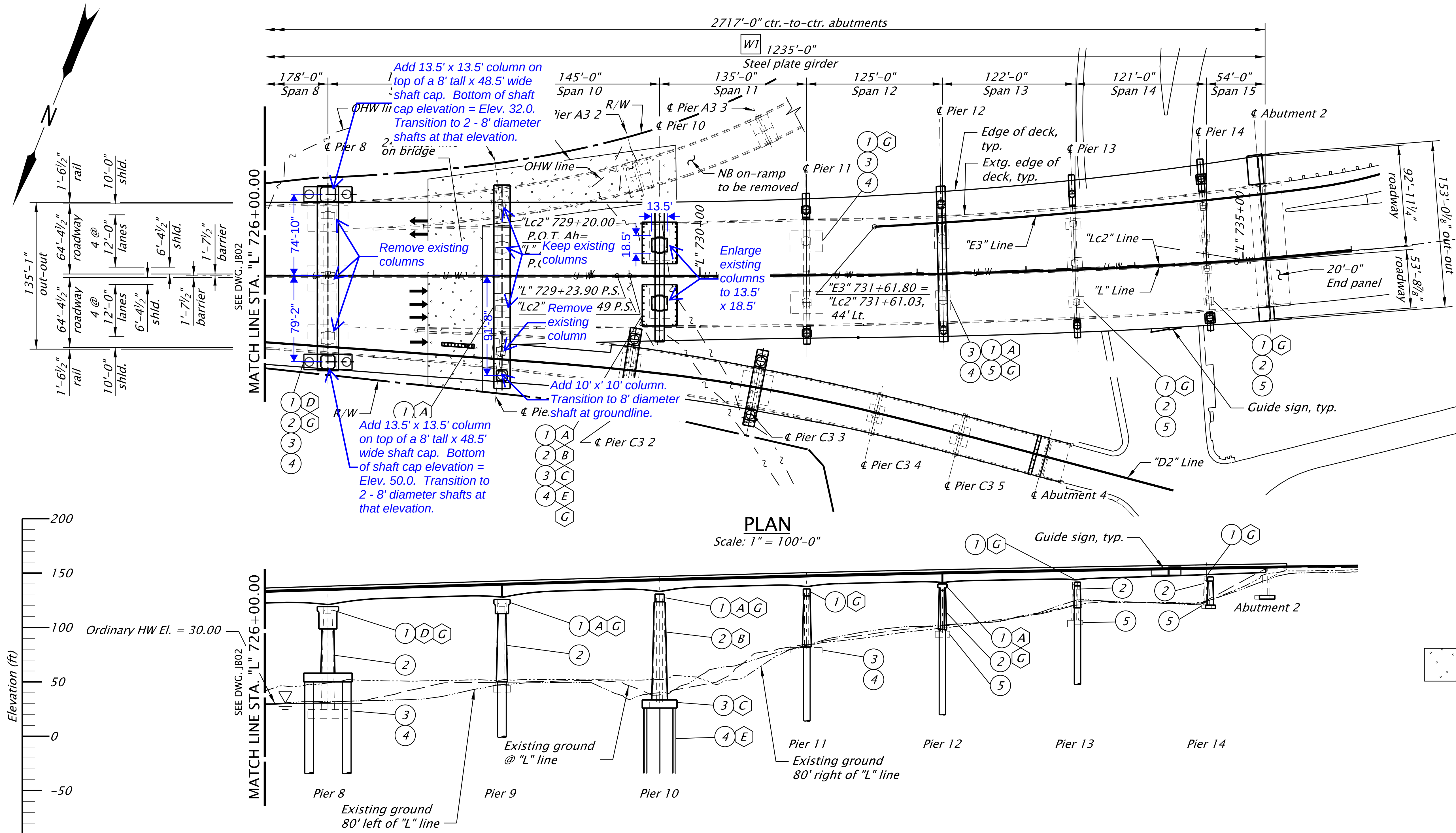
I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Mikal Mitchell
Reviewer: Jeff Olson
Drafter: Heather Gonsior
Checker: -

WIDENING AND SEISMIC RETROFIT PLAN AND ELEVATION - 2

SHEET NO. JB02



ELEVATION

Scale: 1" = 100'-0"

Existing structure shown approximately at "L" line
Proposed structure shown approximately at right edge of mainline structure

SEISMIC DEFICIENCY

1. Crossbeam flexural/shear strength (LL)
2. Column flexural/shear strength (LL)
3. Lack of top mat pile cap reinforcing (LL)
4. Insufficient pile anchorage (LL)
5. Spread footing overturning/strength (LL)

SEISMIC RETROFIT

- A Crossbeam enlargement
- B Column enlargement
- C Pile cap enlargement
- D Substructure replacement
- E Micropiles
- F Strengthen footing and pile connection
- G Isolation bearings

WIDENING

- W1 Steel girder widening
- W2 Cantilever widening

LEGEND:

Ground improvements

Notes:
1. Elevations shown are based on North American Vertical Datum (1988).

SCALE WARNING
If scale bar doesn't measure one inch then drawing is not to scale

ACCOMPANIED BY DWGS.:
See sheets JB01 thru JB04.

STRUCTURE NO.	09403
BDS DWG NO.	00000
CALC. BOOK	0000
HWY: 064 M.P.: 9.03	
COUNTY	Clackamas
DATE	07/2019

PRELIMINARY COPY INFORMATION ONLY

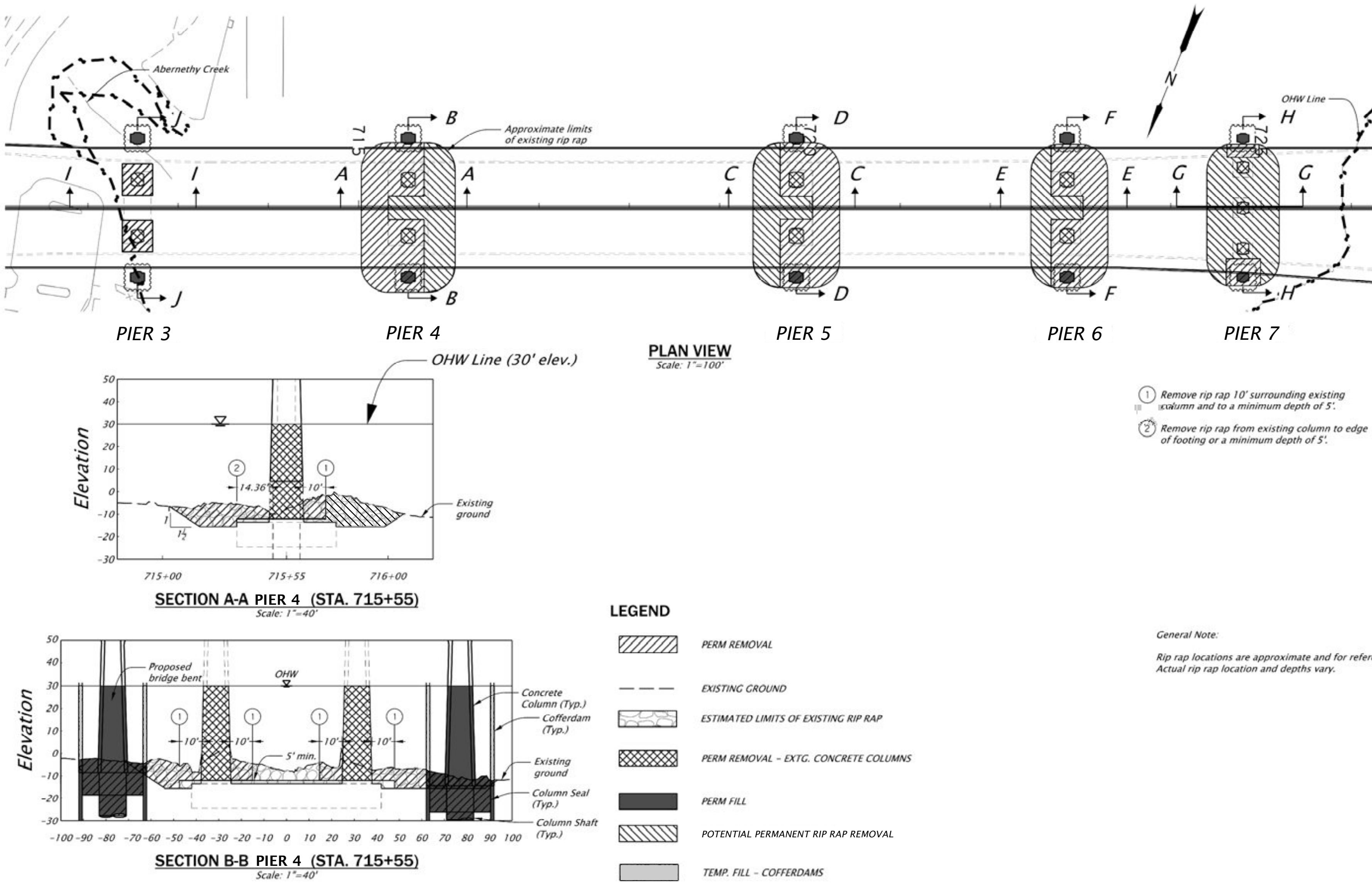
HDR ENGINEERING, INC
1050 SW 6TH AVENUE, SUITE 1800
PORTLAND, OR 97204-1134
503.423.3700

WILLAMETTE R & HWYS 1E & 3, HWY 64 (GEO ABERNETHY)
I-205: I-5 - OR213, PHASE 1 SEC.
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Mikal Mitchell — Reviewer: Jeff Olson
Drafter: Heather Gonsior — Checker: -

WIDENING AND SEISMIC RETROFIT PLAN AND ELEVATION - 3

SHEET NO. JB03



HDR

I-205 ABERNETHY

PERMANENT AND TEMPORARY IMPACTS

FIGURE 6

DATA SOURCE: HDR 2019

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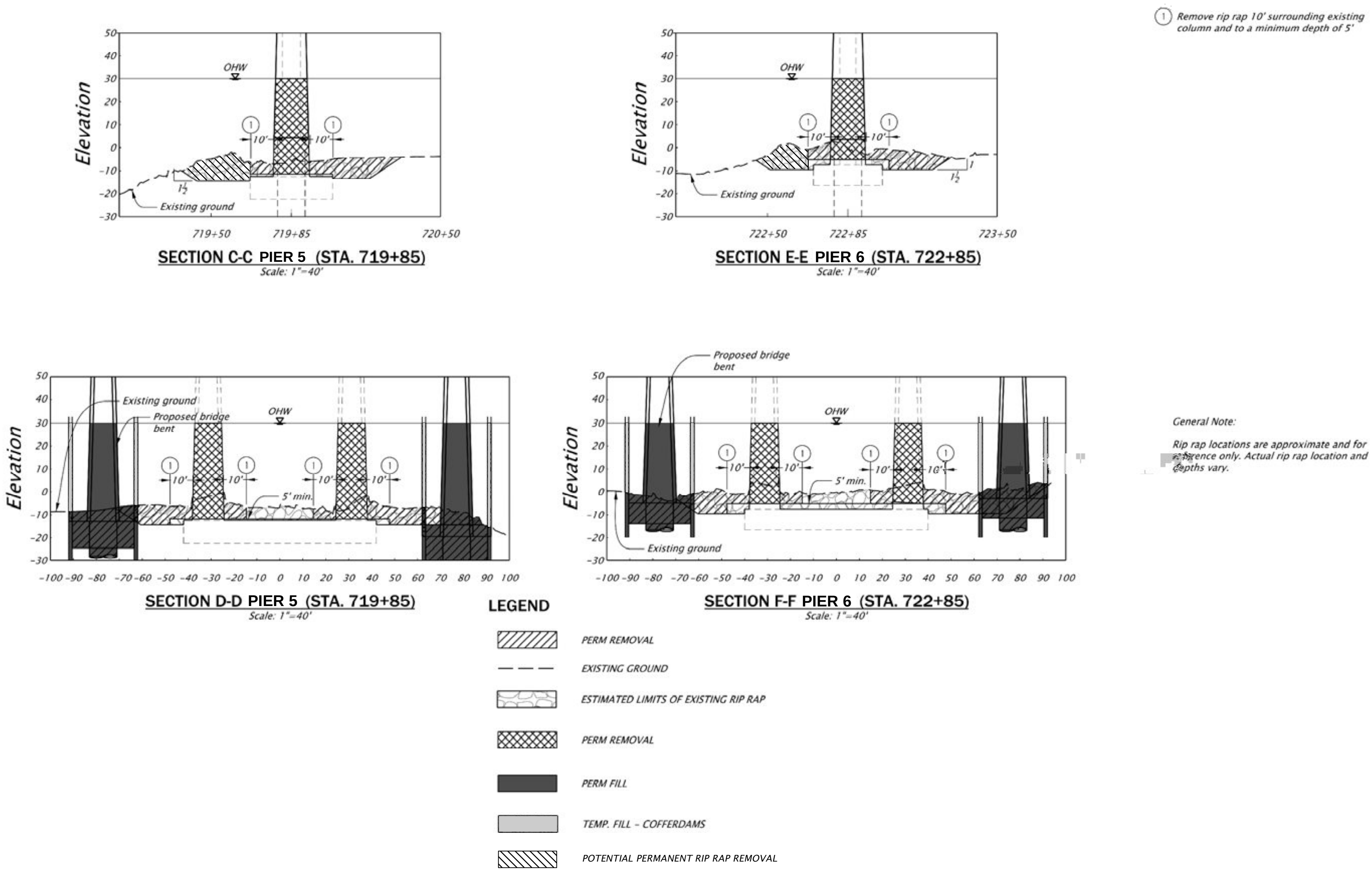


I-205 ABERNETHY

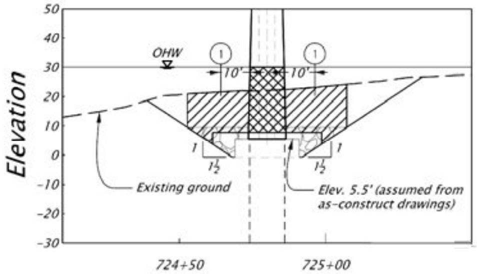
PERMANENT AND TEMPORARY IMPACTS

FIGURE 7

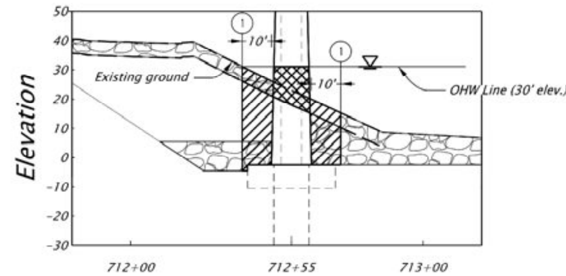
DATA SOURCE: HDR 2019

PATH: C:\PROJECTS\STAGING_WORKFROMHOME\I205\JPA\MAP_DOCS\JPA\F5 IMPACTS_SHEET_5_5.MXD - USER: JBEARD - DATE: 4/16/2019

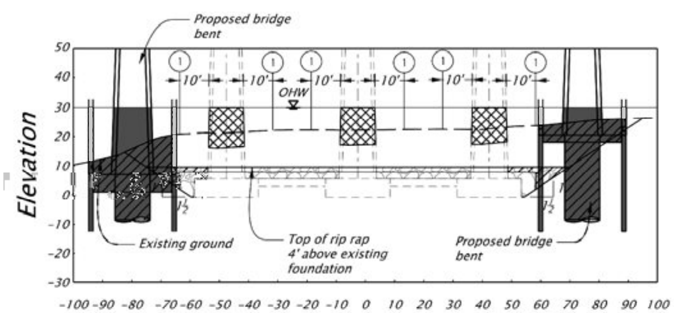
(1) Remove rip rap 10' surrounding existing column and to a minimum depth of 5'



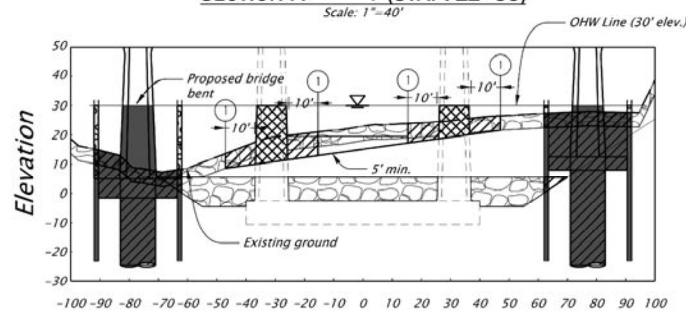
SECTION G-G PIER 7 (STA. 724+80)
Scale: 1"=40'



SECTION I-I PIER 3 (STA. 712+55)
Scale: 1"=40'



SECTION H-H PIER 7 (STA. 724+80)
Scale: 1"=40'



SECTION J-J PIER 3 (STA. 712+55)
Scale: 1"=40'

General Note:

Rip rap locations are approximate and for reference only. Actual rip rap location and depths vary.

LEGEND

- PERM REMOVAL
- EXISTING GROUND
- ESTIMATED LIMITS OF EXISTING RIP RAP
- PERM REMOVAL – EXTG. CONCRETE COLUMNS
- PERM FILL
- TEMP. FILL – COFFERDAMS

I-205 ABERNETHY
PERMANENT AND TEMPORARY IMPACTS
FIGURE 8

DATA SOURCE: HDR 2019

PATH: C:\PROJECTS\STAGING_WORKFROMHOME\I205\JPA\MAP_DOCS\JPA\F5 IMPACTS_SHEET_5_6.MXD - USER: JBEARD - DATE: 4/16/2019

Attachment G. Stormwater Report

Preliminary Stormwater Design Report

ODOT | K19786 I-205: I-5 to OR213, Phase 1 Section

Combined I-205 Freeway Widening and Abernethy Bridge Project

ODOT EA: PE003013
HDR Project # 10063137

August 3, 2020

Plan Prepared by:	Cory Gieseke, PE Morgan Tholl, EIT				
Stormwater Manual Cited:	ODOT's Hydraulics Manual (2014) Oregon City Public Works Stormwater and Grading Design Standards (2019) City of Portland Stormwater Management Manual (2016) City of West Linn Public Works Design Standards (2010)				
Project Location:	Clackamas County				
Project Name:	ODOT K19786 I-205: I-5 to OR 213, Phase 1 Section				
Project Contact Information:	ODOT Project Leader Bret Richards, PE				
Contents	X	Inlets	X	Water Quality	
	X	Storm Drains		Small Channels	
	X	Detention	X	Energy Dissipaters	
		Small culverts		Pipe Rehabilitation	
DFI Nos.	To be determined				

Contents

Tables

Appendices

Acronyms and Abbreviations

ADT	Average Daily Traffic
CIA	Contributing Impervious Area
kV	kilovolt
MP	mile post
NAVD88	North American Vertical Datum of 1988
NB	northbound
ODOT	Oregon Department of Transportation
PGE	Portland General Electric
Project	I-205: I-5 to OR-213, Phase 1 Section
ROW	right-of-way
SB	southbound
SBUH	Santa Barbara Urban Hydrograph
STA	Station

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1 Overview

1.1 Project Description

The I-205: I-5 to OR-213, Phase 1 Section project (Project) is located on I-205, from milepost (MP) 6.41 to MP 10.11 in Clackamas County, Oregon.

The main components of the Project include:

- Reconstructing the I-205 southbound (SB) auxiliary lane from OR 99E exit ramp to OR 43 entrance ramp (across the Abernethy Bridge)
- Reconstructing and extending the I-205 northbound (NB) auxiliary lane from OR 43 entrance ramp to OR 99E exit ramp (across the Abernethy Bridge)
- Constructing the NB auxiliary lane from OR 99E entrance ramp to OR 213 exit ramp
- Adjusting the OR 99E interchange ramp geometries to conform to the additional freeway lanes
- Modifying the OR 43 interchange by consolidating the entrance and exit ramps and removing the existing OR 43 NB entrance ramp that connects to the Abernethy Bridge
- Removing a portion of the rock slope adjacent to the I-205 NB direction to support the freeway widening
- Widening and seismically retrofitting the following bridges:
    - I-205 over Willamette River (Abernethy Bridge) – MP 9.03
    - I-205 SB Connector #2 to OR 43 (West Linn interchanges) – MP 9.14
    - I-205 NB Connector #1 to OR 99E (Oregon City interchange) – MP 9.30
    - I-205 over Main Street (Oregon City) – MP 9.51
- Eliminating existing seismic vulnerabilities, replacing the following bridges:
    - Sunset Avenue (West Linn) over I-205 – MP 8.28
    - West A Street (West Linn) over I-205 – MP 8.64
- Permanently removing the following conflicting bridges:
    - Broadway Street (West Linn) over I-205 and OR 43 Connector #1 – MP 8.69
    - OR 43 NB Connector to I-205 NB (Abernethy Bridge) – MP 9.00

The purpose of this project is to improve traffic congestion and safety along a 3.7-mile stretch of I-205. Currently, over 100,000 vehicles use this section of I-205 each day. The narrow roadway and volume of traffic cause more than six and a half hours of congestion daily and increase the likelihood of traffic collisions. A third lane will be added in both directions of I-205 to improve mobility and decrease collisions along the corridor.

I-205 has been designated as a lifeline route by ODOT. With this designation, I-205 must be operational if other roadways become unusable after a major earthquake. Abernethy

Bridge, which crosses the Willamette River, would be vulnerable to a large earthquake. Seismic upgrades to the Abernethy Bridge and other bridges along this section of I-205 will increase safety and access in case of a major earthquake.

1.2 Purpose of the Study

This report further evaluates the Preliminary Stormwater Recommendations previously submitted during the Final Design Acceptance Package stage. This report provides facility design information such as the type, size, location, critical dimensions, and other features determined by the project development team after review of the Preliminary Stormwater Recommendations. This report demonstrates that water quality, flow control, and conveyance design meet the requirements for the proposed storm drainage and water quality facilities.

1.3 Key Issues

There are several key issues pertaining to the stormwater design for this Project.

- Existing stormwater management features only consist of conveyance systems; there are no existing water quality facilities within the Project footprint. The existing conveyance systems will be used to the extent feasible; however, incorporating new water quality facilities and providing a conveyance system that meets current design standards will require construction of additional conveyance networks.
- Available space for detention and water quality will be limited in some areas along the Project. In these instances, drainage ditches will be replaced with closed conduit conveyance systems.
- Due to low rates of infiltration observed during testing, infiltration will not be utilized as a treatment and disposal technique. The proposed stormwater facilities are flow-through treatment facilities, where no to little infiltration into the subsurface is anticipated.

1.4 Summary of the Results

The Project area consists of 63.05 acres of Contributing Impervious Area (CIA). Thirteen treatment facilities along the length of the Project are proposed to treat 61.53 acres of the Project CIA. Of the remaining 1.52 acres, 0.93 acres are proposed to remain untreated due to maintenance access concerns and a lack of elevation to convey to proposed facilities. The final 0.59 acres lack suitable right-of-way (ROW) to be treated and non-engineered dispersion is expected to occur before runoff reaches receiving waters. To offset the untreated CIA, 1.80 acres of impervious area outside the Project are proposed to be treated. Table 1shows the analysis of surplus treatment. Facilities have been designed as flow-through treatment facilities due to low infiltration rates observed throughout the Project area.

All water quality and flow control facilities meet the required standards for new construction.

Of the thirteen proposed treatment facilities, seven are biofiltration swales and four are bioretention ponds. The remaining treatment facilities are one bioslope and one stormwater planter. One underground detention system is also proposed.

Table 1. CIA Treatment Summary

	Area w/ADT 0-25k (acre)	Area w/ADT 25k-50k (acre)	Area w/ADT 50k-100k (acre)	Total Area (acre)
Treated CIA	7.489	36.578	17.525	61.592
Non-Treated CIA	1.522	0	0	1.522
Offset Treatment	0.433	0	1.368	1.801
Treatment Total	7.922	36.578	18.893	63.393
Total CIA	9.011	36.578	17.525	63.114
Surplus Treatment	-1.089	0	+1.368	+0.279

ADT= Average Daily Traffic

2 Background

2.1 Watershed Characteristics

The Project is located along the existing I-205 corridor, between the Park Place Interchange and 10th Street. The roadway topography varies between flat and 3 percent slopes and generally slopes downhill in a west to east direction. The embankment side slopes range from flat terrain to vertical retaining walls. The roadway surface is located in both cut and fill sections in relation to the adjacent ground. The northern side of the highway is generally at a higher elevation than the southern side. Elevations along the Project range from 50 to 280 feet. Land within the Project area is primarily used as an Oregon Department of Transportation (ODOT) traffic corridor with some residential and commercial areas along the Project's perimeter.

2.1.1 Pre-Construction

General

The existing Project area consists of approximately 50 acres of CIA including pavement, gravel shoulders, overpasses that drain to the Project, and bridges.

Conveyance systems are the only existing stormwater management feature. These systems will be utilized to the extent feasible; however, new water quality facilities and construction of additional conveyance networks that meet current design standards will be incorporated to the conveyance system.

Wetlands

HDR prepared a Wetlands and Waterbodies Delineation Report describing 2017 and 2018 field investigations of nearby wetlands for the I-205 expansion. Thirteen wetland features totaling 5.12 acres were identified in the Phase 1 section during the field investigations. These features met the definition of a wetland and contained all three wetland parameters (soils, vegetation, and hydrology).

Storm Drain Piping

The existing conveyance system consists of a combination of open ditches and closed conveyance pipes, with diameters generally between 10 and 24 inches.

Inlets

Existing inlets are mostly type G-2 grate inlets.

Culverts

Several culverts drain West Linn neighborhoods across I-205 to the Willamette River. These existing drainage patterns would be maintained wherever possible to keep Project flow separate from offsite flow. Two, 12-foot box culverts cross I-205 between the Park Place Interchange and Main Street Bridge. The culverts connect the Oregon City stormwater system to its outfall to the Clackamas River.

2.1.2 Post-Construction

General

The proposed changes to existing conditions that could affect water quality or hydrology include widening the roadway surface an additional travel lane in both directions and, to a lesser extent, removing and relocating existing bridges and ramps. The additional travel lanes would not change existing roadway drainage patterns, but to meet stormwater design criteria, water quality facilities and detention facilities are proposed along the length of the Project. These facilities would be located in areas with adequate available ROW to construct and safely maintain the facilities following ODOT guidelines. Appendix A provides facility locations and proposed CIA.

Drainage curbs and inlets will be used to the extent practicable to capture roadway surface runoff, but not to capture or convey runoff from non-roadway surfaces to water quality facilities. This would reduce the required amount of ROW for the water quality facilities' footprints. Appendix B provides an inlet basin map. A set of stormwater construction plans is included in Appendix C.

Storm Drain Piping

In some areas along the Project, drainage ditches will be replaced with closed conduit conveyance systems due to lack of available space. Existing conveyance systems would be left in place where possible.

Inlets

Type G-2 inlets are proposed to collect runoff.

Manholes

Diversion manholes and pollution control manholes are proposed upstream of facilities to provide flow control and pre-treatment.

Planting Plan

The stormwater facilities will be planted in accordance with ODOT standard practices. Vegetation will be established prior to operation. Permanent seeding should be performed March 1 through May 15 and September 1 through October 31. The planting plan, which includes plant species and a schematic showing how facilities will be planted, is provided in the planting plan included in Attachment D "Stream and Wetland Restoration Plan" of the Joint Permit Application. The proposed seeding mix for the vegetated water quality facility bottoms and sides is provided in Table 2.

Table 2 Water Quality Facility Seeding

Common Name	Botanical Name	Pounds per Acre
California Oatgrass	*Danthonia californica*	5
Tufted Hairgrass	*Deschampsia cespitosa*	4
Slender Hairgrass	*Deschampsia elongata*	4
Red Fescue	*Festuca rubra var. rubra*	10
Meadow Barley	*Hordeum brachyantherum*	10
Dense Sedge	*Carex densa*	1
Slough Sedge	*Carex obnupta*	1
Slender Rush	*Juncus patens*	0.5
Spreading Rush	*Juncus tenuis*	0.5
Broadleaf Lupine	*Lupinus latifolius*	0.25
Graceful Cinquefoil	*Potentilla gracilis*	0.25

Stormwater Management Facilities

For basins where treatment is proposed, runoff is conveyed to a water quality facility for treatment. The water quality facilities consist of seven biofiltration swales, one bioslope, and one stormwater planter. In addition, four bioretention ponds are proposed for flow control, two of which are combination biofiltration swales designed to meet water quality treatment standards. One underground detention system is proposed for flow control. Details of the facilities can be found in the stormwater construction plans in Appendix C. Table 3 provides a summary of the facilities.

Table 3. Stormwater Management Facility Summary

Facility	Treated Project Area (acres)	Construction Plan Sheet	Facility Type	Description
1	1.065	HA01	Bioretention pond	Located between Station (STA) “L” 663+50 and STA “L” 665+46. The pond receives runoff from Basin 10 via sheet flow and conveyance in an existing ditch, and outfalls to an Abernethy Creek tributary.
2	3.147	HA02	Bioslope	Located between STA “L” 665+06 and STA “L” 684+64. The bioslope receives runoff from Basins 20A – 20E via sheet flow. The bioslope outfalls to an existing roadside ditch, which is connected to the Clackamas River via an existing stormwater conveyance system.
3	4.413	HA03	Bioretention pond	Bioretention pond located between STA “L” 688+85 and STA “L” 691+53. A pollution control manhole is proposed for pre-treatment. The pond receives runoff from Basin 30 and OS-31 via the proposed pipe network, which uses existing pipes and structures where possible, and outfalls to an existing system leading to Clackamas River.
4	4.553	HA04	Two biofiltration swales	Two biofiltration swales, one located between STA “99E2” 108+95 and STA “99E2” 110+07 and the other between STA “99E2” 110+31 and STA “99E2” 111+42. Runoff from Basins 40, 41, 42, 43, and 44 is collected through proposed pipe network via diversion and pollution control manholes. After treatment, the proposed network connects to an existing system that outfalls to the Willamette River.
5	4.331	HA05	Two biofiltration swales	Two biofiltration swales, one located between STA “99E2” 114+24 and STA “99E2” 115+29 and the other between STA “99E2” 116+46 and STA “99E2” 115+44. Runoff from Basins 50, 51, 52, and 53 is collected and piped under the on- and off-ramps connecting I-205 NB to OR99E through diversion and pollution control manholes before reaching either swale. After treatment, the proposed network connects to an existing system that outfalls to the Willamette River.
6	12.393	HA06, HA07	Biofiltration swale	Biofiltration swale located between STA “OR43” 10+12 and STA “OR43” 8+77. Runoff from Basins 60, 61, 62, 63, 65, 66, and 67 is conveyed to the swale from a pollution control manhole via a pipe network. After treatment, the proposed system outfalls to the Willamette River at a proposed riprap pad underneath the Abernethy Bridge.

Facility	Treated Project Area (acres)	Construction Plan Sheet	Facility Type	Description
7	1.309	HA08	Biofiltration swale	Biofiltration swale located between STA “E3” 740+37 and STA “OR43” 9+53. Runoff from Basin 72 is captured and conveyed via a ditch to the high end of the I-205 NB off-ramp to OR43. The stormwater is conveyed through the proposed pipe network and picks up flow from Basins 70 and 71. A flow splitter manhole diverts the volumetric flow rate generated by the water quality storm event in Basins 70, 71, and 72 to the swale. After treatment, the proposed system outfalls to the Willamette River at a proposed riprap pad underneath the Abernethy Bridge.
8	10.202	HA09	Biofiltration swale	Biofiltration swale located between STA “E3” 737+53 and STA “E3” 738+66. Runoff from Basin 80 is conveyed to the swale in a pipe network. The swale is sized to treat runoff from improvements further upstream, as well as some of the offsite flow from a large residential area. After treatment, the proposed system outfalls to the Willamette River at a proposed riprap pad underneath the Abernethy Bridge.
9	0.433	HA10	Stormwater planter	Stormwater planter located behind curbline of proposed parking lot in Jon Storm Park. Runoff from Basin 90 is conveyed via sheet flow. The stormwater planter is sized to treat runoff from the proposed impervious area’s new parking area. After treatment, the proposed facility connects to an existing stormwater network and discharges into the Willamette River.
10	2.951	HA11	Bioretention swale	Bioretention swale located between STA “Ln” 812+12 and STA “Ln” 813+82. Runoff from basins 100, 101 and 102 is conveyed from the proposed pipe network to a diversion manhole, followed by a pollution control manhole for pre-treatment. After treatment, the proposed system connects to an existing 18-inch culvert that reaches a tributary to the Willamette River.
11	5.836	HA12, HA13	Biofiltration swale and underground detention system	Biofiltration swale located between STA “Ln2” 836+83 and STA “Ln2” 838+60. Runoff from basins 110 and 111 is conveyed to the biofiltration swale via a diversion manhole from the proposed pipe network. A pollution control manhole is proposed for pre-treatment. After treatment, flow moves to the proposed underground system of detention pipes, outfalling into the existing conveyance system and then into a Willamette River tributary.
12	4.925	HA14	Bioretention pond	Bioretention pond located between STA “D2” 856+67 and STA “D2” 859+15. The pond receives runoff from Basins 120, 121, and 122 via sheet flow and an existing ditch. The pond outfalls to an existing ditch via proposed 24-inch pipe.

Facility	Treated Project Area (acres)	Construction Plan Sheet	Facility Type	Description
13	4.408	HA15	Bioretention pond	Bioretention pond located between STA “A2” 859+07 and STA “A2” 860+92. The pond receives runoff from Basins 130, 131, and 132 via the proposed pipe network and an existing ditch. The pond outfalls to an existing ditch via proposed 24-inch pipe.

2.2 Outfalls

Detention is proposed for facilities that outfall to systems with an upstream drainage basin of less than 100 square miles. Therefore, the existing stormwater system outfall is expected to have capacity for the additional flow. Two key outfalls to the Willamette River will be added/replaced:

- Due to proposed ground improvements, the outfall on the east side of the Willamette River underneath Abernethy Bridge will be removed and replaced.
- A new outfall will be installed on the west side of the Willamette River above the Ordinary High Water line and underneath Abernethy Bridge.

The new and replaced outfalls will have slope protection and capacity for the proposed flows.

The proposed receiving waterbody is the Willamette River. Table 4 lists the beneficial uses and water quality impairments for the receiving waterbody.

Table 4. Receiving Waters Beneficial Uses and Water Quality Impairments

Waterbody	Beneficial Uses[1]	Listed Water Quality Impairments[2]
Willamette River	Public/private/industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, hydropower, commercial navigation and transportation	aldrin, chlorophyll a, chlordane, DDE, DDT, dieldrin, dioxin, e coli, hexachlorobenzene, iron, lead, manganese, mercury, PCB, pentachlorophenol, polynuclear aromatic hydrocarbons, temperature

[1] Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines, Appendix 3 Designated Beneficial Uses(Oregon Department of Environmental Quality [DEQ] 2018)

[2] Water Quality Assessment – Oregon's 2012 Integrated Report Assessment Database and 303(d) List (DEQ 2014)

DDE=Dichloro-2,2-bis(p-chlorophenyl) ethylene
DDT=Dichlorodiphenyltrichloroethane
PCB=Polychlorinated Biphenyls

Pollutants of concern typically expected in highway runoff are sediment, nutrients, oil and grease, polycyclic aromatic hydrocarbons (PAH), and particulate and dissolved metals (such as copper and lead). Because I-205 has high average daily traffic (ADT), high pollutant loads and concentrations are expected.

2.3 Utilities

Utilities located within the existing Project area include gas, power, storm and sanitary sewers, water, and communications. Utilities, owned by various private and public entities, are listed by utility owner and divided into categories that indicate if a utility is to be relocated, a potential utility conflict, unconfirmed conflicts, or if no conflicts are anticipated. The utility information is based on utility locates performed by the Oregon Utility Notification Center and researched within the Project study area. ODOT facilities have not been provided because the facilities are part of the Project and addressed in other reports.

- Gas (NW Natural): Relocation required for 6-5/8-inch steel high pressure main and a 2-inch steel line hanging from the bridge at Broadway Street. Minor adjustments needed for 6-5/8-inch high pressure steel line on northern side of Willamette Falls Drive; 4-1/2-inch steel line on southern side of Willamette Falls Drive; 8-5/8-inch high pressure and 4-1/2-inch steel lines within Willamette Falls Drive roadway at Broadway Street; 4-1/2-inch steel line within OR43. Unconfirmed conflicts include a 2-inch poly line on southern side of 15th Street; 4-1/2-inch steel line on McLoughlin Boulevard crossing through southeastern gore of NB off-ramp to 17th Street; pressure reducing station West A Street to Broadway Street at I-205.
- Power (PGE): Potential conflicts include a 12.5 kilovolt (kV) aerial distribution line north of I-205 along West A Street. Minor adjustment needed for 12.5kV underground distribution line crossing OR43 between SB ramps and I-205. Unconfirmed conflicts include 12.5 kV aerial distribution line crossing I-205 between West A Street and Broadway Street; 12.5 kV and 115 kV aerial distribution lines along Main Street; 12.5kV underground distribution line crossing I-205 west of Main Street; secondary aerial serving street lights along Willamette Falls Drive; 60 count underground fiber crossing I-205 west of Main Street; 60 count aerial fiber along Main Street. No conflicts anticipated for 12.5 kV aerial distribution lines along Broadway Street, Clackamette Drive, McLoughlin Boulevard, and lines adjacent to I-205 SB ramps; secondary overhead power crossing Broadway Street and Willamette Falls Drive; secondary underground north of I-205 along Mcloughlin Boulevard; 144 count aerial fiber crossing OR43 south of Willamette Falls Drive.
- Water:
  - City of Oregon City potential conflicts include 8-inch waterline along Clackamette Drive, 6- and 8-inch abandoned waterlines along Clackamette Drive. No conflicts anticipated for 12-inch waterline along Mcloughlin Boulevard; 12-inch waterline along Main Street from 15th to 18th Street; 10-inch waterline crossing Main Street and Agnes Avenue intersection.
  - City of West Linn, relocation required for 8-inch waterline poured into bridge at West A Street. Minor adjustments needed for 24-inch waterline along northern side of Willamette Drive at Broadway Street and OR43. Potential conflicts include 24-inch waterline touchdown across Abernethy Bridge from Broadway Street to Willamette Drive and 24-inch waterline attached to Abernethy Bridge. No conflicts anticipated for 20-inch and abandoned 8-inch waterlines along Willamette Falls Drive at West A Street; 6-inch waterline along Broadway Street, north and south of I-205; 8-inch abandoned waterline crossing Broadway Street north of I-205; and 24-inch waterline attached to Abernethy Bridge.
- Sanitary: City of Oregon City, potential conflicts include force main crossing Clackamette Drive and 30-inch line along western side of Mcloughlin Boulevard. No conflicts anticipated for 30-inch line south of I-205 along Clackamette Drive. City of West Linn potential conflicts include sewer line crossing Willamette Falls Drive at Broadway Street and 24-inch sewer line crossing I-205 from Willamette Drive to

Abernethy Bridge. No conflicts anticipated for sewer line crossing Broadway Street on northern side of I-205.

- Storm: City of Oregon City, potential conflicts include 12-inch storm line south of I-205 along western side of Main Street. City of West Linn, no conflicts anticipated for storm line on southern side of Willamette Falls Drive at West A Street.
- Communication:
  - CenturyLink, relocation required for major duct bank from Broadway Street within sidewalk of bridge to new West A Street Bridge. Minor adjustments needed for major duct banks along Willamette Falls Drive at West A Street and within Willamette Drive (OR43). Unconfirmed conflicts include buried cable within Clackamette Drive; underground copper serving cell tower near West A Street and Broadway Street; major duct bank along eastern side of McLoughlin Boulevard.
  - Comcast Cable, potential conflict includes aerial along West A Street north of I-205. Unconfirmed conflicts include 48 count aerial fiber along Main Street and underground under I-205; 24 count aerial fiber on PGE poles and underground fiber serving cell tower West A Street to Broadway Street. No conflicts anticipated for 96 count and dark aerial fiber along southern side of Willamette Falls Drive at West A Street.
  - CBX, unconfirmed conflicts include aerial fiber on PGE poles across I-205 between West A Street and Broadway Street; aerial fiber along Main Street becomes underground under I-205. No conflicts anticipated for aerial fiber on PGE poles along West A Street north of I-205.
  - Wave Broadband, unconfirmed conflict includes cell tower adjacent to rock cut on southern side of I-205 between West A Street and Broadway Street.
  - City of Oregon City, potential conflict includes 720 count underground fiber crossing I-205 on eastern side of Main Street.

2.4 Investigations

The location survey, online mapping, past reports, and field reconnaissance were referenced when designing the proposed stormwater system. Available online mapping includes ODOT's TransGIS, West Linn's MapOptix, Oregon City's Web Maps, and as-built drawings. Oregon City's Drainage Master Plan and West Linn's Surface Water Management Plan were used to help analyze offsite drainage patterns.

Soils within the Project area generally consist of the Hydrologic Soil Groups C and D, with a few pockets of B. The Natural Resources Conservation Service (NRCS) Soil Survey Report can be found in Appendix D (NRCS 2017).

In-situ infiltration tests were completed in several locations throughout the proposed Project area. Test locations are shown in the Stormwater CIA Exhibit (Appendix A) with the Phase 1 located tests summarized in Table 5. Multiple tests were conducted at each location. The average infiltration rates during the August 2018 geotechnical investigation ranged from 0.24 to 3.36 inches per hour (in/hr).

Table 5. In-Situ Infiltration Test Results

Designation	Approximate Depth (feet)	Infiltration Testing Method	Final Infiltration Rate for each Trial (in/hr)			Average Infiltration Rate (in/hr)
			1	*2*	*3*	
INF19786-08	2.0	Open Pit Falling Head Test	1.44	1.44	1.44	1.44
INF19786-09	2.0		3.60	3.60	2.88	3.36
INF19786-10	2.0		2.88	2.88	2.88	2.88
INF19786-11	2.0		0.72	0.36	0.36	0.48
INF19786-12	2.0		1.44	0.72	1.44	1.20
INF19786-13	3.0		1.44	1.44	1.44	1.44
INF19786-14	3.5		1.44	0.72	1.44	1.20
INF19786-15	2.0		0.36	0.00	0.36	0.24

Groundwater wells were installed in October 2017 and November 2018, and elevations of seasonal groundwater levels have been measured periodically since installation. Piezometers were also installed near the western and eastern ends of the Abernethy Bridge. Table 6 provides measured seasonal high groundwater elevations and Appendix D locations of wells. For locations not near the test wells, the U.S. Geological Survey (2009) groundwater elevation maps are referenced for approximate groundwater elevations. The portion of the Project located within West Linn has groundwater levels between 20 and 100 feet below ground surface. The portion of the Project located in Oregon City has groundwater levels between 12 and 20 feet below ground surface.

Table 6. Measured Seasonal High Groundwater Elevations

Facility Number	Anticipated Seasonal High Groundwater Elevation (feet, NAVD88)
TB19786-01	13.8
TB19786-09	27.4
TB19786-30B	17.5
TB19786-32	17.6
TB19786-40	26.1
TB19786-44	36.5
TB19786-63	82.2

NAVD88= North American Vertical Datum of 1988

3 Design

3.1 Design Criteria

The Project will be designed to meet stormwater management design standards outlined in ODOT's *Hydraulics Manual* (2014), Oregon City Public Works *Stormwater and Grading Design Standards* (2020), and City of Portland *Stormwater Management Manual (2016)*, as amended and adopted by the City of West Linn, and the requirements in the City of West Linn Public Works *Design Standards* (2010). In the event design standards are different for the two agencies in overlapping coverage areas, the most conservative standard will be used.

3.1.1 Water Quality Standards

Stormwater treatment within ODOT's ROW is required to meet water quality control standards (ODOT 2014). The Project water quality goal is met if "…treatment is provided for all of the runoff generated by the Water Quality Design Storm from the contributing impervious area (CIA) using Best Management Practices (BMPs) that utilize infiltration, media filtration, or vegetative filtration." The Project's CIA consists of all impervious surfaces within the Project limits and those owned or operated by ODOT outside the Project limits that drain to the Project via direct flow or discrete conveyance.

Stormwater quality treatment facilities will be designed based on a water quality design flow rate and volume. Per City of West Linn and Oregon City, the water quality design storm is 0.83 and 1.0 inch respectively. However, ODOT's *Hydraulics Manual*'s water quality design storm is one-half of the 2-year, 24-hour storm event, or 1.22 inches. Water quality facilities will be designed using the ODOT water quality design storm of 1.22 inches. Table 7 provides additional Project design rainfall depths.

Table 7. Design Rainfall Depth

Return Interval	Rainfall Depth ODOT (inches)[1]	Rainfall Depth West Linn (inches)[2]	Rainfall Depth Oregon City (inches)[3]
Water Quality	1.22	0.83	1.0
2	2.44	2.4	2.8
10	3.28	3.4	3.5
25	3.82	3.9	4.0
50	4.17	N/A	4.4
100	4.65	4.4	4.5

[1]ODOT Hydraulics Manual Chapter 7 Appendix H, Oregon 24-Hour Precipitation Maps
[2]City of Portland Stormwater Management Manual Appendix A, Table A-1
[3]Oregon City Stormwater and Grading Design Standards Chapter 5, Table 5-2

Water quality facilities are sized based on the volumetric flow rate expected to result from the water quality storm event in the corresponding basins. Flow rate calculations for each basin can be found in Appendix E. Key design considerations for the biofiltration swales included a minimum residence time of 9 minutes and a maximum velocity of 3 feet per second during a 25-year storm event. Swale and bioslope sizing calculations are included in Appendix F. The bioslope and stormwater planter were sized to infiltrate the peak flows anticipated during the water quality storm event.

3.1.2 Detention Standards

ODOT requires detention when one of the following criteria is met (ODOT 2014):

- Required by a local jurisdiction
- Drainage deficiencies, such as flooding, have been documented
- Discharge into an intermittent or perennial water body with an upstream drainage basin less than 100 square miles
- Uncontrolled peak post-construction discharge rate during the design storm increases 0.5 cubic feet per second or more
- Total contributing area after the proposed development is 0.25 acres or more

ODOT detention guidelines are in place to reduce streambed and bank impacts to the receiving streams. The Project should not increase peak flows or duration of flows for a recurrence interval that corresponds to a flow resulting in sediment transport. ODOT defines sediment transport flows from a lower end of 42 percent of the 2-year event to an upper threshold of the 10-year event for incised streams or bank overtopping for minimally incised streams.

ODOT does not require detention if the site discharges into a water body with an upstream drainage basin greater than 100 square miles.

Oregon City uses the same flow control guidelines as ODOT, and exempts systems that discharge directly to the Clackamas River, Willamette River, and Abernethy Creek from flow control if the development lies within the 100-year floodplain or is up to 10 feet above the design flood elevation of 50.7 feet NAVD88, and the entire project is drained through a manmade conveyance system with sufficient hydraulic capacity. If detention is required, facilities should be sized using the BMP Sizing Tool explained in the Oregon City Public Works *Stormwater and Grading Design Standards*.

The City of West Linn requires the post-Project runoff from a 2-year, 24-hour storm event to be less than or equal to one-half the runoff from a 2-year, 24-hour storm for pre-development conditions. The facilities must also control the post-development peak flows from the 5-, 10-, and 25-year, 24-hour storm to the predevelopment 5-, 10-, and 25-year, 24-hour design storm events. Systems that discharge stormwater runoff directly into the Willamette River or through a conveyance system that has adequate capacity to convey the 10-year storm event to the Willamette River are exempt from detention requirements.

The bioretention ponds were sized to provide enough detention to achieve an outflow rate during the 10-year storm equal to the pre-construction outflow rate. Inflow and outflow hydrographs for the proposed detention facilities are provided in Appendix E.

3.1.3 Infiltration Design Standards

The City of West Linn and Oregon City stormwater design guidance materials recommend using infiltration as a stormwater treatment and disposal technique above other methods. Both the City of Portland *Stormwater Management Manual*, as modified by the City of West Linn and the Oregon City Public Works *Stormwater and Grading Design Standards* state that infiltration may not be required if site conditions make infiltration infeasible. Examples include:

- The site has seasonally high groundwater of less than 5 feet below the lowest elevation of the infiltration facility
- The site has low infiltration rates of less than 2.0 inches per hour
- The facility would be located on fill
- The site is located near steep slopes or does not meet slope setbacks

As discussed in Section 2.4, infiltration rates rarely exceeded 2.0 inches per hour. Because of the low onsite infiltration rates, infiltration will not be utilized as a standalone treatment and disposal technique. Instead infiltration will be combined with other stormwater treatment and disposal techniques to the extent site conditions allow.

3.1.4 Inlet Capacity and Spacing

Inlets are designed to capture flow while limiting spread as described in Chapter 13 of ODOT's *Hydraulics Manual* (2014). The design standards relevant to the Project are summarized in Table 8.

Table 8. Inlet Spread Requirements

Location	Recurrence Interval (years)	Maximum Spread	Clogging (percent)
On-grade	10	Shoulder	30
Local sag point	25	Shoulder	50
Main sag point	50	Shoulder	50

The maximum spread increases by 2 feet for the limited number of Project locations where the speed limit is less than 45 miles per hour. The minimum 5-minute time of concentration was assumed for all roadway basins. The maximum inlet spacing is 400 feet.

3.1.5 Storm Drains

Storm drains must convey the 10-year design storm. The minimum diameter for a storm drain pipe is 12 inches. For pipes that cross the highway, the minimum diameter is 18 inches. The minimum full-flow velocity for storm drains is 3 feet per second.

3.2 Analysis Methods

Flows to the water quality facilities and offsite flows were analyzed using the Santa Barbara Urban Hydrograph (SBUH) method. Runoff from small roadway basins to inlets, for the spread and conveyance calculations, was analyzed using the rational method.

1. Hydraulic calculations for the capacity analysis were performed using Manning's equation. Spread calculations were performed using Bentley MicroStation Inroads, which uses the same equations for intercepted flow and spread found in ODOT's *Hydraulics Manual*. Most of the stormwater management facilities were designed using the methodology provided in ODOT's *Hydraulics Manual*. Facilities 1, 3, and 9 were sized, using the BMP Sizing Tool per Oregon City design standards, to filter the water quality storm event through water quality mix and provide enough detention to achieve a 10-year storm outflow rate equal to the preconstruction outflow rate. Inflow and outflow hydrographs for the proposed detention facilities are provided in Appendix F. The bioslope and stormwater planter were sized to filter the peak flows anticipated during the water quality storm event through water quality mix. Assumptions are included in the relevant supporting calculations and described in the narrative below.

3.3 Calculations Discussion

3.3.1 Hydrology

The Project is divided into basins based on topography and the proposed conveyance system. Appendix A provides a map of basin and facility locations. Table 9 provides a summary of proposed drainage basins.

Table 9. Basin Summary

Basin	Treatment Facility	Treated CIA (acres)	Untreated CIA (acres)	Offset Treatment Impervious Area (acres)	Comments
10	1	1.065	0	0	--
20A	2	0.253	0	0	--
20B	2	0.839	0	0	--
20C	2	0.517	0	0	--
20D	2	0.496	0	0	--
20E	2	1.042	0	0	--
30	3	3.045	0	0	--
0S-31	3	0	0	1.368	--
40	4	0.304	0	0	--

Basin	Treatment Facility	Treated CIA (acres)	Untreated CIA (acres)	Offset Treatment Impervious Area (acres)	Comments
41	4	2.673	0	0	--
42	4	0.886	0	0	--
43	4	0.316	0	0	--
44	4	0.374	0	0	--
50	5	0.696	0	0	--
51	5	0.474	0	0	--
52	5	2.591	0	0	--
53	5	0.550	0	0	--
60	6	1.115	0	0	--
61	6	0.474	0	0	--
62	6	2.320	0	0	--
63	6	0.123	0	0	--
64	--	0	0.592	0	Unfeasible to provide engineered treatment due to lack of suitable ROW and proximity to Willamette River. Non-engineered dispersion is expected to occur before runoff reaches receiving water.
65	6	7.606	0	0	--
66	6	0.450	0	0	--
67	6	0.305	0	0	--
X	TBD	2.079	0	0	Facilities under bridge to treat subbasin X are under development and will be included in the next design iteration.
70	7	0.287	0	0	--
71	7	0.432	0	0	--
72	7	0.590	0	0	--
80	8	2.320	0	0	--
81	8	7.675	0	0	--

Basin	Treatment Facility	Treated CIA (acres)	Untreated CIA (acres)	Offset Treatment Impervious Area (acres)	Comments
82	8	0.207	0	0	--
83	--	0	0.293	0	Unfeasible to provide engineered treatment due to roadway being too low to connect to proposed drainage system.
84	--	0	0.386	0	Unfeasible to provide engineered treatment due to roadway being too low to connect to proposed drainage system.
90	9	0.268	0	0	--
91	--	0	0.251	0	--
100	10	1.533	0	0	--
101	10	2.461	0	0	--
102	10	0.490	0	0	--
110	11	3.507	0	0	--
111	11	2.329	0	0	--
120	12	3.287	0	0	--
121	12	1.252	0	0	--
122	12	0.386	0	0	--
130	13	3.528	0	0	--
131	13	0	0	0.433	--
132	13	0.447	0	0	--
Totals		**61.592**	**1.522**	**1.801**	**--**

3.3.2 Facility Design

The water quality design flow was calculated in HydroCAD using the SBUH method. The biofiltration swales were designed to treat the water quality design flow using the parameters described in ODOT's *Hydraulics Manual*. These parameters are noted in the sizing calculations in Appendix F. Swale dimensions and locations can be found in the construction plans (Appendix C).

The bioslope was designed to treat the water quality design flow and capture and convey the peak flow from a 2-year storm event. The design procedures listed in Chapter 14, Appendix C of ODOT's *Hydraulic Manual* were used to size the proposed bioslope. Facility plans and cross sections are provided in the construction plans.

Bioretention ponds and the underground detention system are designed so that the post-construction design peak flow is less than or equal to the pre-construction design peak flow for the 10-year storm event. The 10-year design storm hydrograph was calculated in HydroCAD using the SBUH method. The bioretention ponds are designed to provide detention while using the parameters in ODOT's *Hydraulics Manual*.

For facilities 1, 3, and 9, the BMP Sizing Tool was used for design. Output from the tool is included in Appendix F.

Design values for pond, swale, and bioslope sizing can be found in the sizing calculations in Appendix F. A summary of all facilities, with the CIA they are designed to treat and their locations in the construction plans, can be found in Table 3.

3.3.3 Groundwater Considerations

Stormwater facilities were designed to not infiltrate in areas with high groundwater tables. Table 10 summarizes the anticipated seasonal high groundwater elevations at each water quality facility and whether or not a liner is proposed for each facility. Facilities 2 and 6 have proposed impermeable membranes for structural purposes as both facilities are located on fill. Because the groundwater elevation was obtained from the USGS Depth to Groundwater maps and the anticipated close proximity of the groundwater to the facility invert, an impermeable membrane is proposed for Facility 3 to prevent migration to the groundwater.

Table 10 Water Quality Facility Depth to Groundwater

Facility ID	Facility Invert Elevation	Anticipated High Seasonal Groundwater Elevation	Depth to Groundwater	Impermeable Liner
1	48.5	33.7*	14.8*	No
2	Varies	Varies	Varies	Yes
3	35.0	29.3*	5.7*	Yes
4	43.8	17.5	26.3	No
5	52.9	17.5	35.4	No
6	105.8	36.5	69.3	Yes
7	118.7	66.2*	52.5*	No
8	142.8	74.3*	68.5*	No
9	37.9	17.6	20.3	No
10	252.5	151.9*	100.6*	No

11	201.0	136.6*	64.4*	No
12	159.9	82.2	77.7	No
13	141.2	82.2	59.0	No

* Groundwater elevation from USGS Depth to Groundwater Interactive Maps (USGS)

3.3.4 Inlet Capacity and Spacing

Inlets are designed to accept the design storm while limiting spread per the requirements outlined in Section 3.1.4. The spread analysis was conducted using Bentley MicroStation Inroads (Appendix G).

3.3.5 Pipe Sizing

Storm drains were designed to convey the 10-year storm and meet other requirements outlined in Section 3.1.5. Manning's equation, assuming full flow, was used to analyze the storm drain capacity (Appendix H).

4 Maintenance

4.1.1 Responsible Party

ODOT staff will provide oversight during Project construction to ensure water quality and stormwater management Project elements are properly constructed following Project plans and specifications. Vegetation shall be established prior to use. Planting should take place from March 1 through May 15 or September 1 through October 31. During this post-construction period, ODOT construction inspection staff will conduct inspections to determine if the water quality and stormwater management swales are vegetated according to specifications and treatment needs. After construction, ODOT maintenance staff will review the facilities at intervals sufficient to ensure continued functioning as designed.

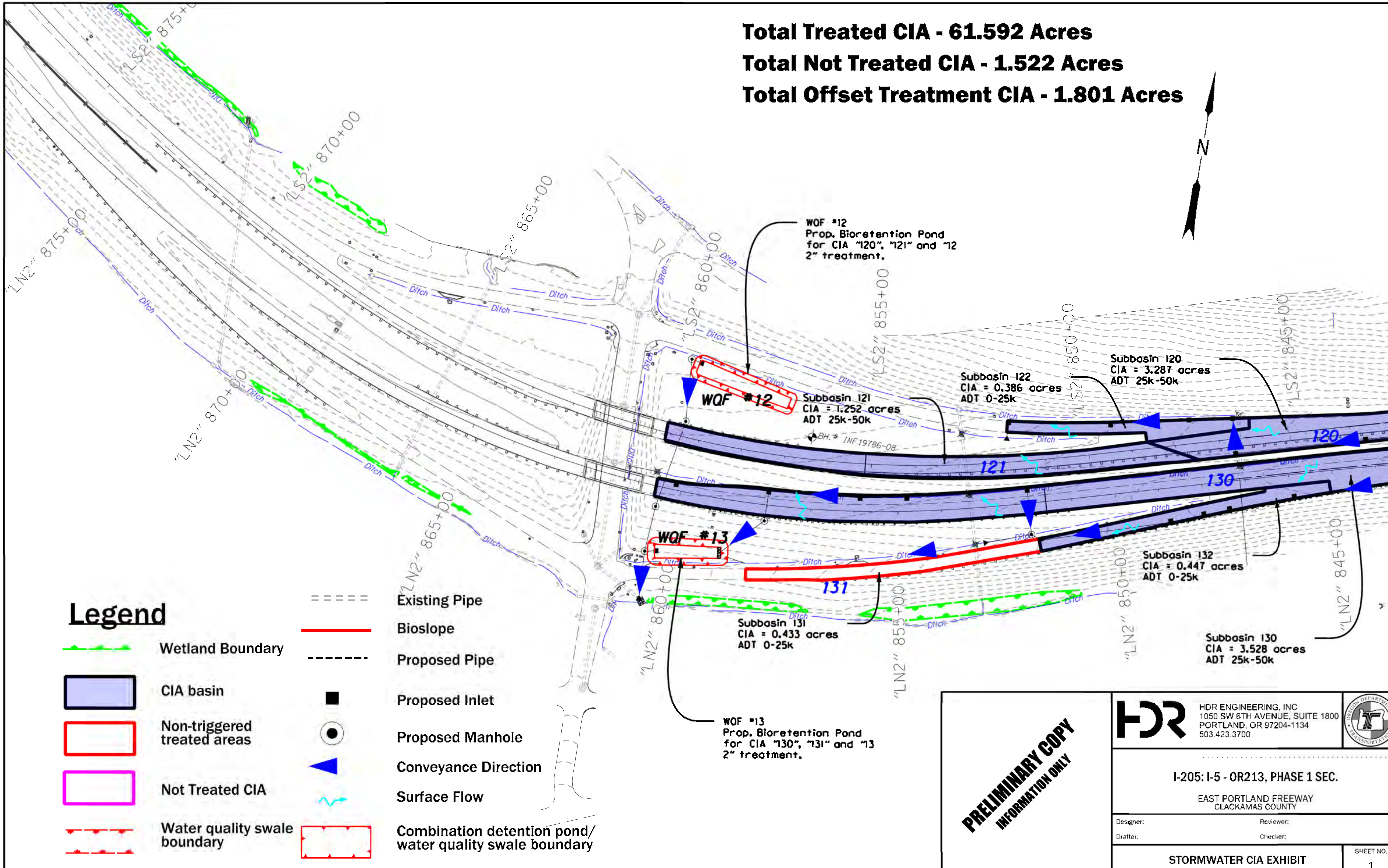
4.1.2 Routine Maintenance Actions

As part of the final plans package, templates for each stormwater facility will be provided. After the facilities are constructed, a comprehensive Operations and Maintenance Manual will be prepared by ODOT staff for each facility using standards described in the ODOT *Hydraulics Manual*. Appendix I provides tables of routine maintenance for the applicable stormwater facilities.

4.1.3 Maintenance Activity Schedule

Maintenance activities will follow the schedule outlined in the tables provided in Appendix I as well as the maintenance schedules determined by ODOT District 2B.

Appendix A. CIA Exhibit



166

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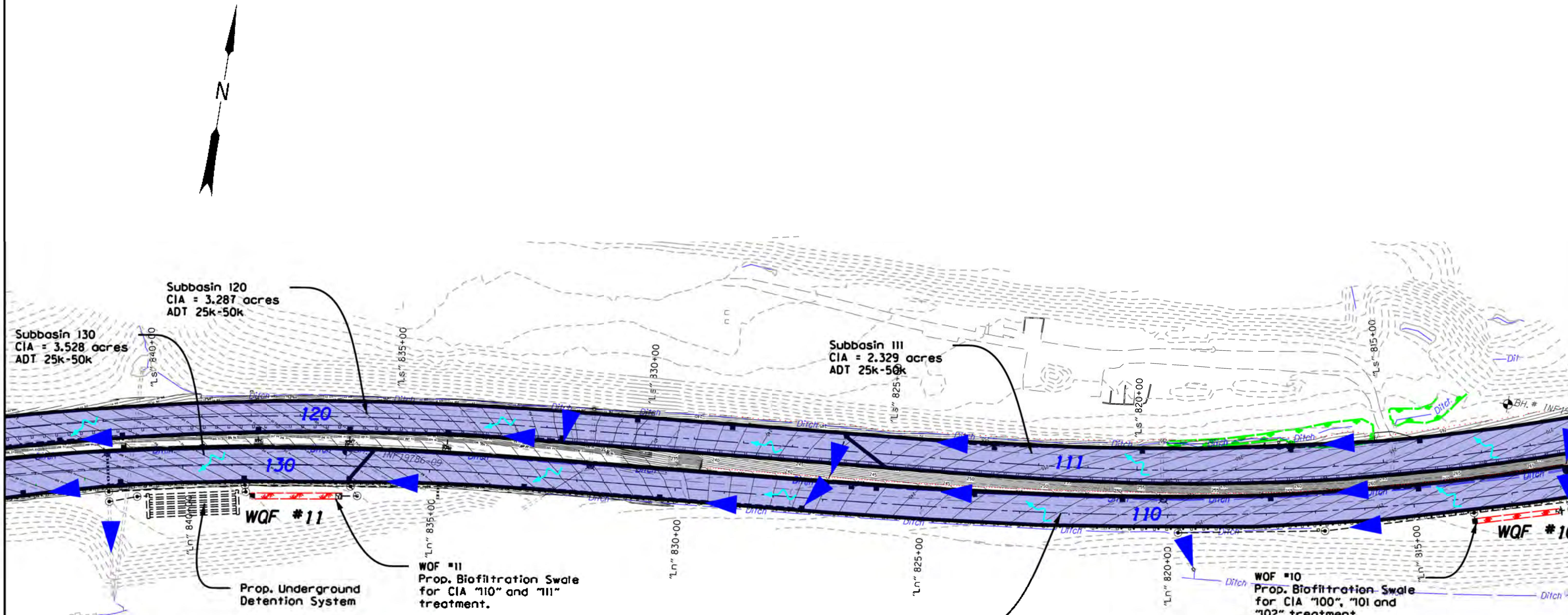

Legend

	Wetland Boundary		Existing Pipe
	CIA basin		Bioslope
	Non-triggered treated areas		Proposed Pipe
	Not Treated CIA		Proposed Inlet
	Water quality swale boundary		Proposed Manhole
			Conveyance Direction
			Surface Flow
			Combination detention pond/ water quality swale boundary

Total Treated CIA - 61.592 Acres

Total Not Treated CIA - 1.522 Acres

Total Offset Treatment CIA - 1.801 Acres

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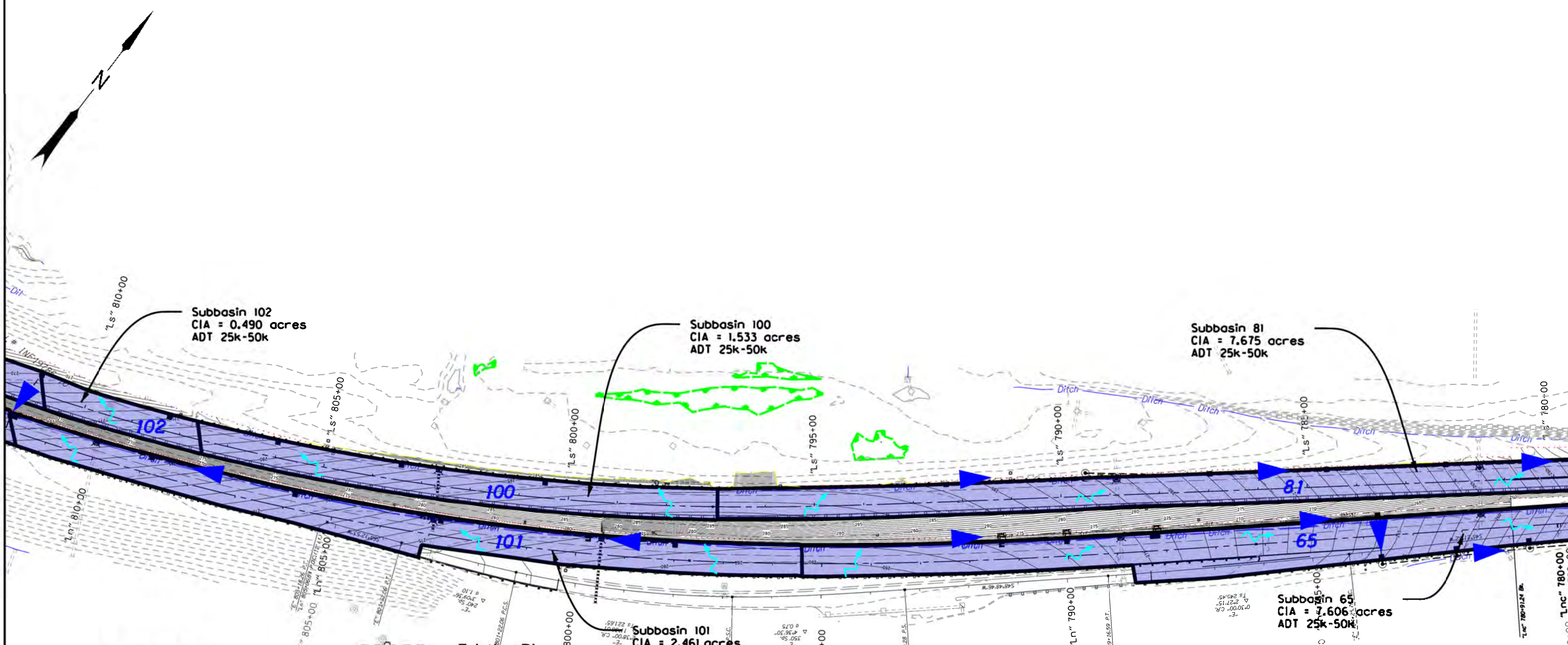

Legend

	Wetland Boundary		Existing Pipe
	CIA basin		Bioslope
	Non-triggered treated areas		Proposed Pipe
	Not Treated CIA		Proposed Inlet
	Water quality swale boundary		Proposed Manhole
			Conveyance Direction
			Surface Flow
			Combination detention pond/ water quality swale boundary

Total Treated CIA - 61.592 Acres

Total Not Treated CIA - 1.522 Acres

Total Offset Treatment CIA - 1.801 Acres

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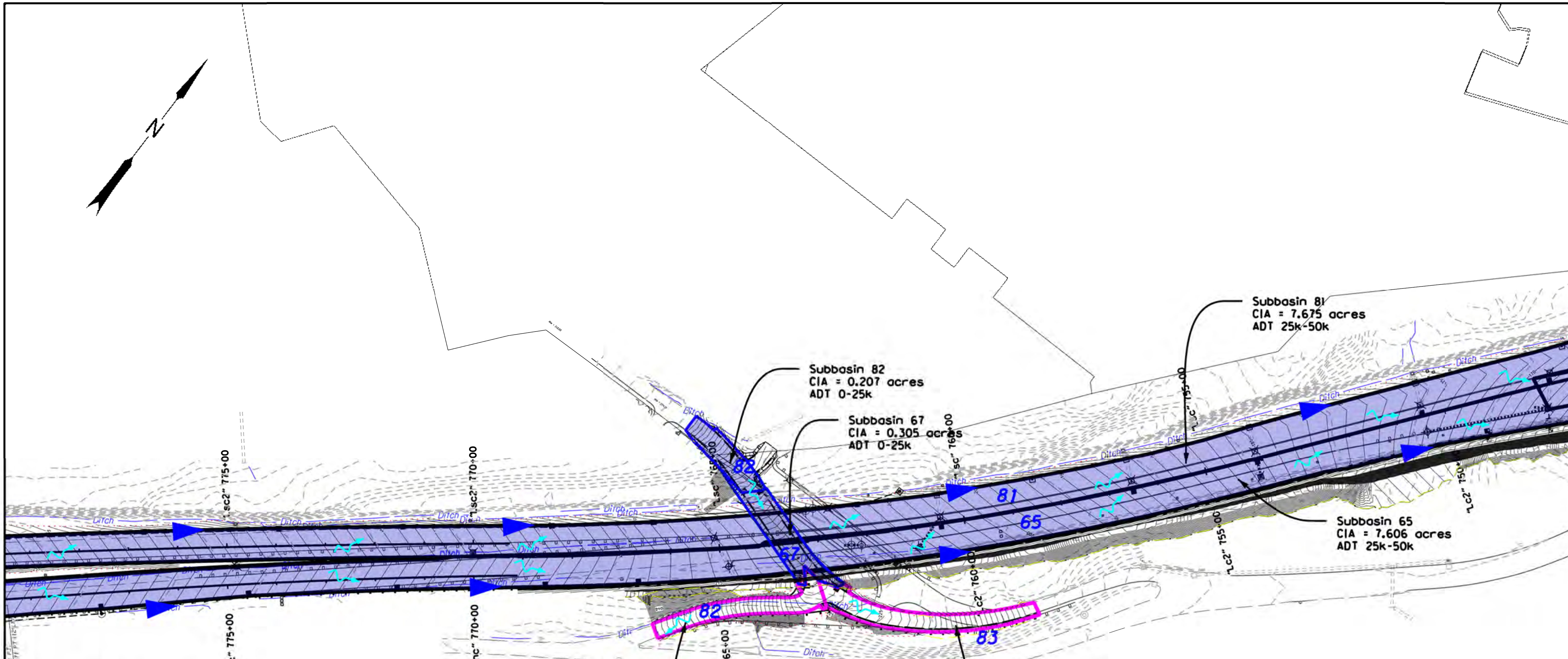

Total Treated CIA - 61.592 Acres

Total Not Treated CIA - 1.522 Acres

Total Offset Treatment CIA - 1.801 Acres

Legend

- Wetland Boundary
- CIA basin
- Non-triggered treated areas
- Not Treated CIA
- Water quality swale boundary
- Existing Pipe
- Bioslope
- Proposed Pipe
- Proposed Inlet
- Proposed Manhole
- Conveyance Direction
- Surface Flow
- Combination detention pond/ water quality swale boundary

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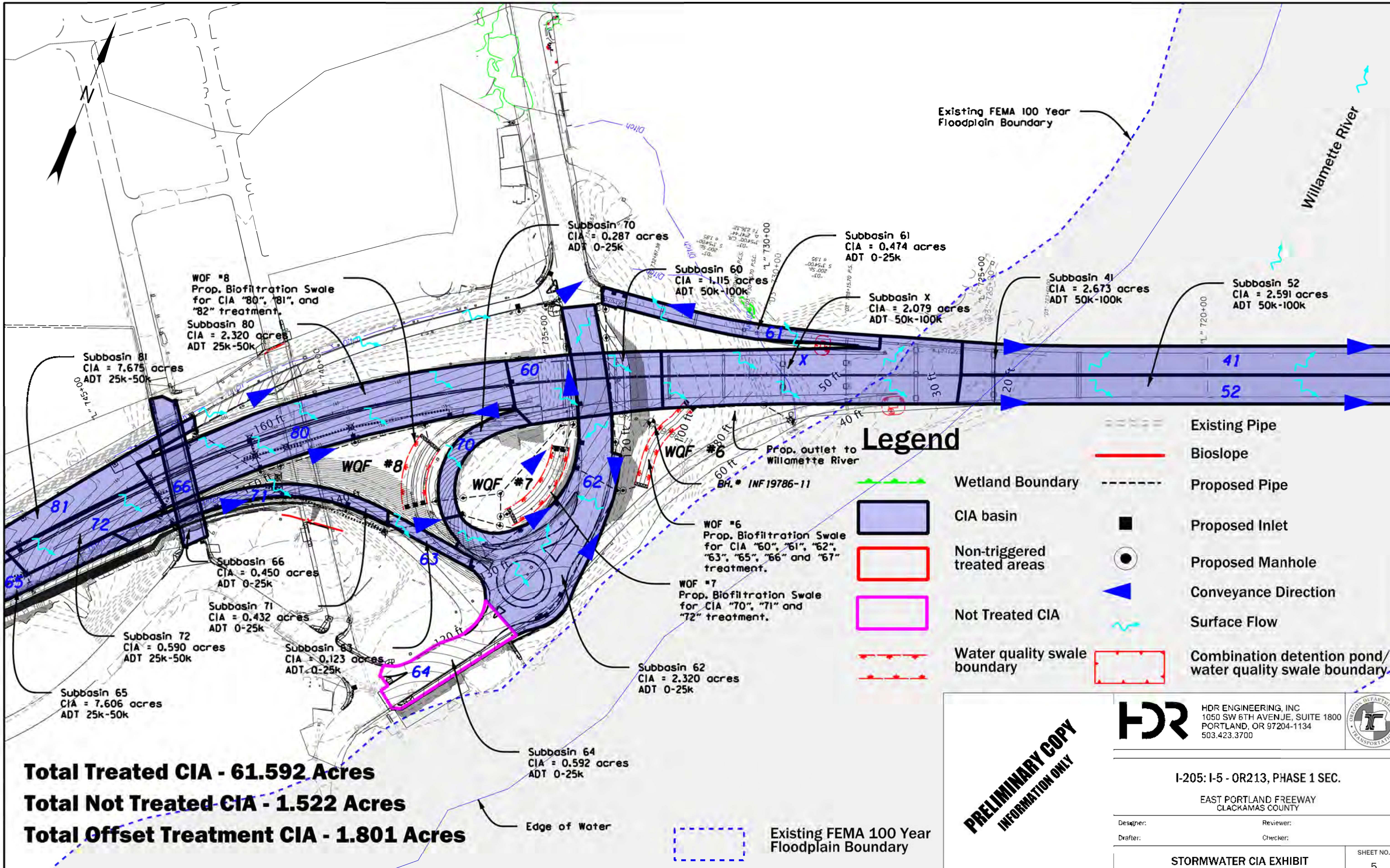
Existing FEMA 100 Year Floodplain Boundary
Willamette River
Subbasin 70
CIA = 0.287 acres
ADT 0-25k
Subbasin 61
CIA = 0.474 acres
ADT 0-25k
Subbasin 60
CIA = 1.115 acres
ADT 50k-100k
Subbasin X
CIA = 2.079 acres
ADT 50k-100k
Subbasin 41
CIA = 2.673 acres
ADT 50k-100k
Subbasin 52
CIA = 2.591 acres
ADT 50k-100k
WQF #8
Prop. Biofiltration Swale
for CIA "80", "81", and
"82" treatment.
Subbasin 80
CIA = 2.320 acres
ADT 25k-50k
Subbasin 81
CIA = 7.675 acres
ADT 25k-50k
Prop. outlet to
Willamette River
BH.# INF 19786-11
WQF #6
WQF #7
WQF #8
WOF #6
Prop. Biofiltration Swale
for CIA "60", "61", "62",
"63", "65", "66" and "67"
treatment.
WOF #7
Prop. Biofiltration Swale
for CIA "70", "71" and
"72" treatment.
Subbasin 66
CIA = 0.450 acres
ADT 0-25k
Subbasin 71
CIA = 0.432 acres
ADT 0-25k
Subbasin 72
CIA = 0.590 acres
ADT 25k-50k
Subbasin 63
CIA = 0.123 acres
ADT 0-25k
Subbasin 65
CIA = 7.606 acres
ADT 25k-50k
Subbasin 62
CIA = 2.320 acres
ADT 0-25k
Subbasin 64
CIA = 0.592 acres
ADT 0-25k
Edge of Water
Legend
Existing Pipe
Bioslope
Wetland Boundary
Proposed Pipe
CIA basin
Proposed Inlet
Non-triggered treated areas
Proposed Manhole
Conveyance Direction
Not Treated CIA
Surface Flow
Water quality swale boundary
Combination detention pond/ water quality swale boundary
Existing FEMA 100 Year Floodplain Boundary
Total Treated CIA - 61.592 Acres
Total Not Treated CIA - 1.522 Acres
Total Offset Treatment CIA - 1.801 Acres
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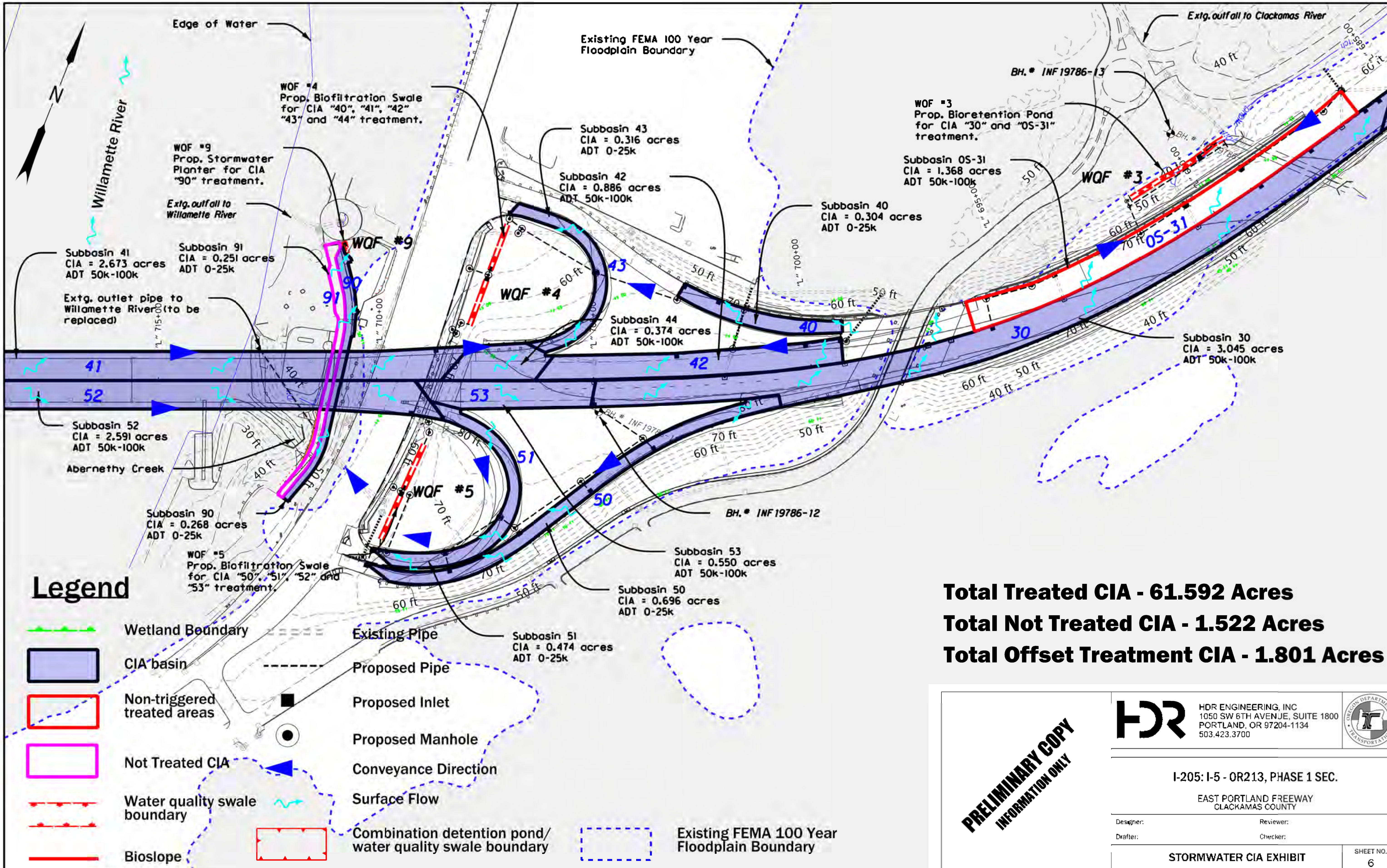
170


N
Willamette River
Edge of Water
Existing FEMA 100 Year Floodplain Boundary
Extg. outfall to Clackamas River
BH. # INF 19786-13
WOF #4
Prop. Biofiltration Swale for CIA "40", "41", "42" "43" and "44" treatment.
WOF #9
Prop. Stormwater Planter for CIA "90" treatment.
Extg. outfall to Willamette River
Subbasin 43
CIA = 0.316 acres
ADT 0-25k
Subbasin 42
CIA = 0.886 acres
ADT 50k-100k
WOF #3
Prop. Bioretention Pond for CIA "30" and "OS-31" treatment.
Subbasin OS-31
CIA = 1.368 acres
ADT 50k-100k
Subbasin 40
CIA = 0.304 acres
ADT 0-25k
Subbasin 41
CIA = 2.673 acres
ADT 50k-100k
Subbasin 91
CIA = 0.251 acres
ADT 0-25k
Extg. outlet pipe to Willamette River (to be replaced)
WQF #9
WQF #4
WQF #3
WQF #5
Subbasin 44
CIA = 0.374 acres
ADT 50k-100k
Subbasin 30
CIA = 3.045 acres
ADT 50k-100k
Subbasin 52
CIA = 2.591 acres
ADT 50k-100k
Abernethy Creek
Subbasin 90
CIA = 0.268 acres
ADT 0-25k
BH. # INF 19786-12
WOF #5
Prop. Biofiltration Swale for CIA "50", "51", "52" and "53" treatment.
Subbasin 53
CIA = 0.550 acres
ADT 50k-100k
Subbasin 50
CIA = 0.696 acres
ADT 0-25k
Subbasin 51
CIA = 0.474 acres
ADT 0-25k
Total Treated CIA - 61.592 Acres
Total Not Treated CIA - 1.522 Acres
Total Offset Treatment CIA - 1.801 Acres
Legend
Wetland Boundary
CIA basin
Non-triggered treated areas
Not Treated CIA
Water quality swale boundary
Bioslope
Existing Pipe
Proposed Pipe
Proposed Inlet
Proposed Manhole
Conveyance Direction
Surface Flow
Combination detention pond/ water quality swale boundary
Existing FEMA 100 Year Floodplain Boundary
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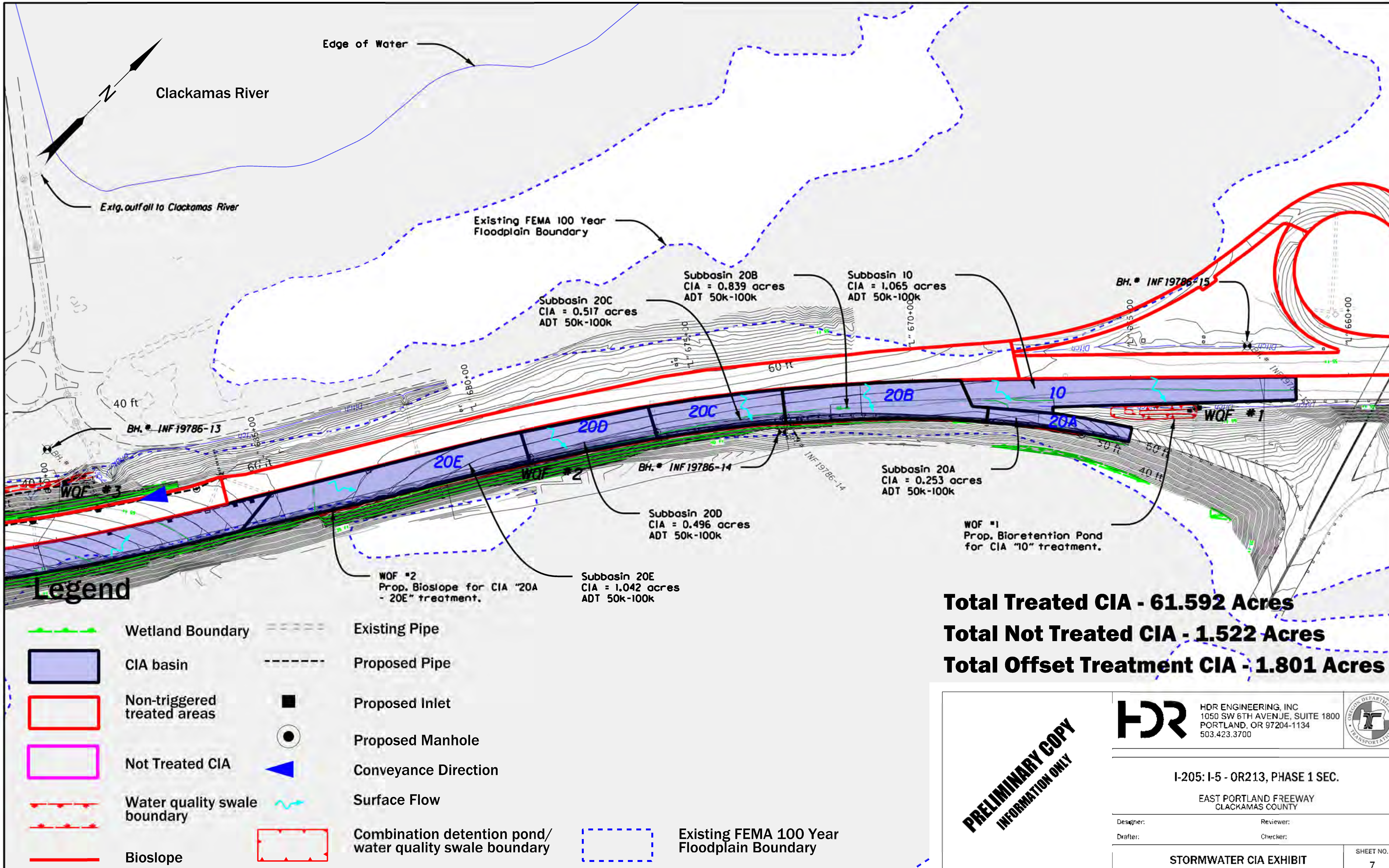

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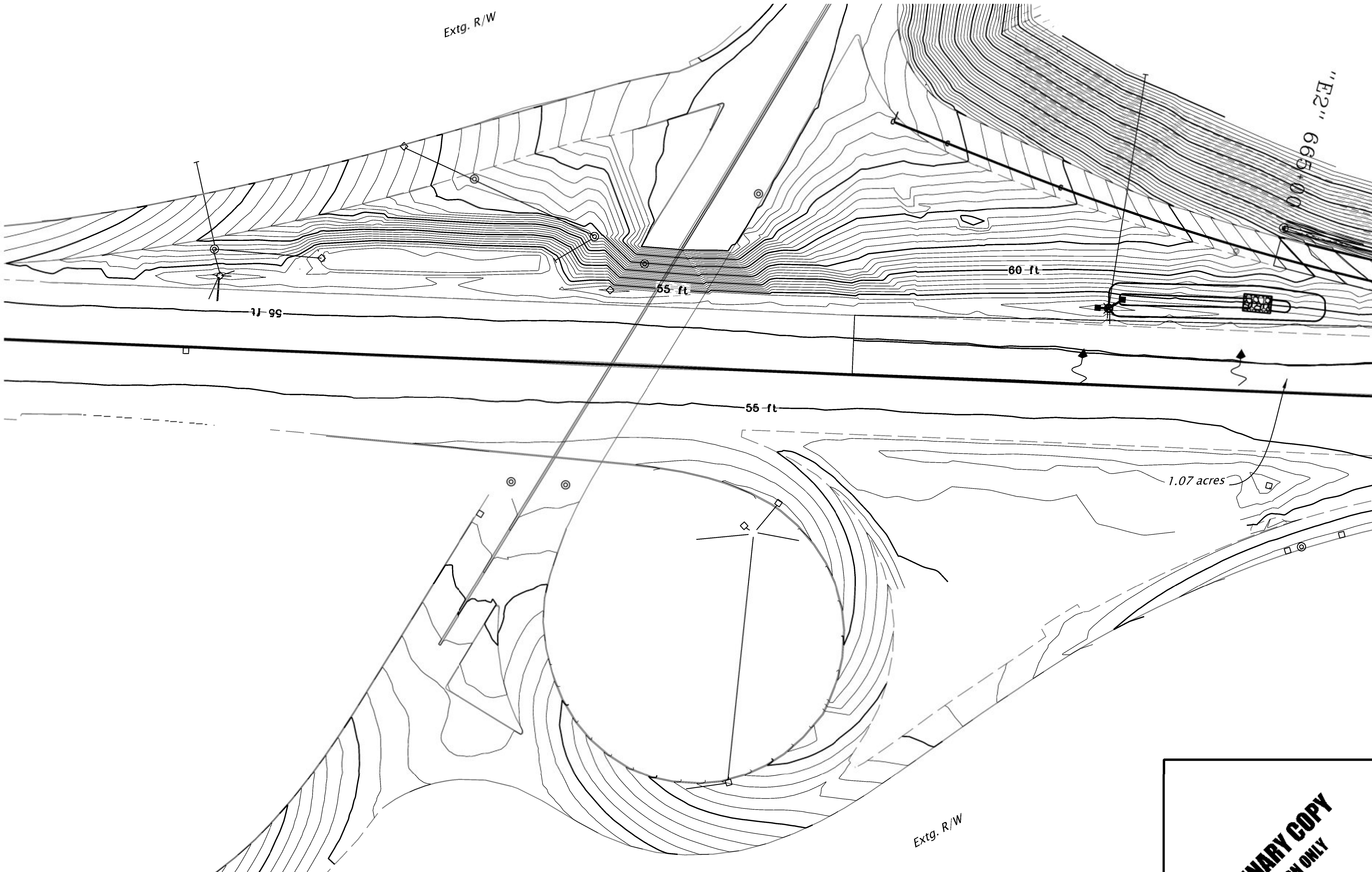
Appendix B. Inlet Basin Map

Sec. 29, T. 2S, R.2E, W.M.

PARK PLACE INTERCHANGE

??V-???



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DRAINAGE BASIN MAP

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176

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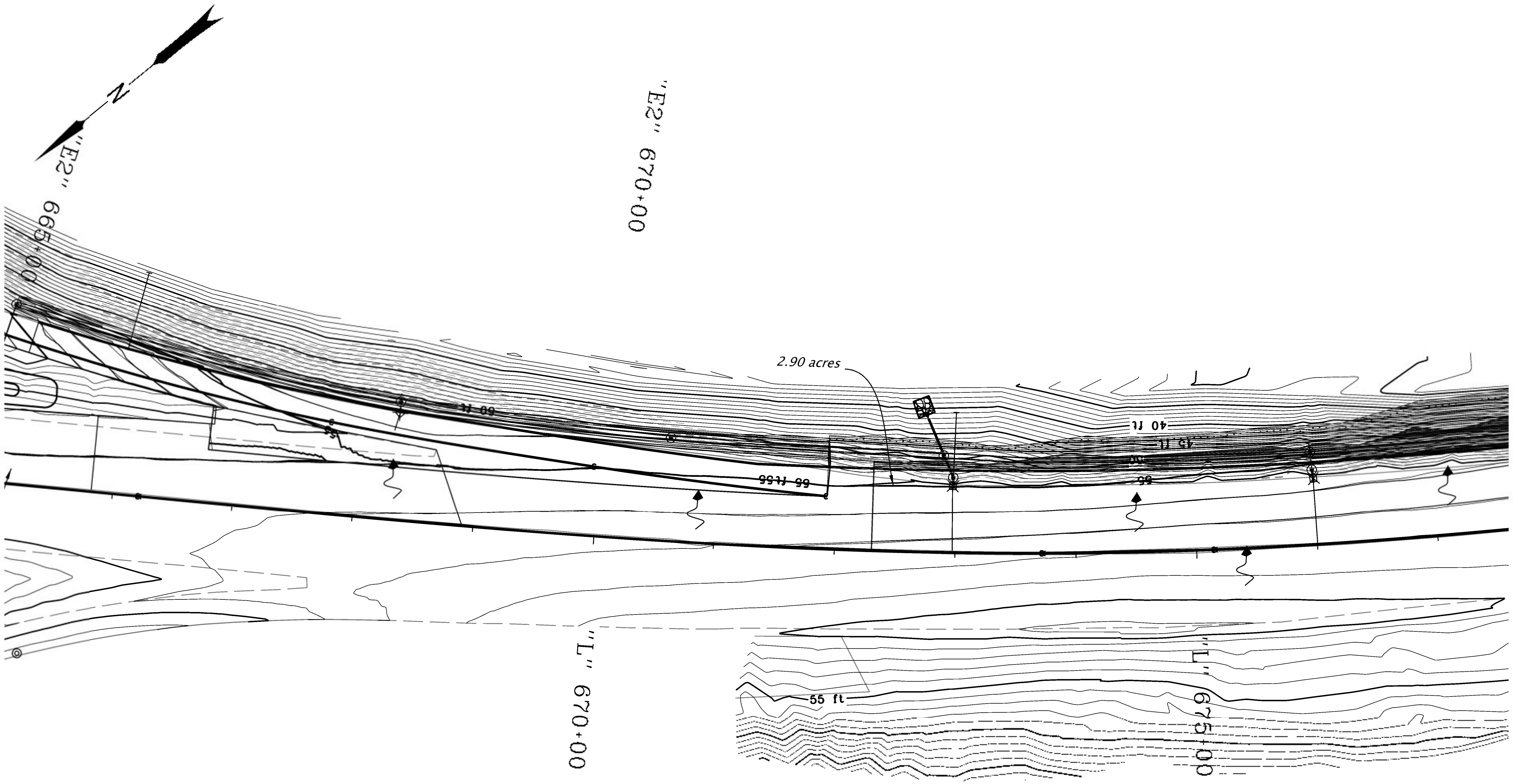
??V-???



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DRAINAGE BASIN MAP

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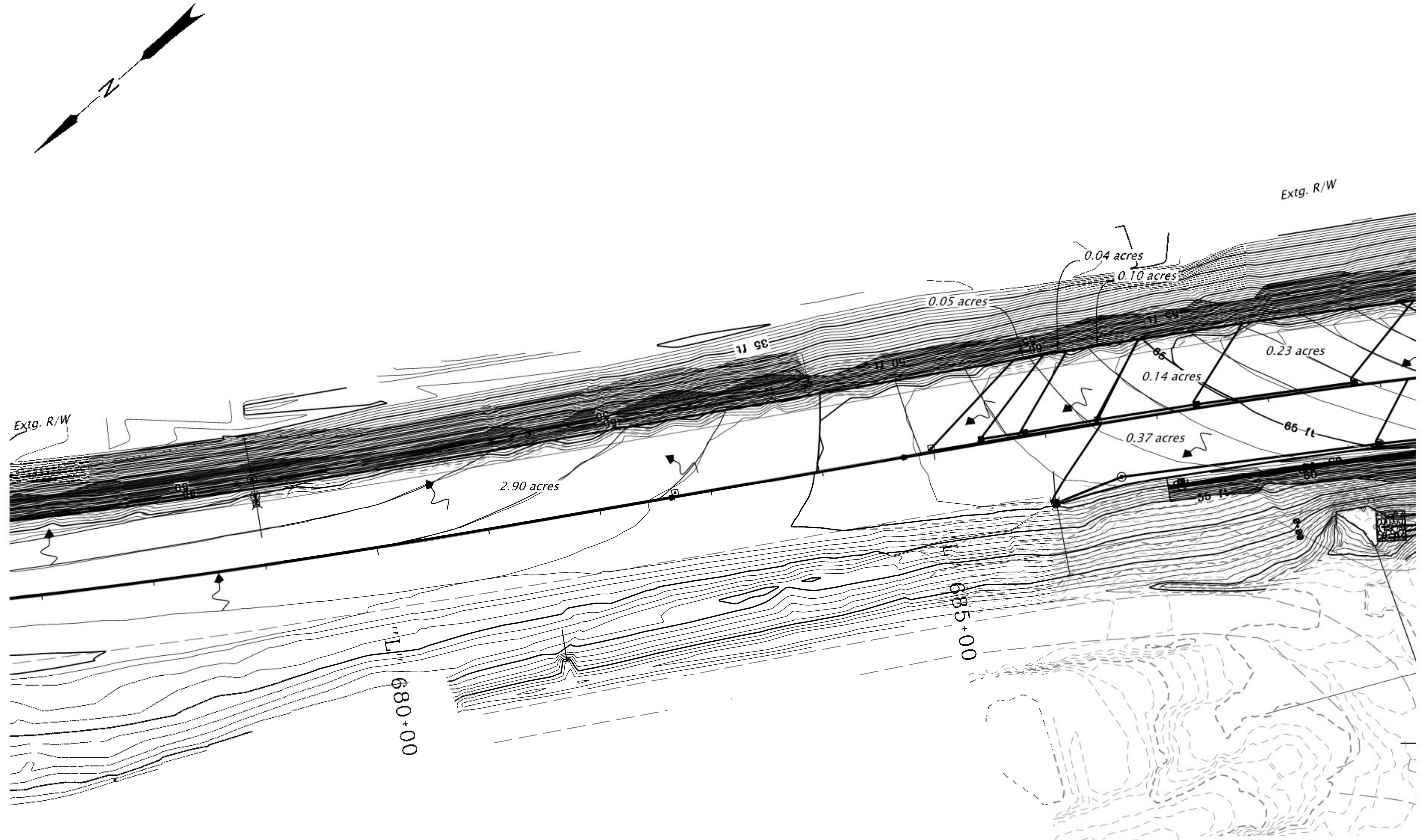

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DRAINAGE BASIN MAP

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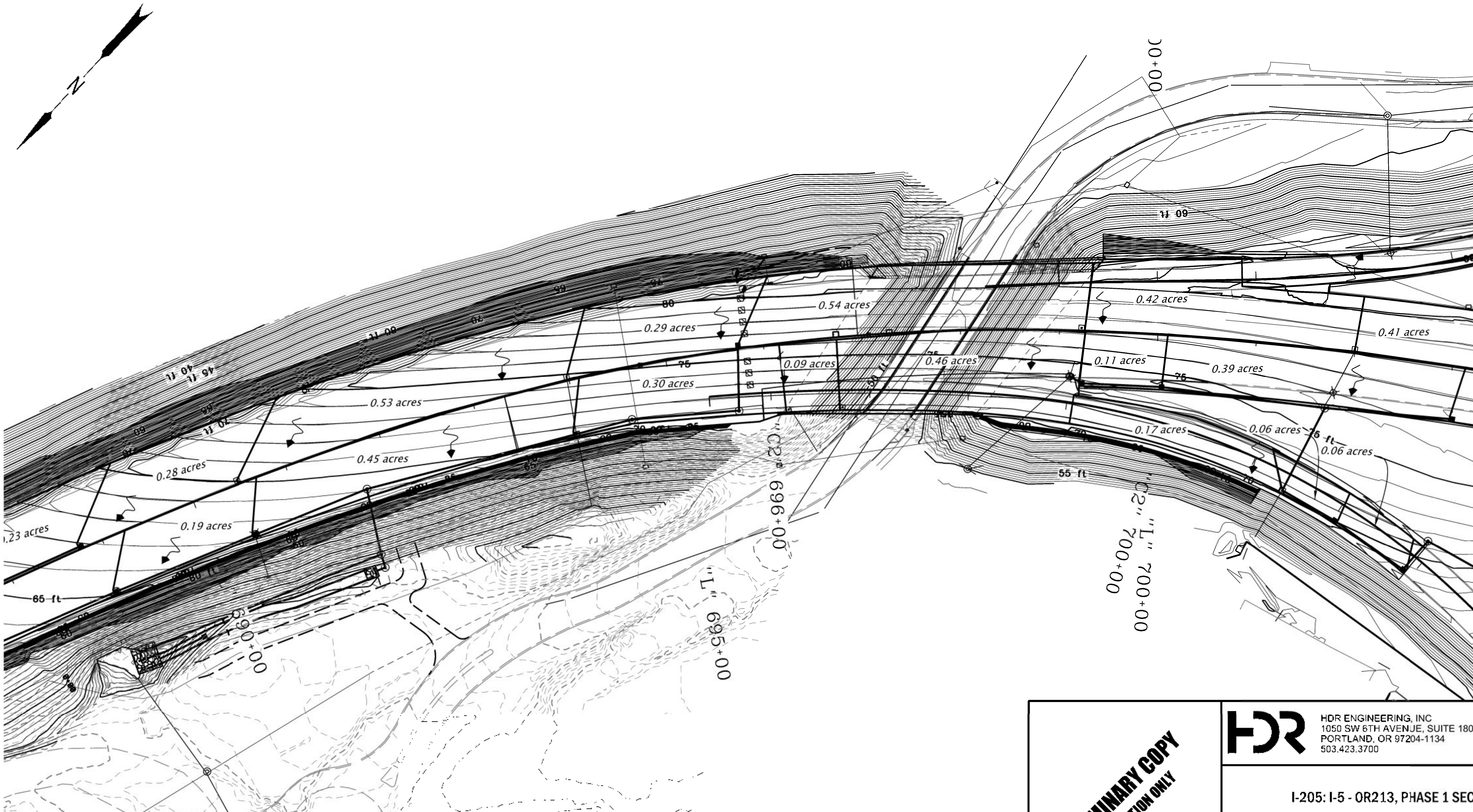
OREGON CITY INTERCHANGE



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DRAINAGE BASIN MAP

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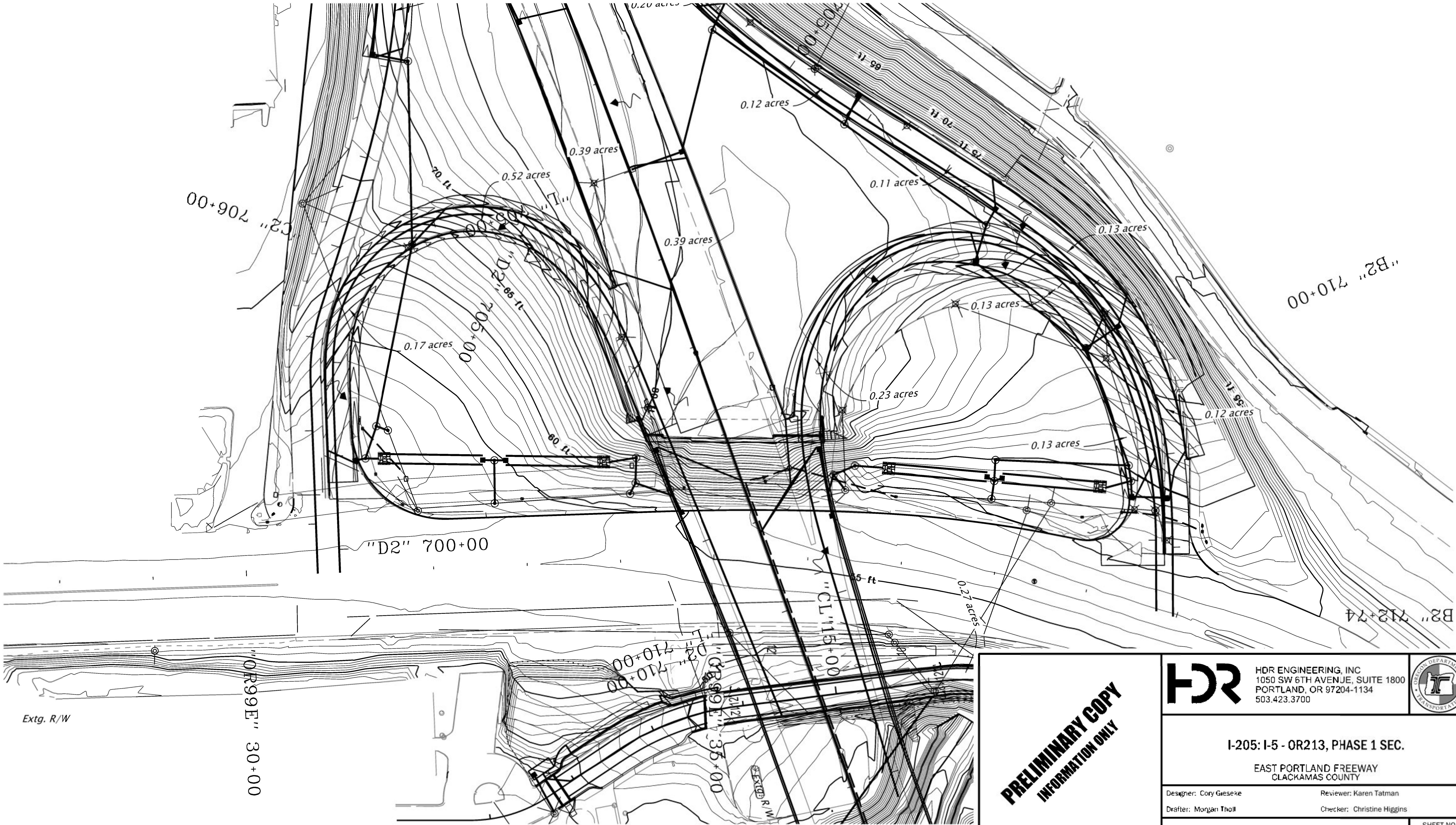

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OREGON CITY INTERCHANGE

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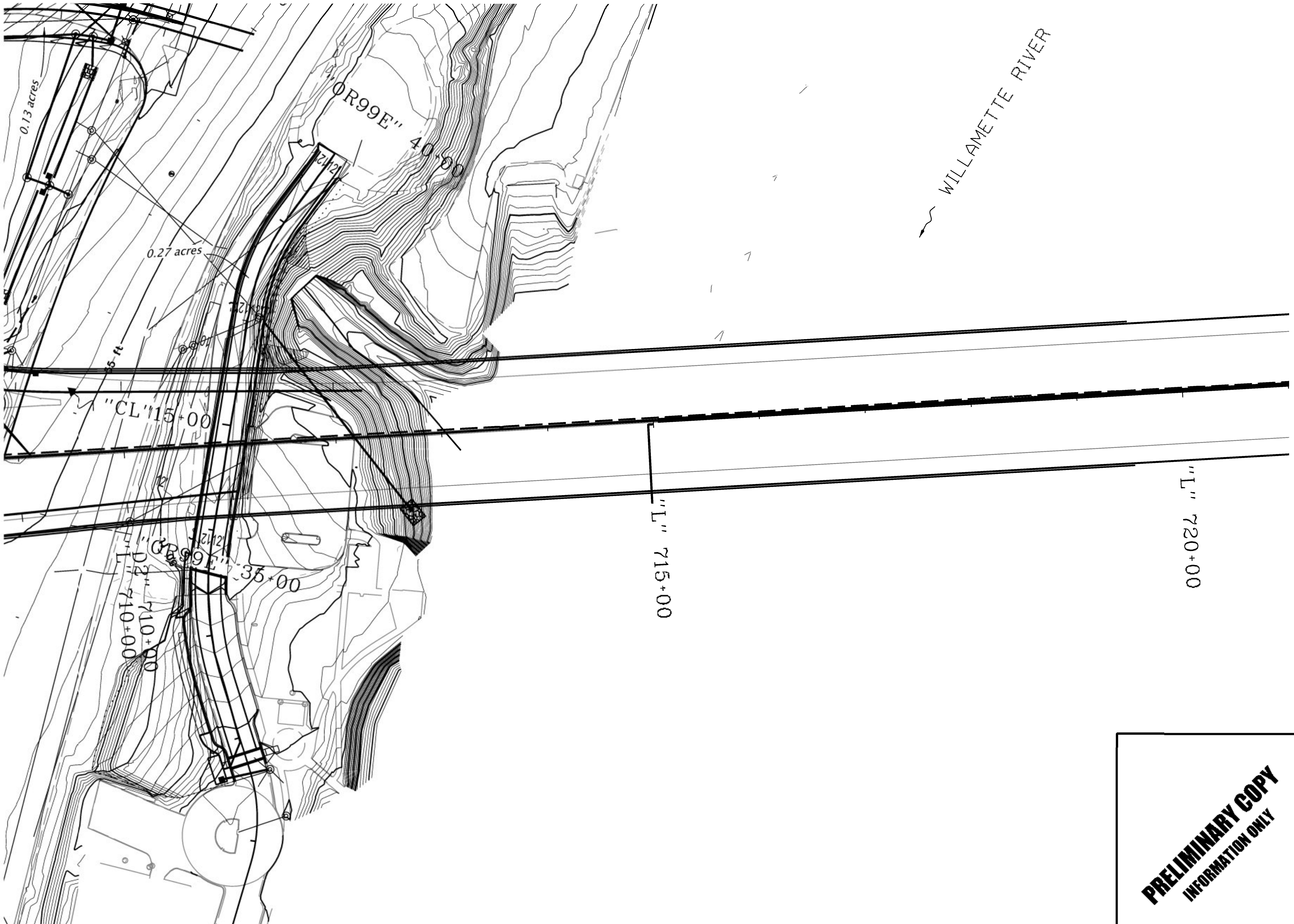

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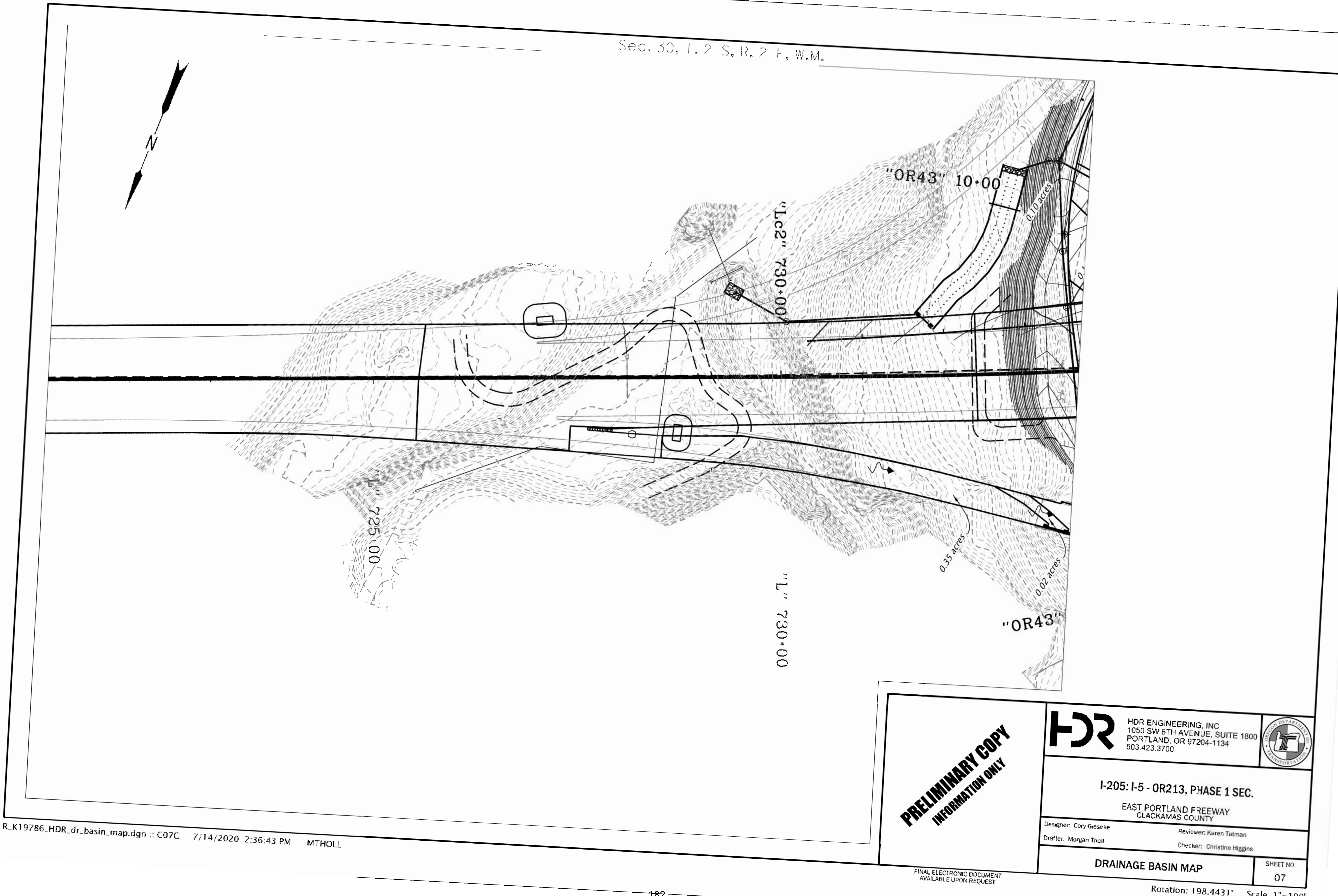

Sec. 30, T. 2 S, R. 2 E, W.M.
N
"OR43" 10+00
"Lc2" 730+00
0.10 acres
"L" 725+00
"L" 730+00
0.35 acres
0.02 acres
"OR43"
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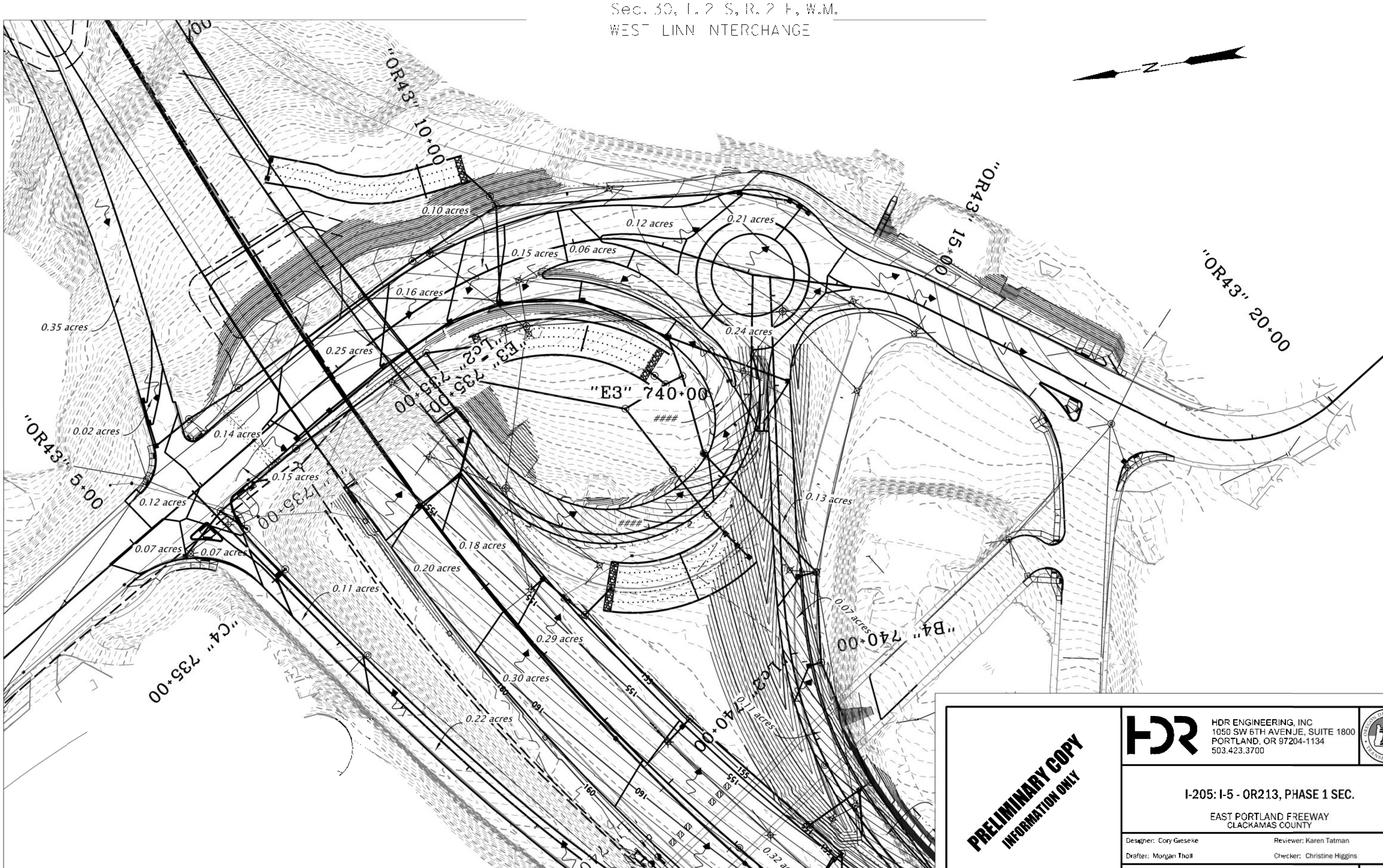

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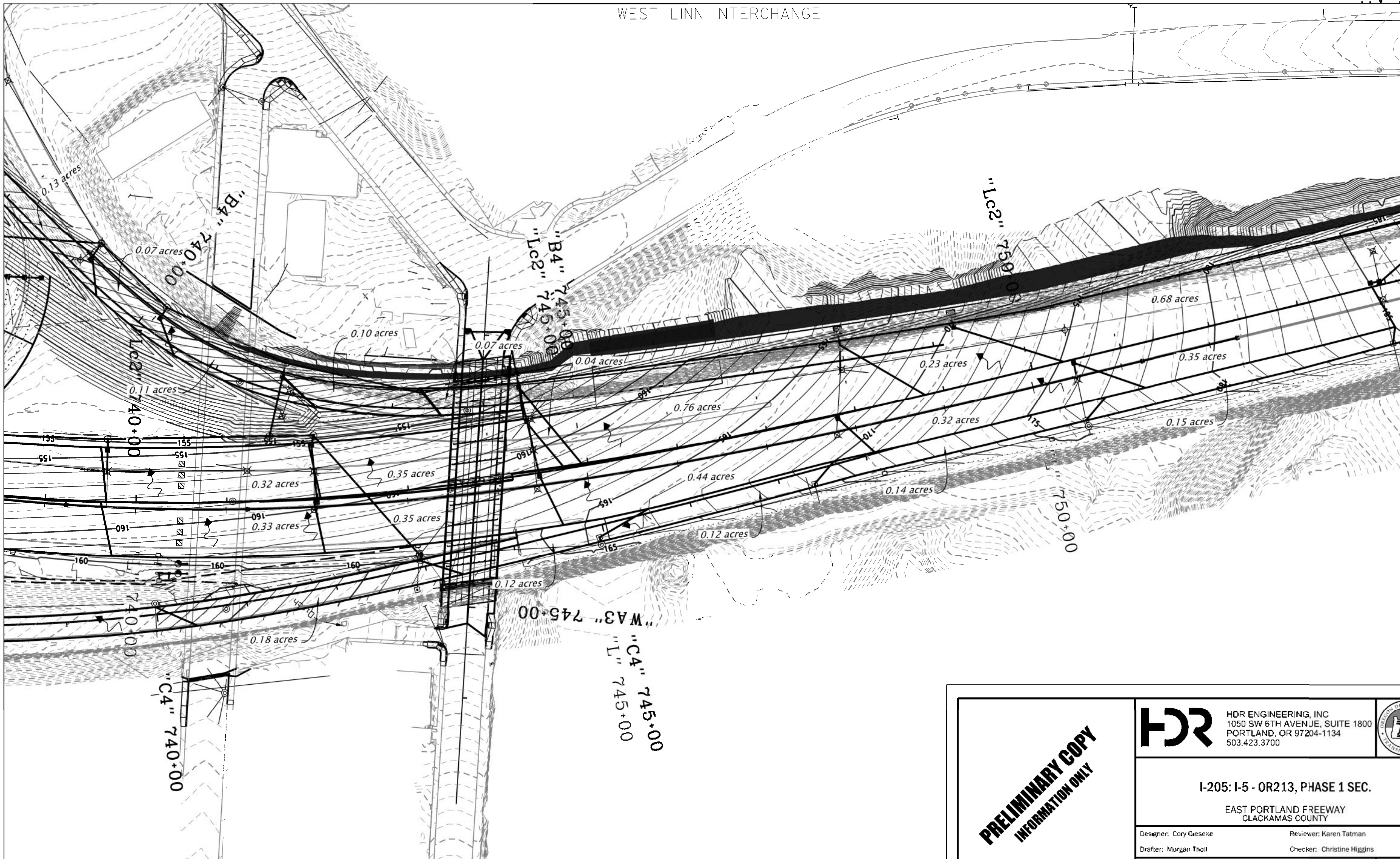
WEST LINN INTERCHANGE

??V-???



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DRAINAGE BASIN MAP

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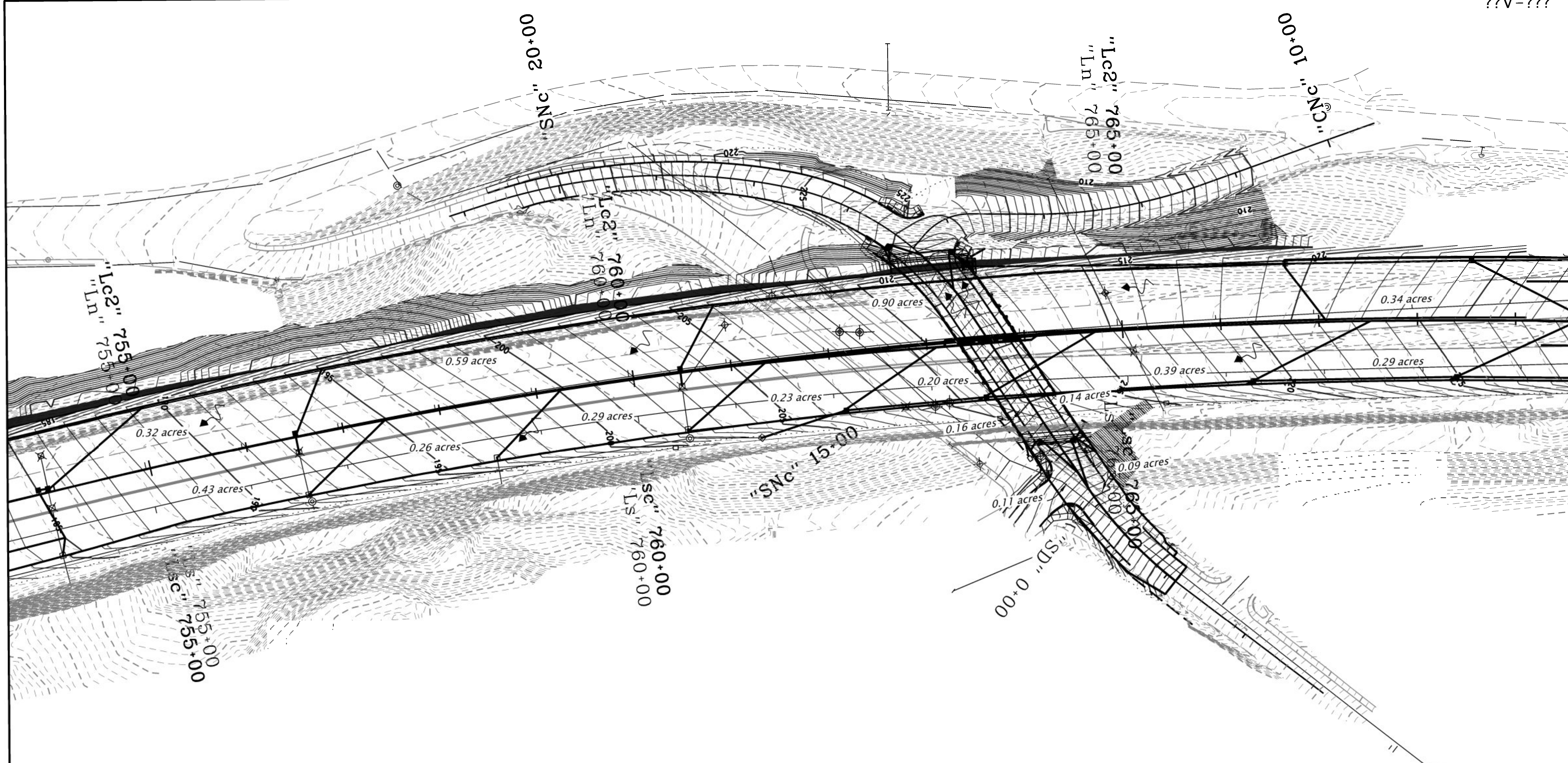

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DRAINAGE BASIN MAP

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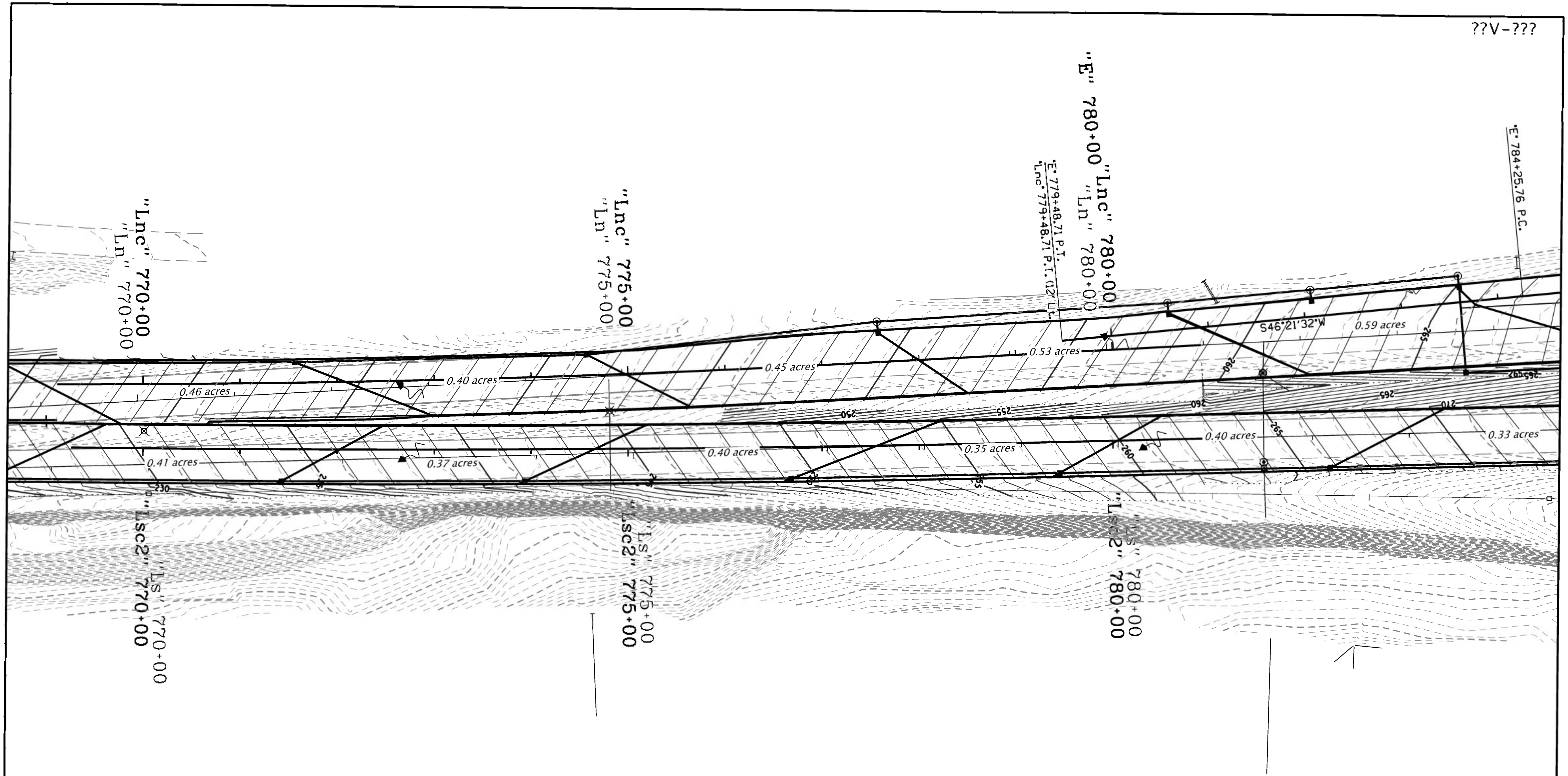

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DRAINAGE BASIN MAP

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11

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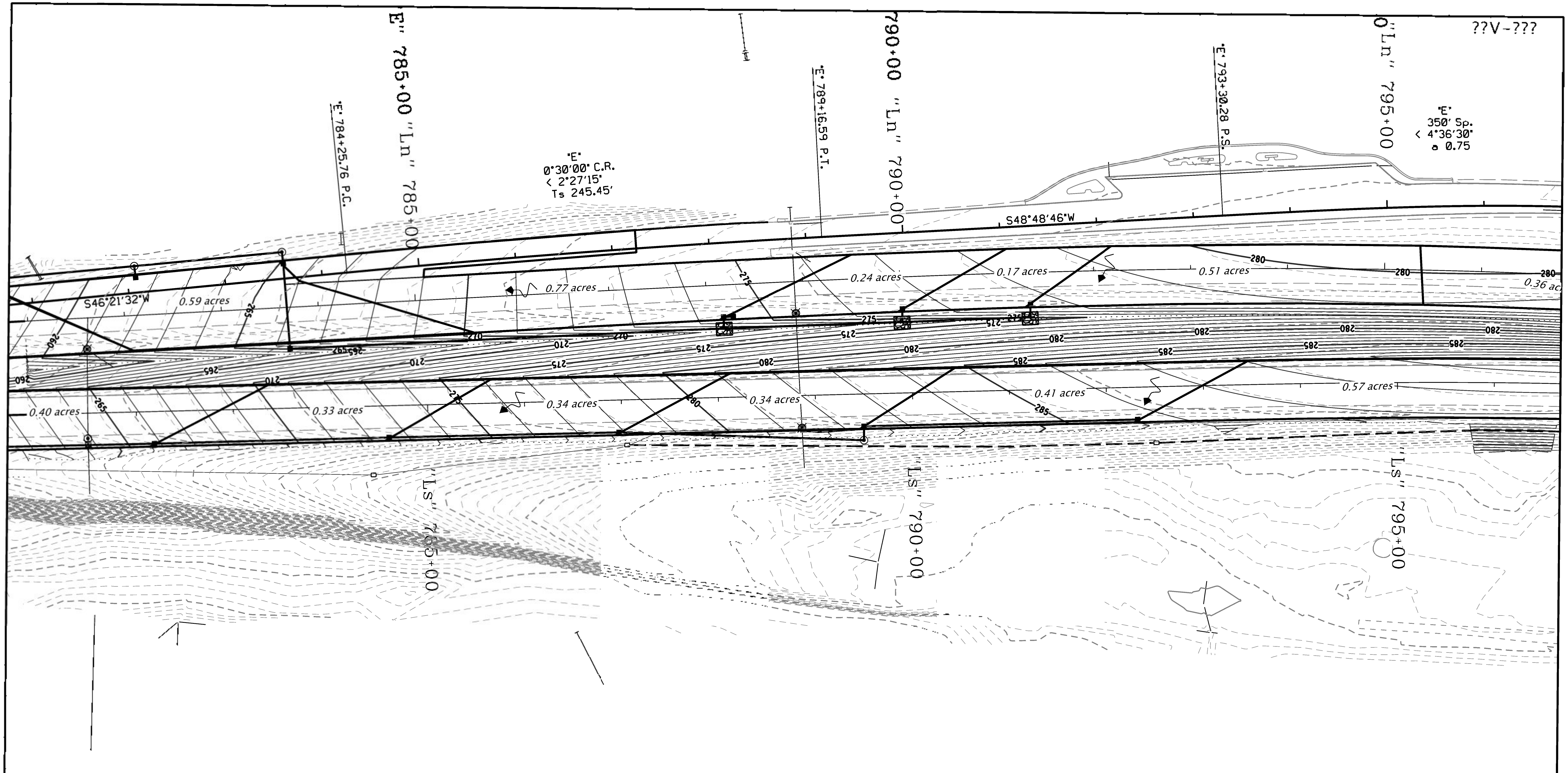
Rotation: 217.6195° Scale: 1"=100'



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503.423.3700

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE BASIN MAP

SHEET NO.
12

R_K19786_HDR_dr_basin_map.dgn :: C12C 7/14/2020 2:41:47 PM MTHOLL

FINAL ELECTRONIC DOCUMENT
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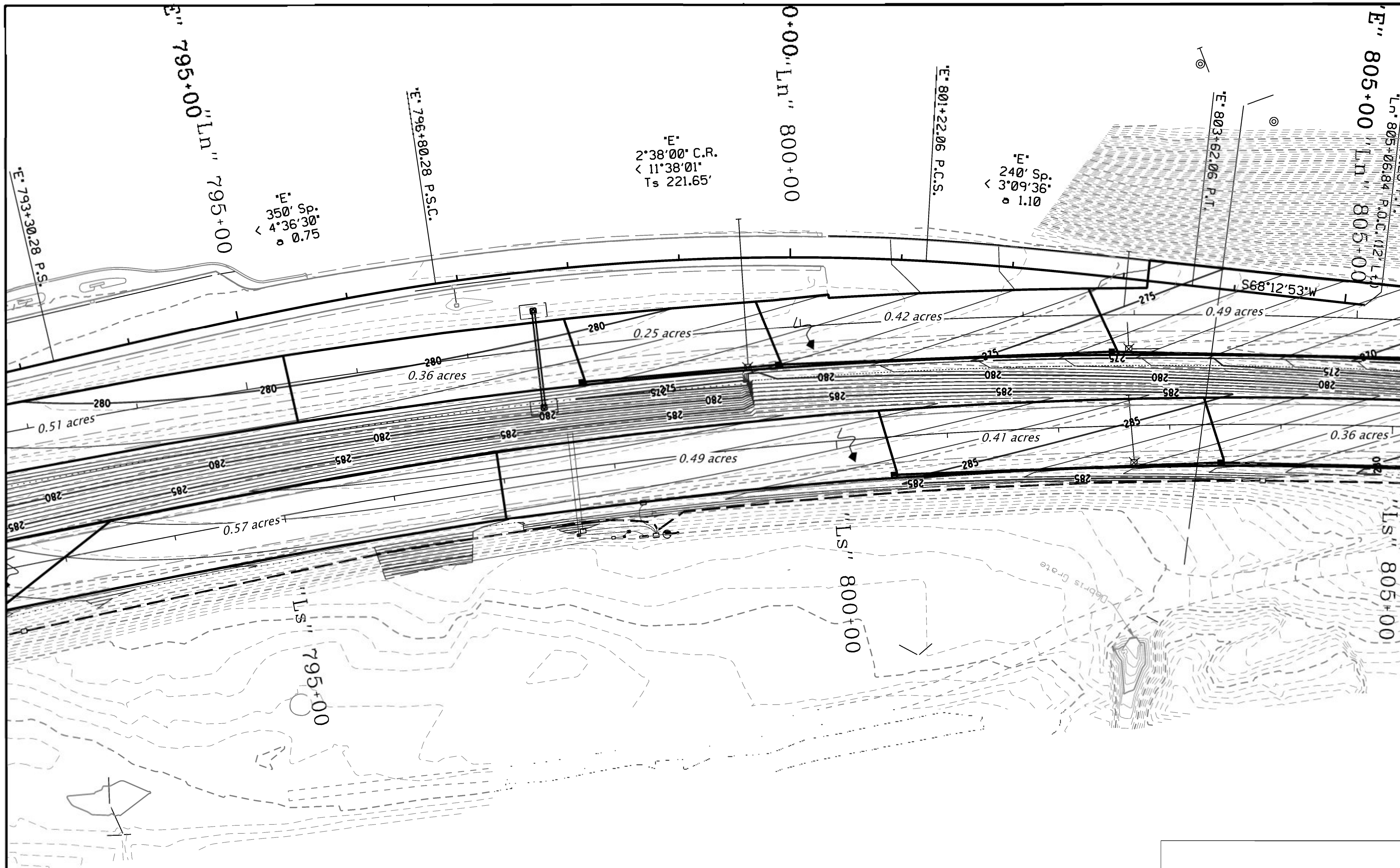
Rotation: 217.6195° Scale: 1"=100'



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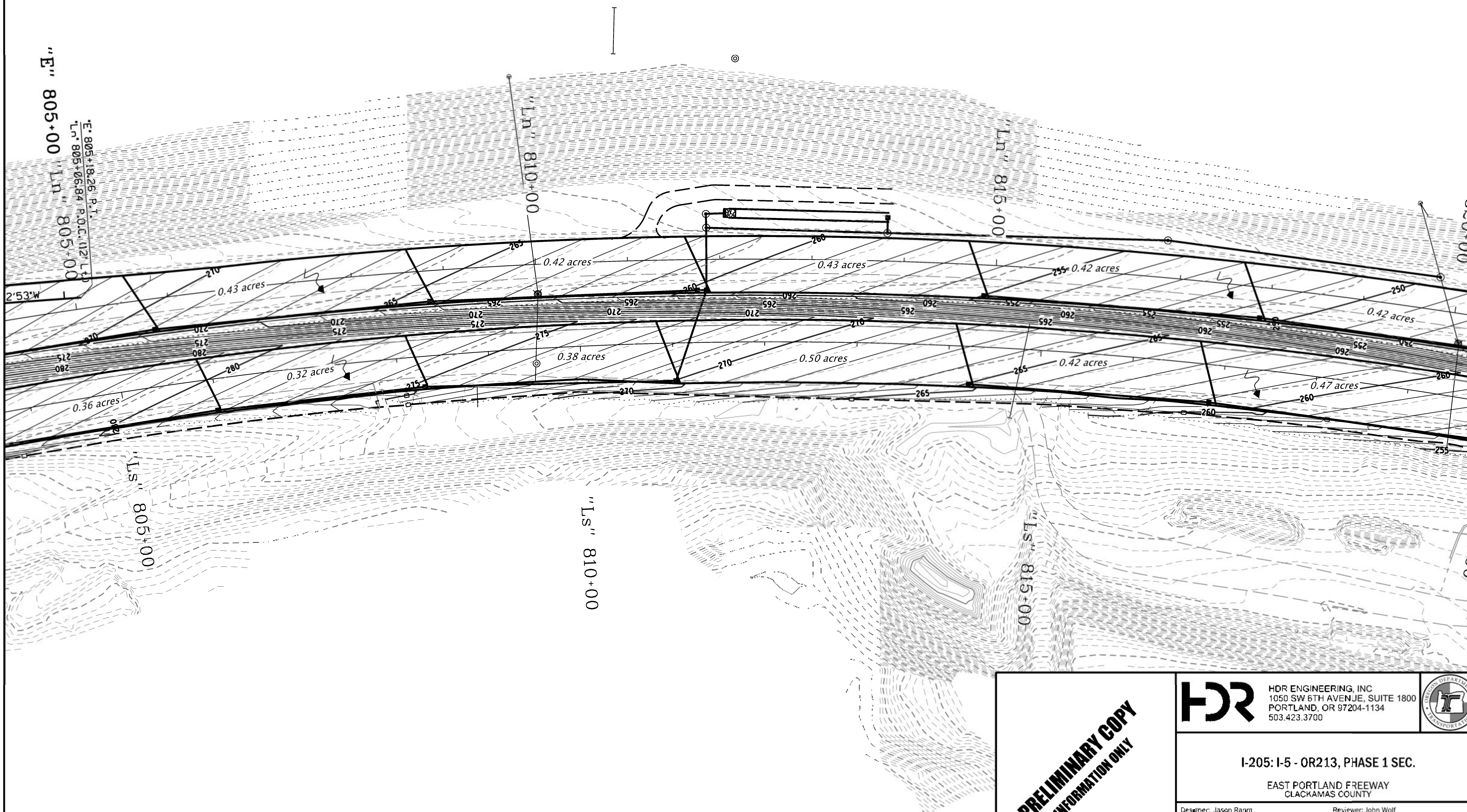
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE BASIN MAP

SHEET NO.
13



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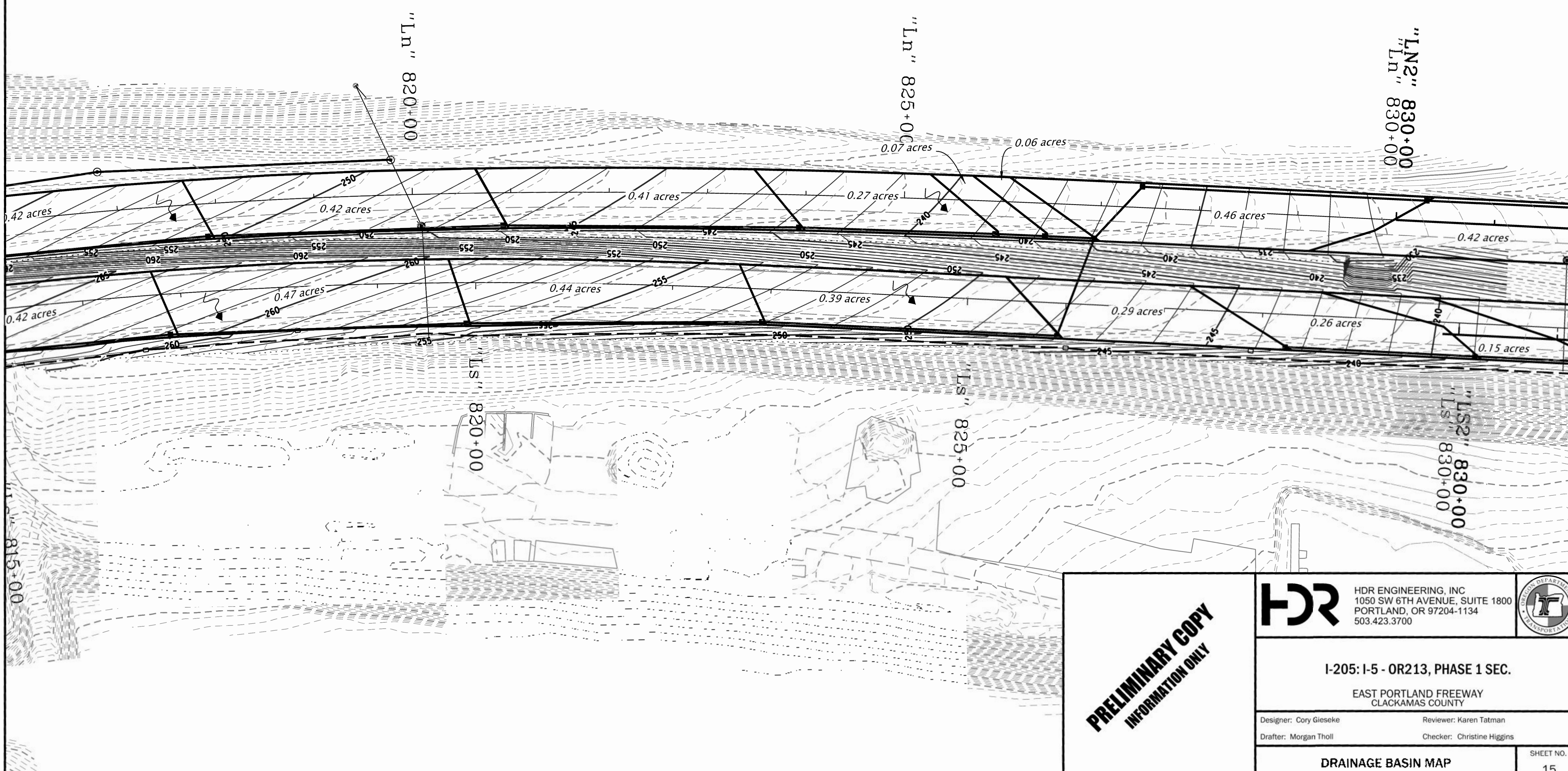
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Jason Rann | Reviewer: John Wolf
Drafter: Connor Donovan | Checker: Brendan LeBlanc

DRAINAGE BASIN MAP

SHEET NO.
14

??V-???



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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

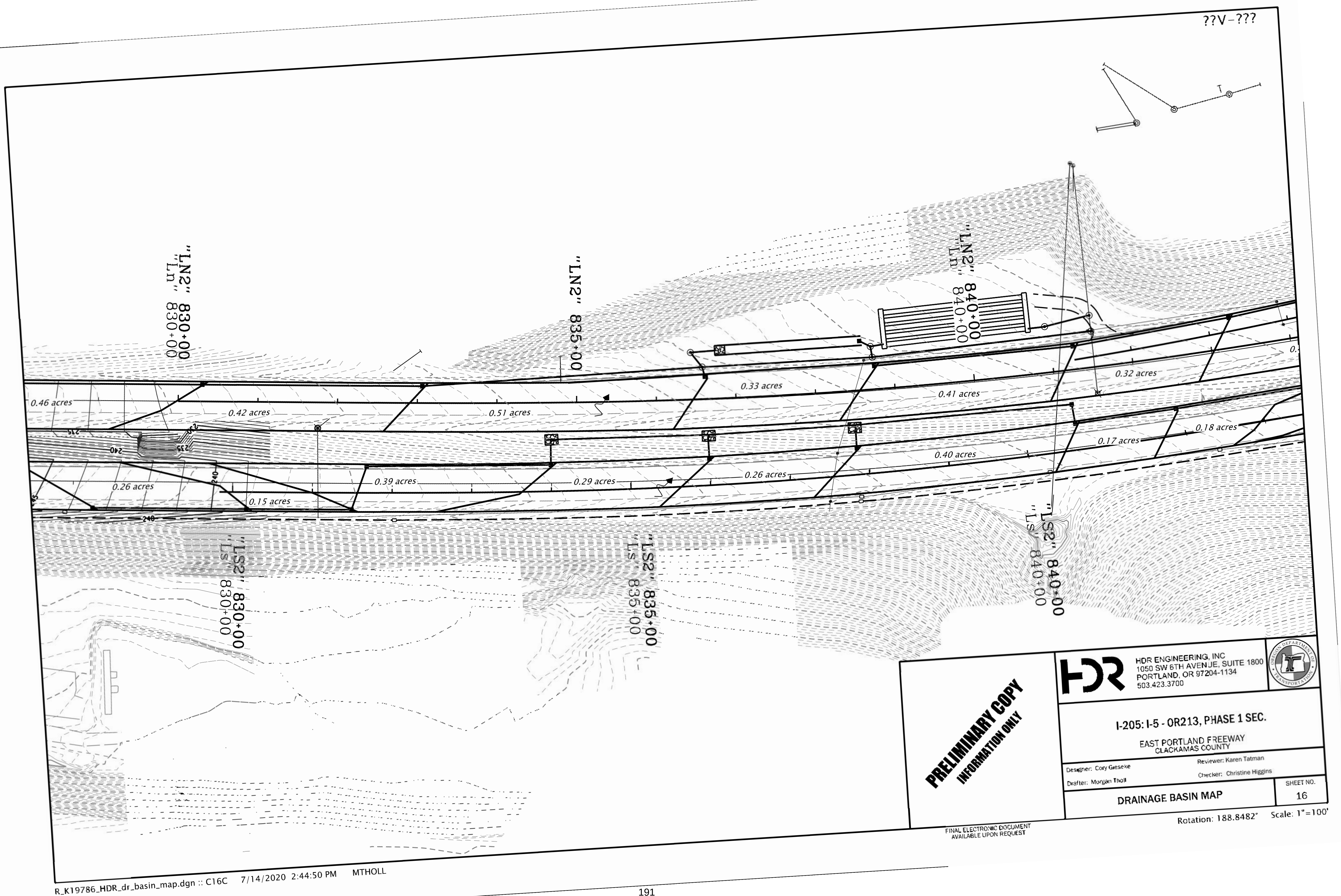
Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE BASIN MAP | SHEET NO. 15

R_K19786_HDR_dr_basin_map.dgn :: C15B 7/14/2020 2:44:02 PM MTHOLL

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

Rotation: 187.5797° Scale: 1"=100'


??V-???
"LN2" 830+00
"Ln" 830+00
"LN2" 835+00
"LN2" 840+00
"Ln" 840+00
"LS2" 830+00
"Ls" 830+00
"LS2" 835+00
"Ls" 835+00
"LS2" 840+00
"Ls" 840+00
0.46 acres
0.42 acres
0.51 acres
0.33 acres
0.41 acres
0.32 acres
0.26 acres
0.15 acres
0.39 acres
0.29 acres
0.26 acres
0.40 acres
0.17 acres
0.18 acres
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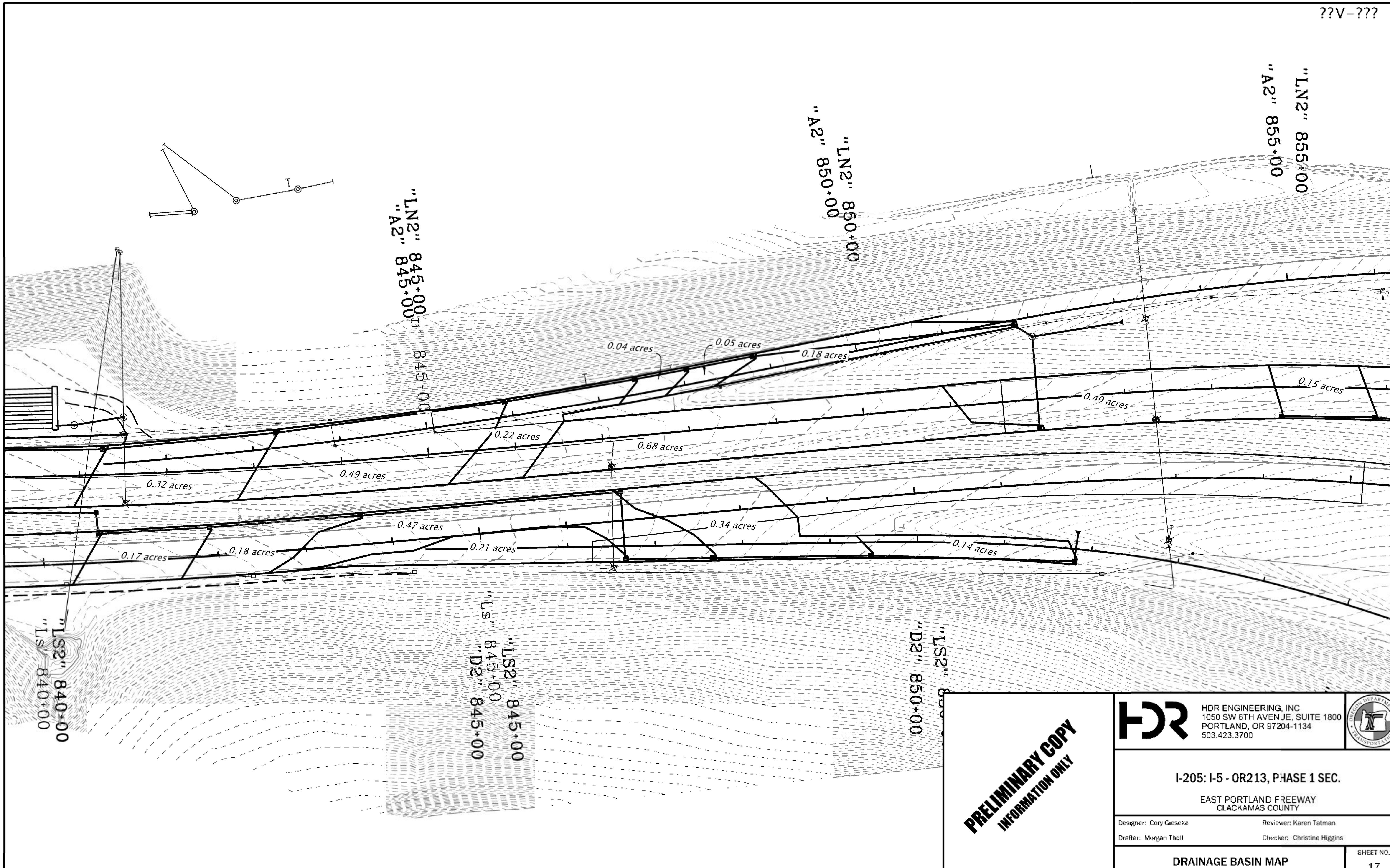
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY
Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins
DRAINAGE BASIN MAP
SHEET NO.
16
Rotation: 188.8482°
Scale: 1"=100'
FINAL ELECTRONIC DOCUMENT
AVAILABLE UPON REQUEST
R_K19786_HDR_dr_basin_map.dgn :: C16C 7/14/2020 2:44:50 PM MTHOLL



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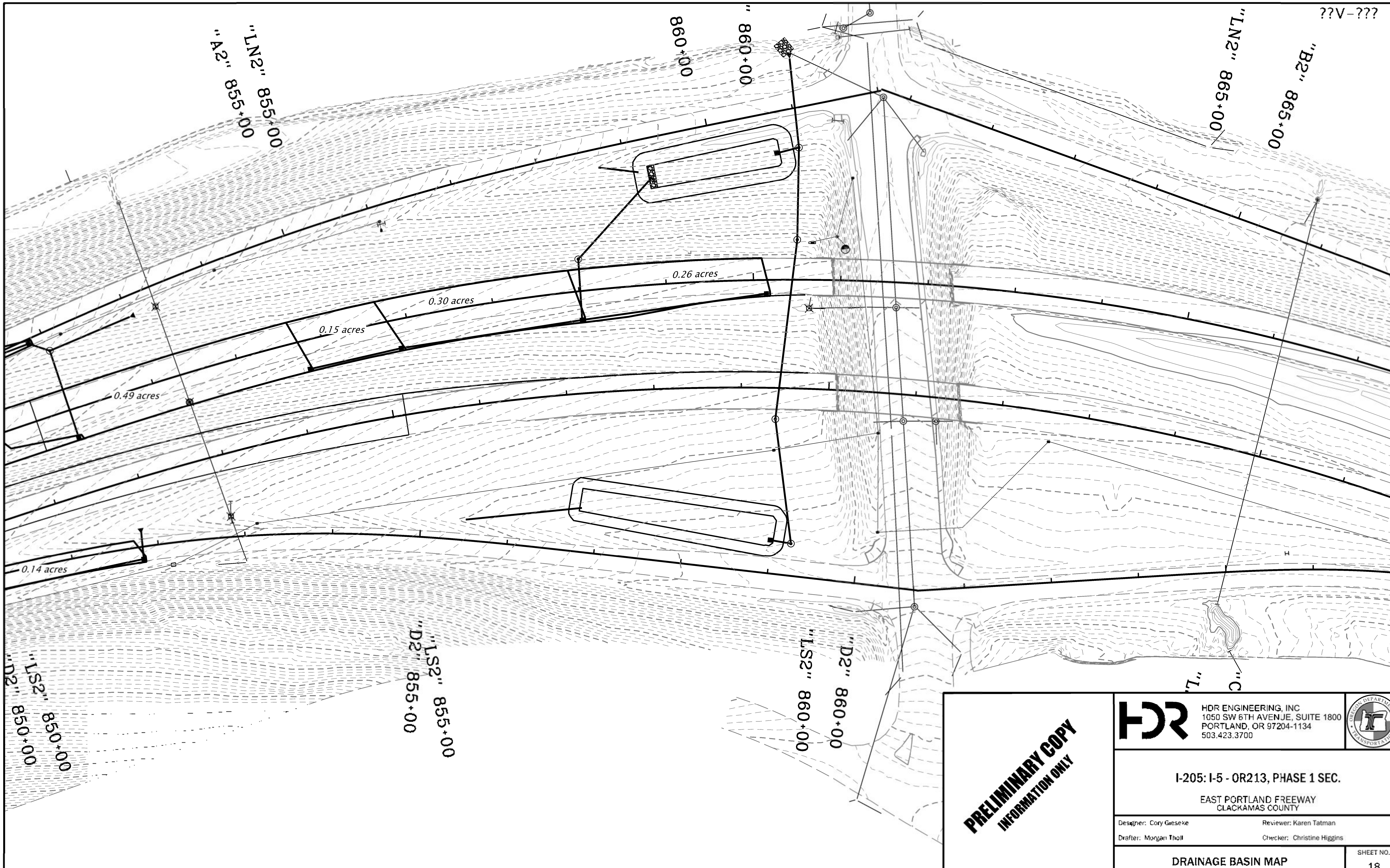
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE BASIN MAP

SHEET NO.
17



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FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

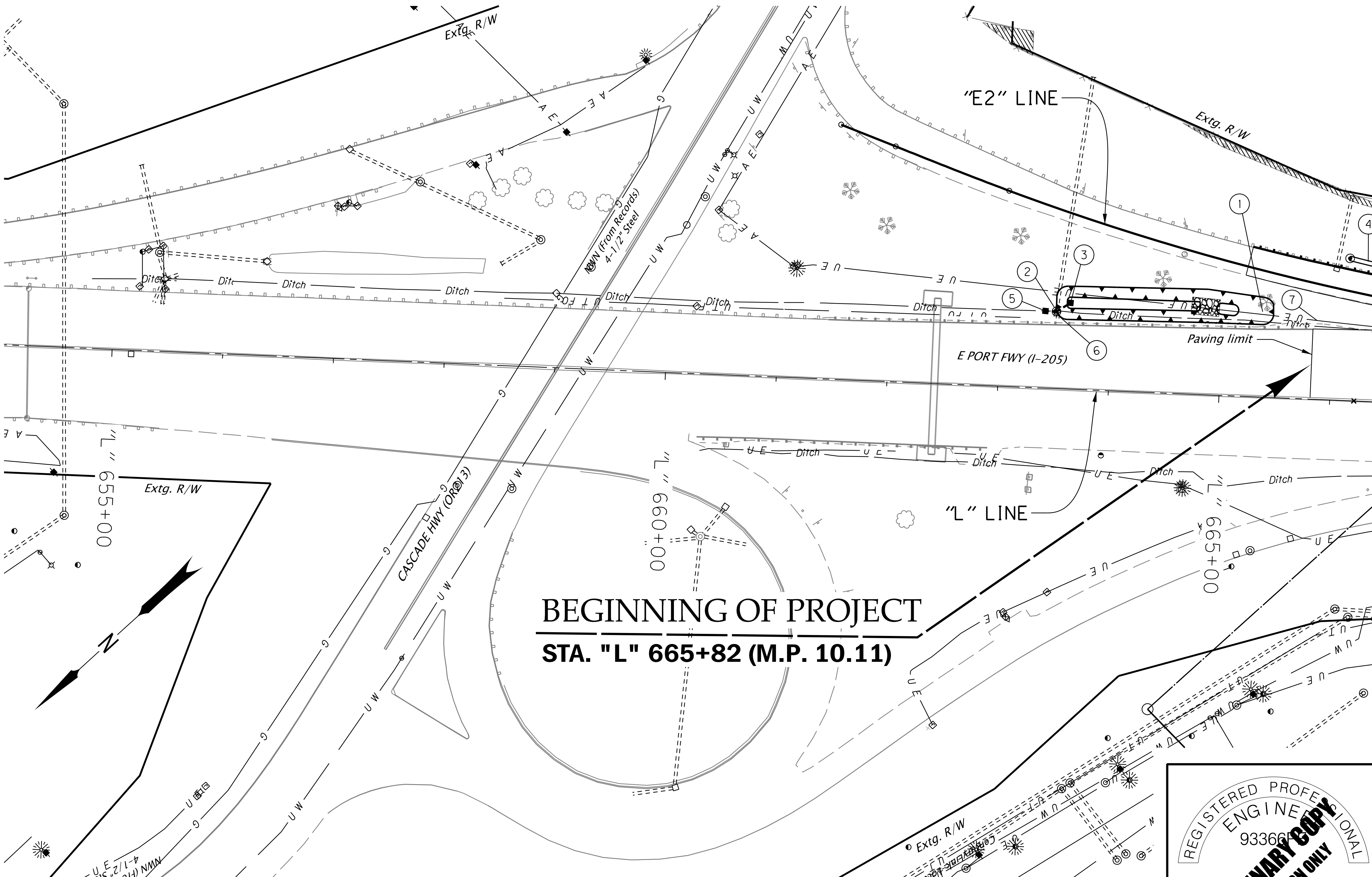
Rotation: 176.5124° Scale: 1"=100'

Appendix C. Stormwater Construction Plans

Sec. 29, T. 2 S, R. 2 E, W.M.
PARK PLACE INTERCHANGE

??V–???

1. Sta. "L" 665+46.16, 77.84' Lt. to Sta. "L" 663+50.02, 77.02' Lt.
Const. bioretention pond
(For details, see sht. HA01)
2. See sht. HA01, note 5
3. See sht. HA01, note 4
4. Sta. "L" 666+13.20, 128.57' Lt. to Sta. "L" 684+63.80, 76.93' Lt.
Const. bioslope - 1851'
(For details, see sht. HA02)
5. See sht. HA01, note 6
6. Remove inlet
7. Relocate ODOT UG electrial line



LEGEND
Wetland Boundary
No Work Area

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... 13, 2018
CORY M. GIESEKE
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I-205: I-5 - OR213, PHASE 1 SEC.
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

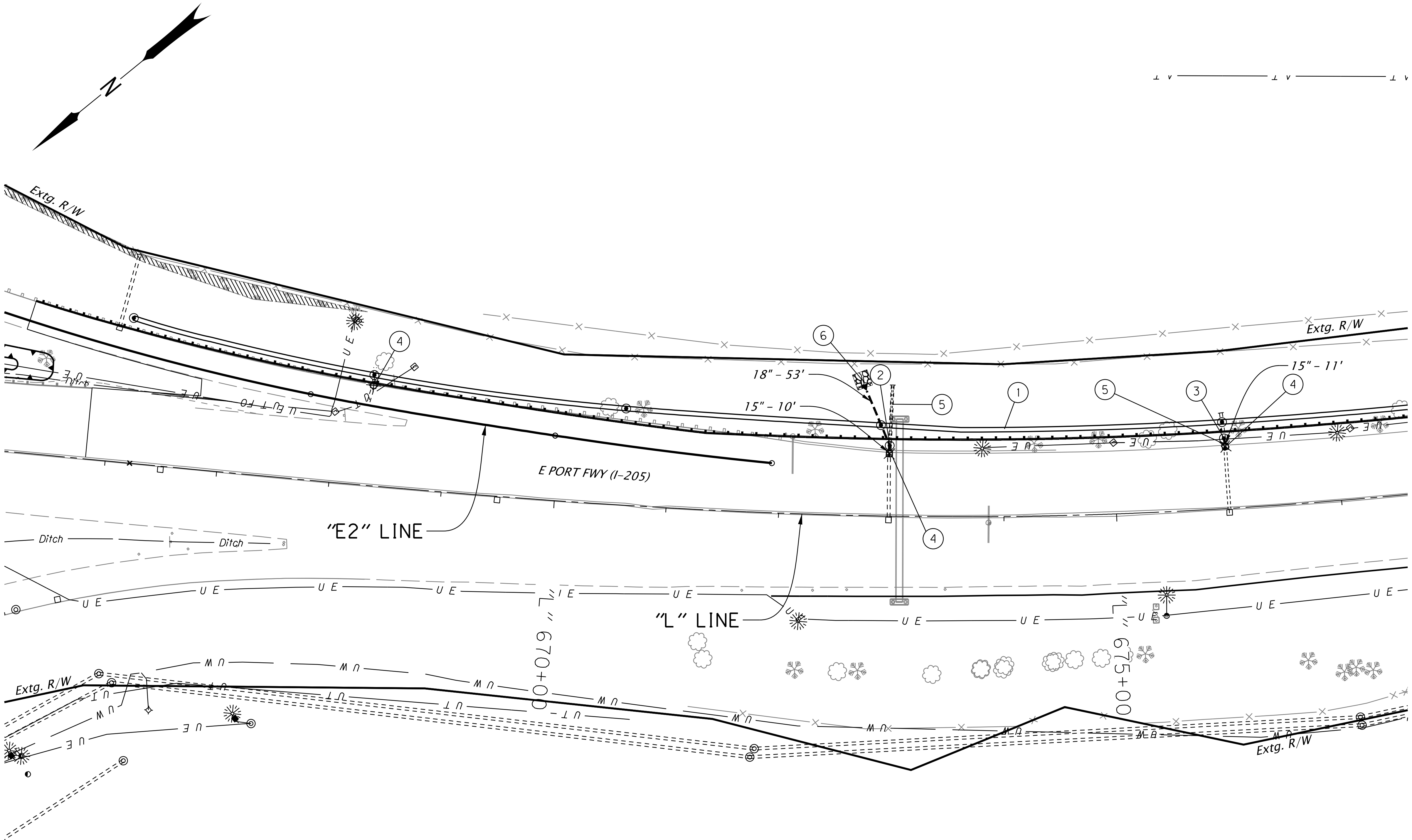
Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE & UTILITIES
SHEET NO. C01B

Rotation: 227.6721° Scale: 1"=100'

Sec. 29, T. 2 S, R. 2 E, W.M.

??V-???



1. See sht. C01B, note 4
2. Sta. "L" 672+97.62, 62.54' Lt.
   Const. storm sew. manhole
   Extend 15" storm sew. pipe - 10' Rt.
   5' Depth
   (See drg. nos. RD300, RD335, RD345, RD386, RD390 and RD393)
3. Sta. "L" 675+98.99, 62.29' Lt.
   Const. storm sew. manhole over existing sewer
   Extend 15" storm sew. pipe - 11' Rt.
   5' Depth
4. Remove inlet - 3
5. Remove pipe - 70'
6. Sta. "L" 672+71.92, 120.51' Lt.
   Inst. 18" storm sew. pipe - 53'
   10' Depth
   Const. riprap pad
   Loose riprap (class 50) - 5.0 tons
   (See drg. no. RD317)

LEGEND

- Wetland Boundary
- No Work Area

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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

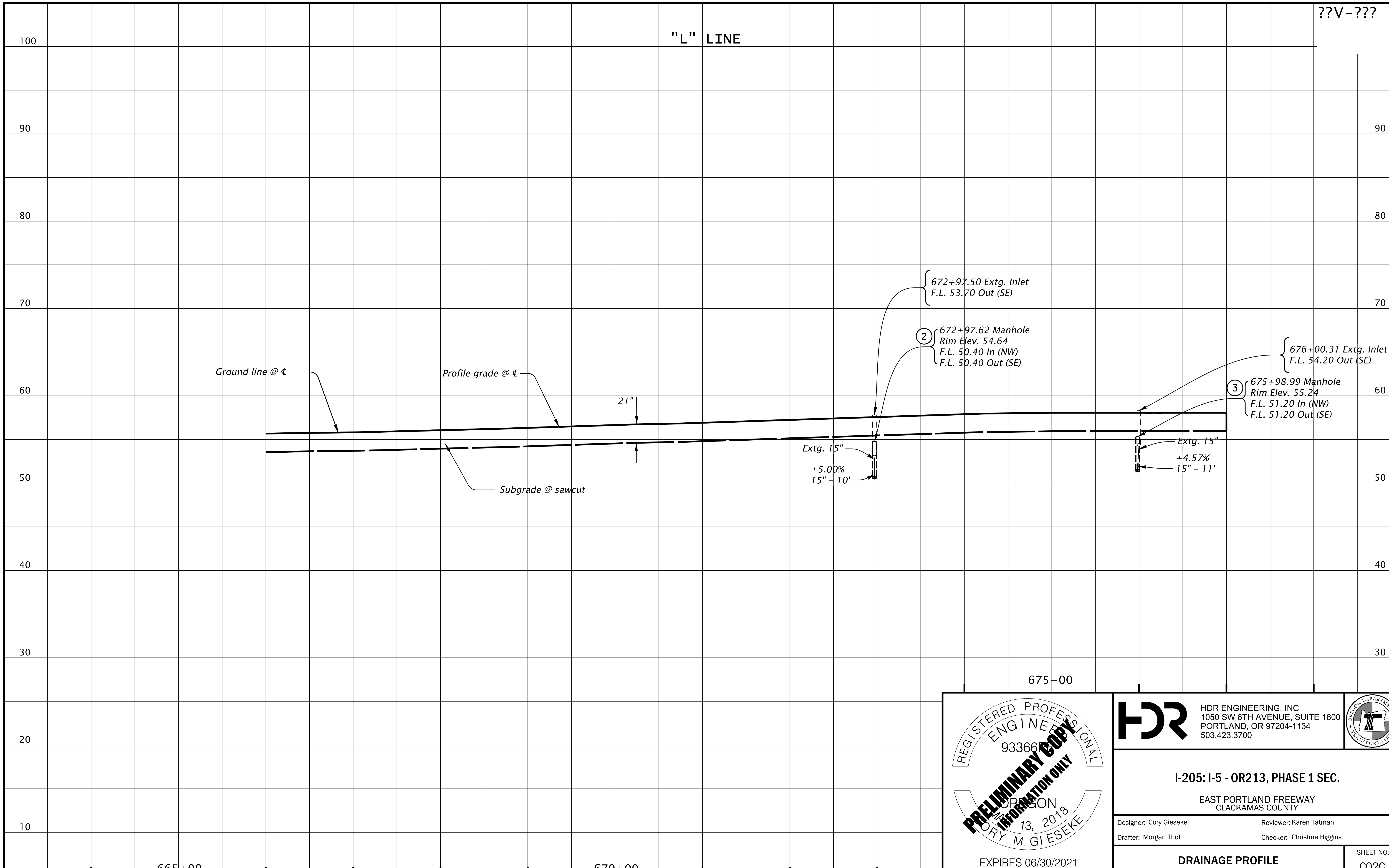
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE & UTILITIES

SHEET NO. C02B

Rotation: 230.7962°
Scale: 1"=100'



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MAY 13, 2018
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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE PROFILE

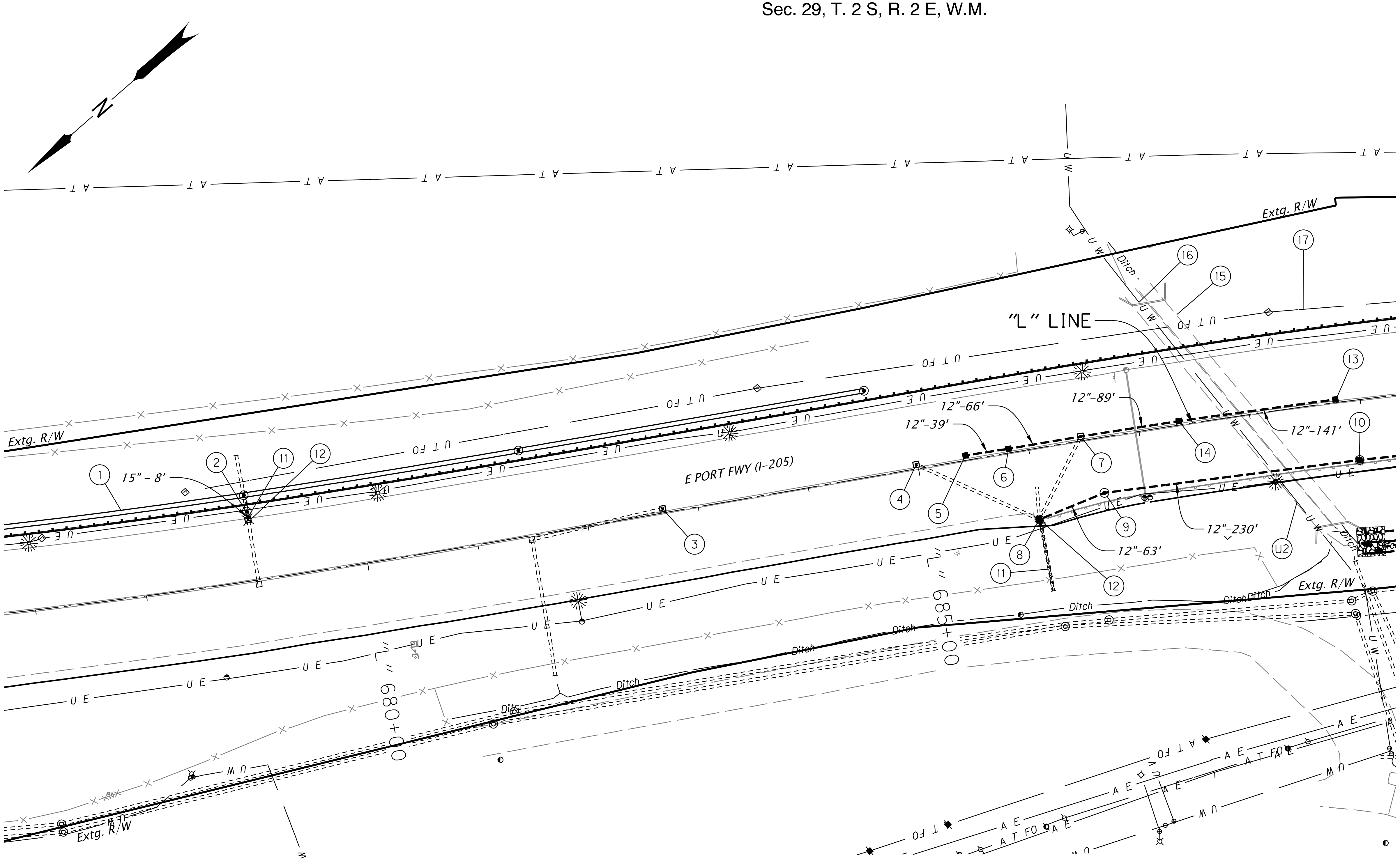
SHEET NO.
C02C

FINAL ELECTRONIC DOCUMENT
AVAILABLE UPON REQUEST

R_K19786_HDR_drpf_01.dgn :: C02C 7/17/2020 1:53:20 PM CGIESEKE

Rotation: 0° Scale: 1"=100'

??V-???



1. See sht. C01B, note 4
2. Sta. "L" 678+99.77, 62.10 Lt.
   Const. storm sew. manhole
   Extend 15" storm sew. pipe - 8' Rt.,
   5' Depth
3. Sta. "L" 682+68.35, Lt.
   Adjust inlet
4. Sta. "L" 684+98.63, Lt.
   Adjust inlet
5. Sta. "L" 685+43.24, Lt.
   Const. type "G-2" inlet - 18" Sump
   (See drg. no. RD364)
6. Sta. "L" 685+82.29, Lt.
   Const. type "G-2" inlet - 18" Sump
   Inst. 12" storm sew. pipe - 39'
   5' Depth
   Trench resurfacing - 13 sq. yd.
   (See drg. no. RD302)
7. Sta. "L" 686+46.66, Lt.
   Adjust inlet
   Inst. 12" storm sew. pipe - 66'
   10' Depth
   Inst. 12" storm sew. pipe - 89'
   10' Depth
   Trench resurfacing - 22 sq. yd.
   Connect to existing inlet
8. Sta. "L" 685+99.03, Rt.
   Const. storm sew. manhole w/ type "G-2" inlet
   Connect existing pipes
   (See drg. no. RD348)
9. Sta. "L" 686+60.59, 49.38' Rt.
   Const. storm sew. manhole
   Inst. 12" storm sew. pipe - 63'
   10' Depth
   Trench resurfacing - 21 sq. yd.
10. Sta. "L" 688+92.74, Rt.
    Const. storm sew. manhole w/ type "G-2" inlet
    Inst. 12" storm sew. pipe - 230'
    10' Depth
    Trench resurfacing - 77 sq. yd.
11. Remove pipe - 71'
12. Remove inlet - 2
13. Sta. "L" 688+78.02, Lt.
    Const. type "G-2" inlet - 18" Sump
14. Sta. "L" 687+36.94, Lt.
    Const. type "G-2" inlet - 18" Sump
    Inst. 12" storm sew. pipe - 141'
    5' Depth
15. Protect ODOT 12' box culvert
16. Protect Oregon City water line
17. Protect ODOT underground communications line

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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke	Reviewer: Karen Tatman
Drafter: Morgan Tholl	Checker: Christine Higgins

DRAINAGE & UTILITIES

SHEET NO.
C03B

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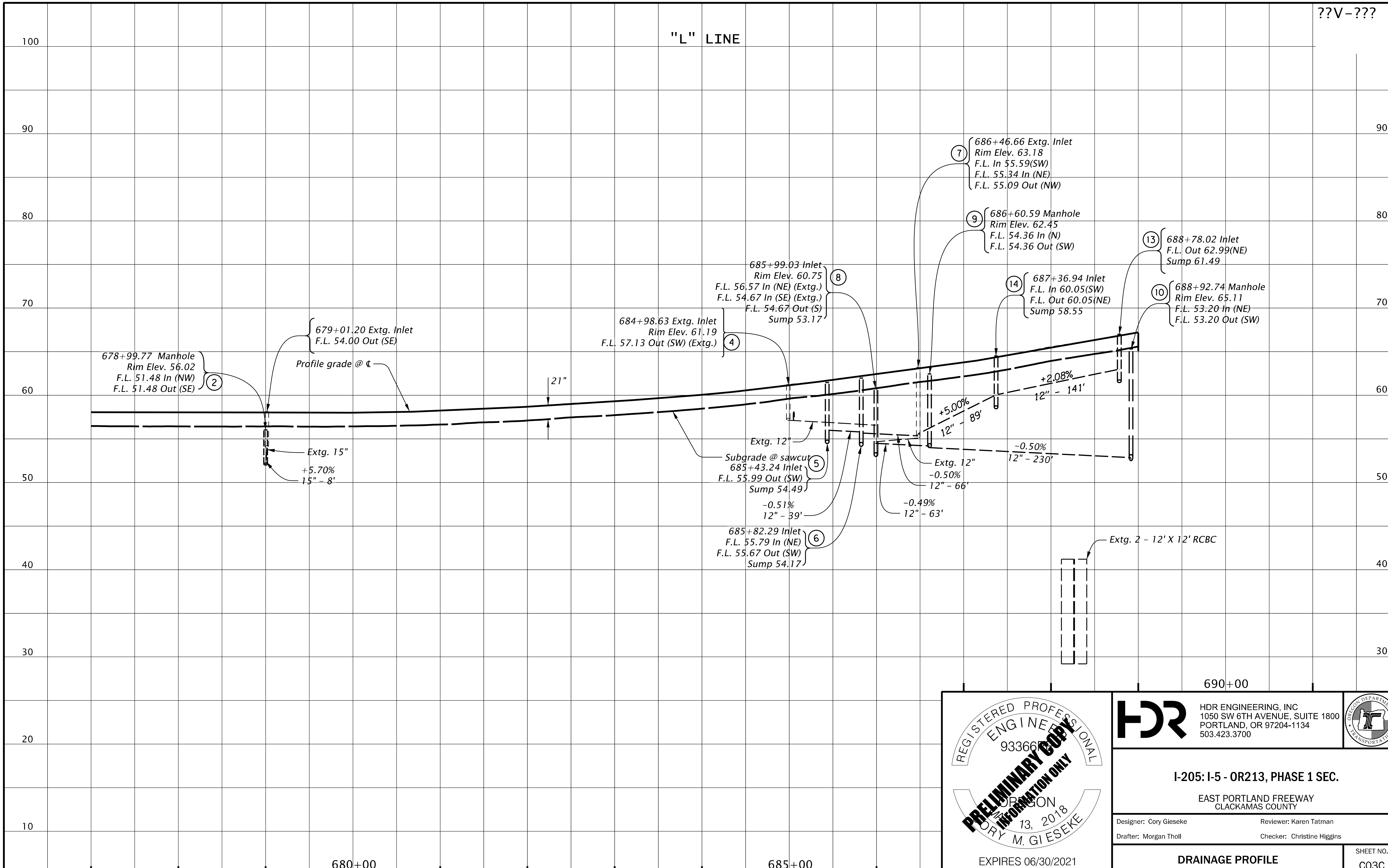
Rotation: 228.87° Scale: 1"=100'



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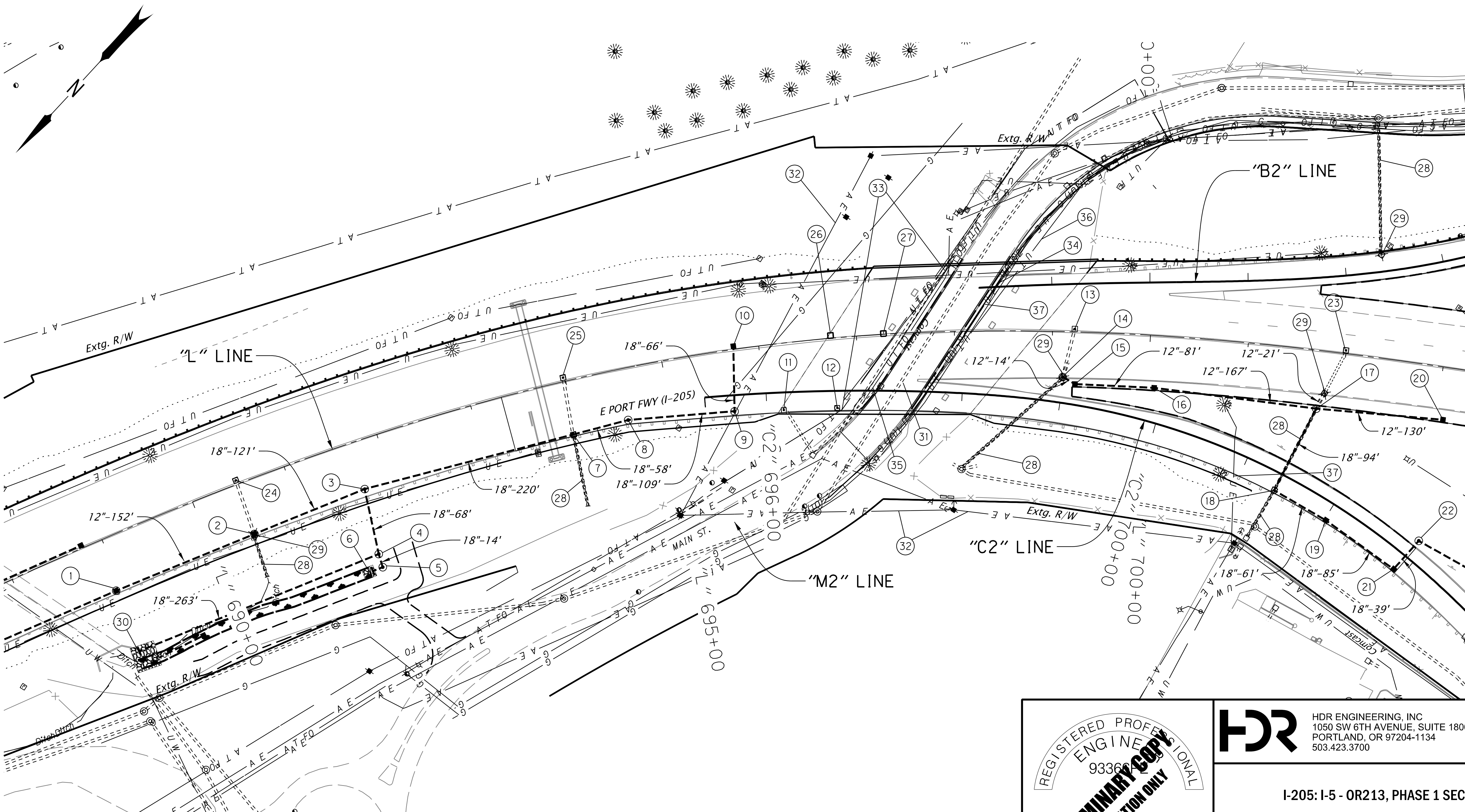
200

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

Rotation: 0° Scale: 1"=100'

Sec. 29, T. 2 S, R. 2 E, W.M.
OREGON CITY INTERCHANGE



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OREGON DEPARTMENT OF TRANSPORTATION

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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke	Reviewer: Karen Tatman
Drafter: Morgan Tholl	Checker: Christine Higgins

DRAINAGE & UTILITIES

SHEET NO.
C04C

Rotation: 212.6746° Scale: 1"=100'

1 See sht. C03B, note 10

2 Sta. "L" 690+47.07, Rt.
Const. storm sew. manhole w/ type "G-2" inlet
Inst. 12" storm sew. pipe - 152'
20' Depth
Trench resurfacing - 51 sq. yd.
Connect existing sewer

3 Sta. "L" 691+70.34, 48.99' Rt.
Const. storm sew. manhole w/ outside drop
Inst. 18" storm sew. pipe - 121'
20' Depth
Inst. 18" storm sew. pipe - 220'
5' Depth
Trench resurfacing - 158 sq. yd.
(See drg. no. RD350)

4 Sta. "L" 691+62.42, 116.45' Rt.
Const. diversion manhole
Inst. 18" storm sew. pipe - 68'
20' Depth
(For details, see sht. HA17)

5 See sht. HA03, note 7

6 Sta. "L" 691+52.67, 130.80' Rt. to Sta. "L" 688+85.28, 133.45' Rt.
Const. bioretention pond
(For details, see sht. HA03)

7 Sta. "L" 693+94.84, Rt.
Adjust inlet
Inst. 18" storm sew. pipe - 58'
10' Depth
Trench resurfacing - 27 sq. yd.
Connect to existing structure

8 Sta. "L" 694+54.39, 52.51' Rt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 109'
5' Depth
Trench resurfacing - 50 sq. yd.

9 Sta. "L" 695+66.12, 62.53' Rt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 66'
5' Depth
Trench resurfacing - 31 sq. yd.

10 Sta. "L" 695+74.21, Lt.
Const. type "G-2" inlet - 18" Sump

11 Sta. "L" 696+18.15, Rt.
Adjust inlet

12 Sta. "L" 696+74.25, Rt.
Adjust inlet

13 Sta. "L" 699+22.67, Lt.
Adjust inlet

14 Sta. "L" 699+11.58, 46.54' Rt.
Const. storm sew. manhole
Connect existing pipe

15 Sta. "L" 699+24.36, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 14'
5' Depth

16 Sta. "L" 700+07.18, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 81'
5' Depth

17 Sta. "L" 701+76.51, 59.40' Rt.
Const. storm sew. manhole
Inst. 12" storm sew. pipe - 130'
5' Depth
Inst. 12" storm sew. pipe - 167'
10' Depth
Extend 12" storm sew. pipe - 21'
10' Depth

18 Sta. "C2" 701+39.47, Rt.
Adjust inlet
Inst. 18" storm sew. pipe - 94'
10' Depth
Trench resurfacing - 15 sq. yd.

19 Sta. "C2" 702+01.71, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 61'
5' Depth

20 Sta. "L" 703+08.01, Rt.
Const. type "G-2" inlet - 18" sump

21 Sta. "C2" 702+89.10, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 85'
5' Depth
Trench resurfacing - 39 sq. yd.

22 Sta. "C2" 702+90.61, 20.61' Lt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 39'
5' Depth
Trench resurfacing - 18 sq. yd.

23 Sta. "L" 701+99.46, Lt.
Adjust inlet

24 Sta. "L" 690+48.91, Lt.
Adjust inlet

25 Sta. "L" 693+98.26, Lt.
Adjust inlet

26 Sta. "L" 696+73.82, Lt.
Cap inlet

27 Sta. "L" 697+27.63, Lt.
Cap inlet

28 Remove/abandon pipe - 381'

29 Remove inlet - 3

30 Sta. "L" 688+89.76, 119.44' Rt.
Inst. 18" storm sew. pipe - 263'
10' Depth

31 Protect Clackamas County sewer

32 Protect PGE OH power lines

33 Relocate CBX UG communications lines (By others)

34 Relocate NW Natural 2" poly gas line and UG PGE electric (By others)

35 Relocate Comcast UG communications line (By others)

36 Relocate PGE UG Fiber (By others)

37 Relocate PGE UG electric (By others)

REGISTERED PROFESSIONAL ENGINEER
93360PE
OREGON
MAY 13, 2018
CORY M. GIESEKE
EXPIRES 06/30/2021
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503.423.3700

OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

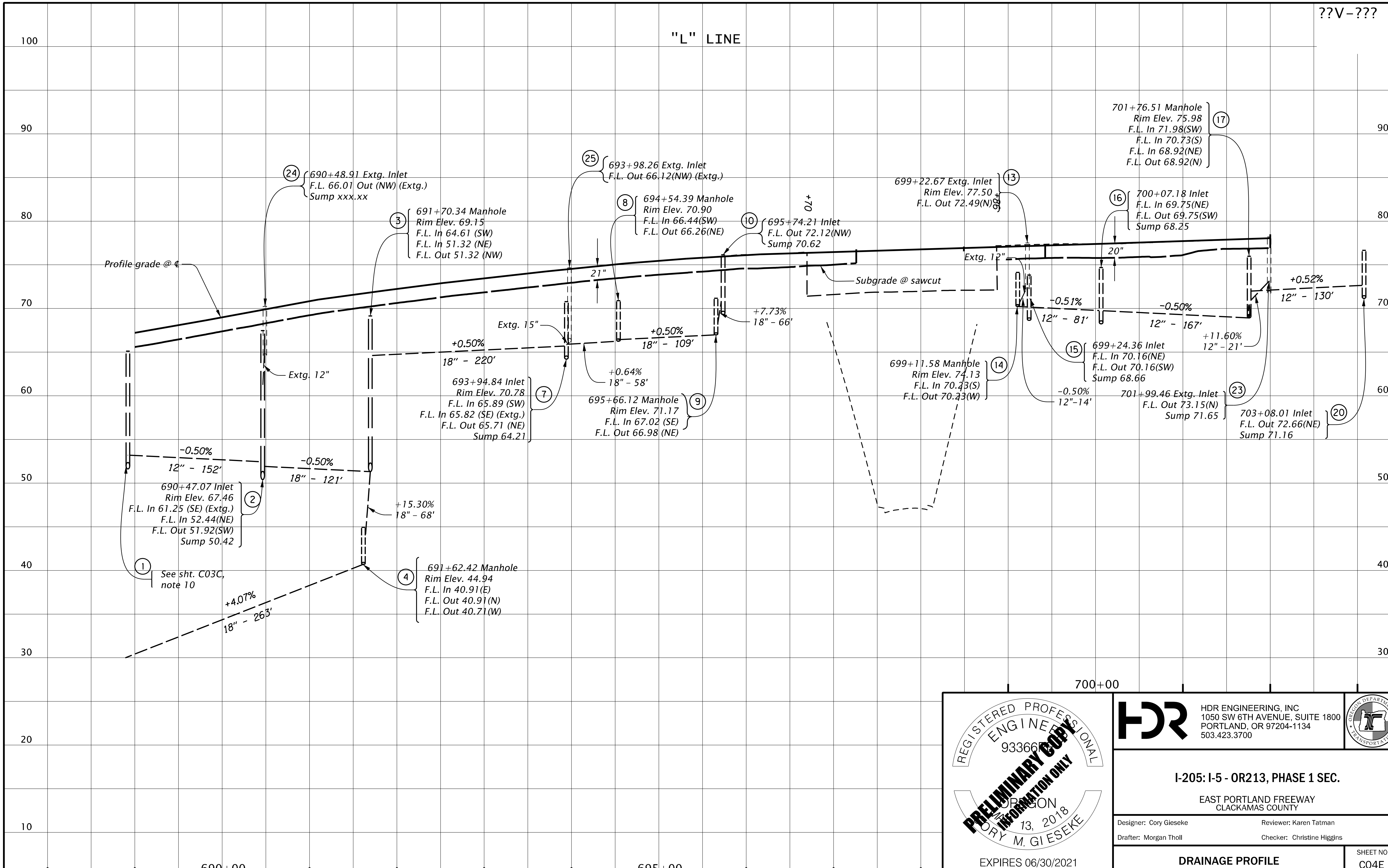
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE & UTILITIES NOTES

SHEET NO.
C04D

Rotation: 0° Scale: 1"=100'



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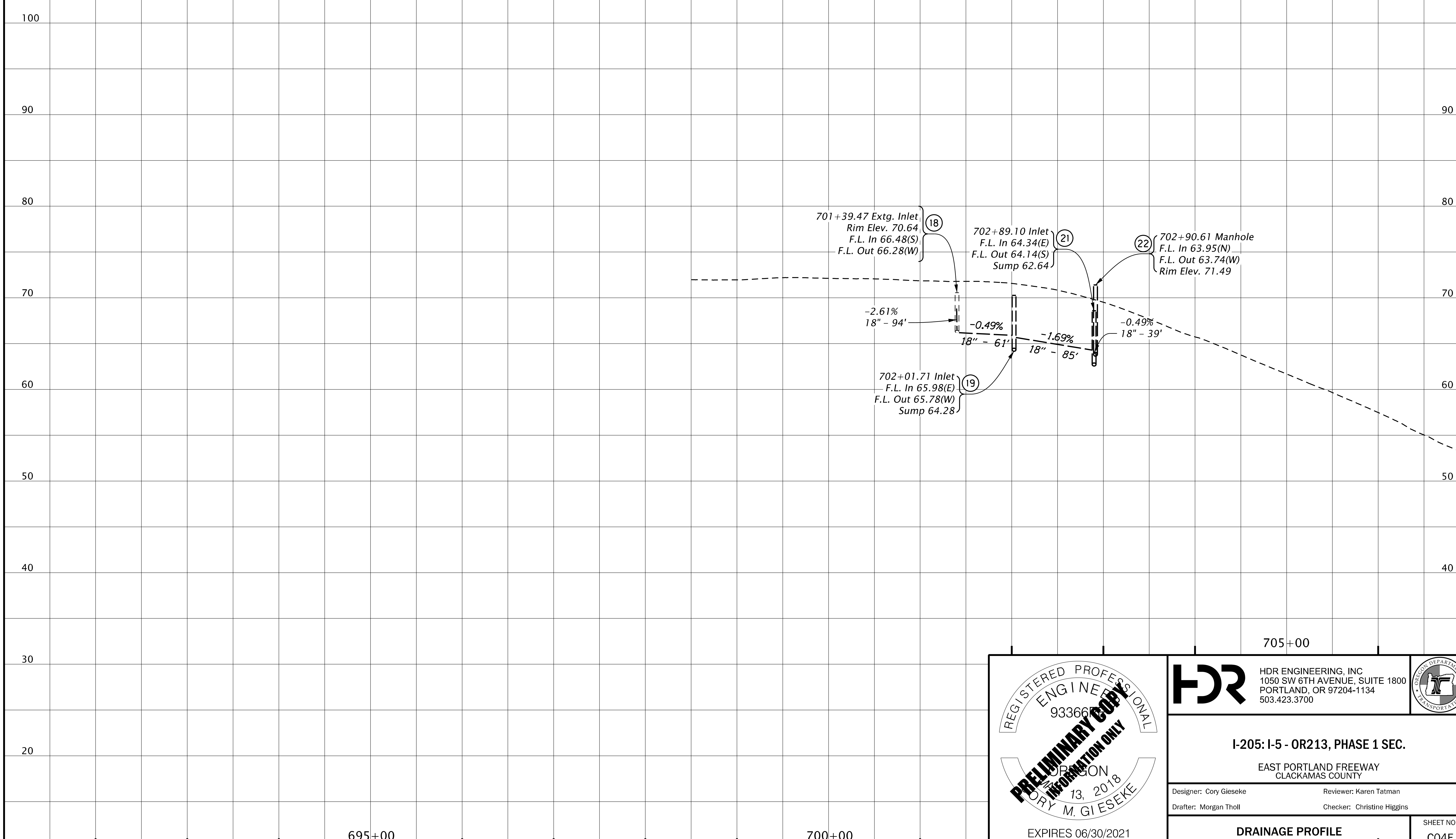
Rotation: 0° Scale: 1"=100'

"C2" LINE
SB EXIT RAMP



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93366PE
OREGON
MAY 13, 2018
CORY M. GIESEKE
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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

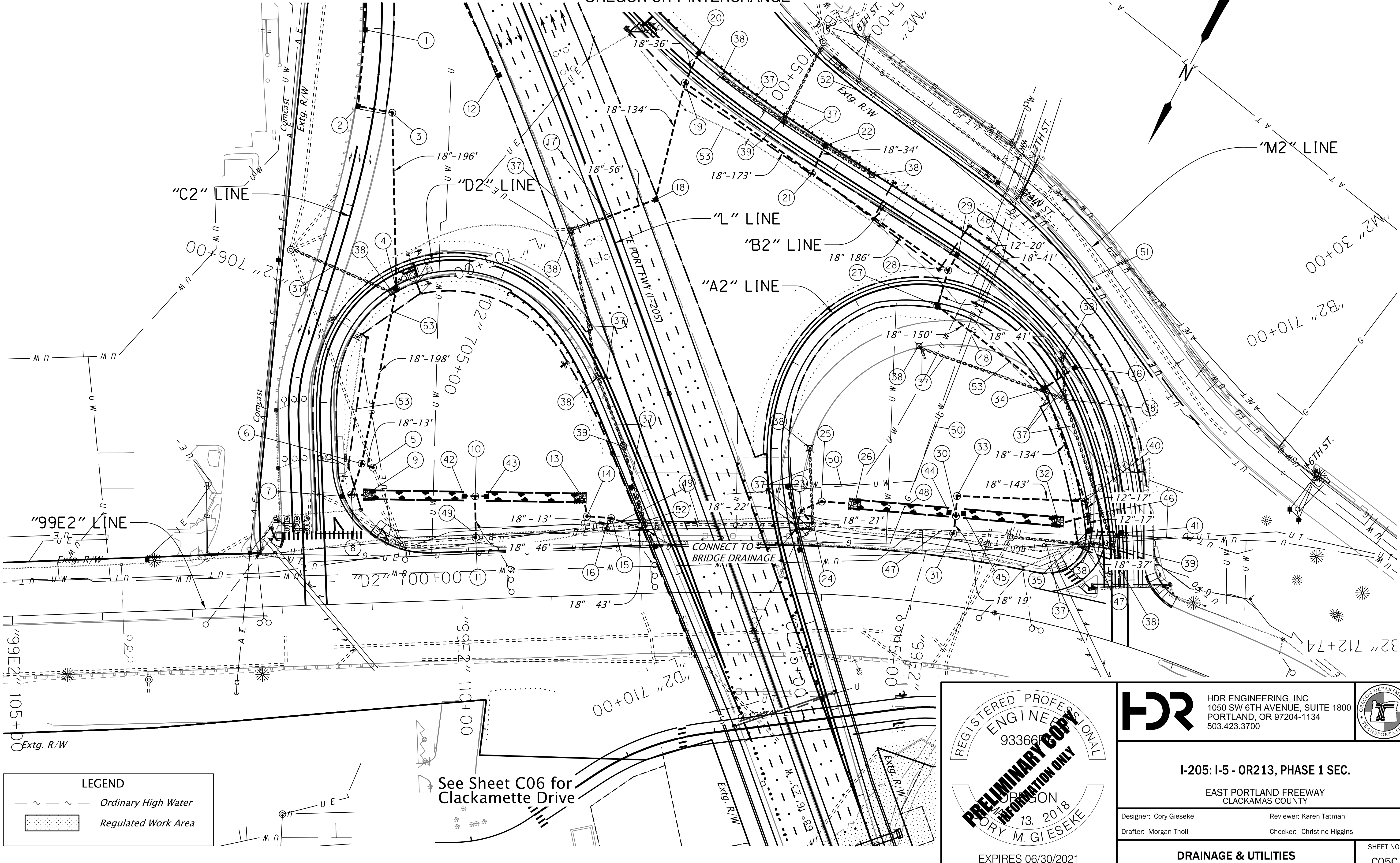
Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C04F

Sec. 29, T. 2 S, R. 2 E, W.M.
OREGON CITY INTERCHANGE

??V-???



LEGEND

Ordinary High Water

Regulated Work Area

See Sheet C06 for Clackamette Drive

REGISTERED PROFESSIONAL ENGINEER
93366PE
OREGON
13, 2018
CORY M. GIESEKE
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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE & UTILITIES

SHEET NO.
C05C

205

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

Rotation: 272.0412°   Scale: 1"=100'

(1) See sht. C04C, note 19

(2) See sht. C04C, note 21

(3) See sht. C04C, note 22

(4) Sta. "D2" 703+67.14, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 196'
10' Depth
Trench resurfacing - 12 sq. yd.

(5) Sta. "D2" 701+25.24, 56.96' Rt.
Const. storm sew. manhole over existing sewer
Inst. 18" storm sew. pipe - 13'
5' Depth

(6) Sta. "D2" 701+29.99, 44.55' Rt.
Const. diversion manhole
Inst. 18" storm sew. pipe - 198'
5' Depth
(For details, see sht. HA17)

(7) Sta. "D2" 700+94.21, Rt.
Const. type "G-2" inlet - 18" Sump

(8) See sht. HA04, note 5

(9) Sta. "99E2" 108+94.90, 120.45' Lt. to Sta. "99E2" 110+06.66, 114.88' Lt.
Const. biofiltration swale
(For details, see sht. HA04)

(10) See sht. HA04, note 7

(11) Sta. "99E2" 110+17.87, 68.32' Lt.
Const. storm sew. manhole over existing sewer
Inst. 18" storm sew. pipe - 46'
10' Depth

(12) See sht. C04D, note 20

(13) Sta. "99E2" 111+42.10, 107.75' Lt. to Sta. "99E2" 110+31.13, 113.76' Lt.
Const. biofiltration swale
(For details, see sht. HA04)

(14) See sht. HA04, note 9

(15) Sta. "99E2" 111+68.75, 84.58' Lt.
Const. diversion manhole
Inst. 18" storm sew. pipe - 43', S = 1.00%
5' Depth
Connect to bridge drainage
(For details, see sht. HA17)

(16) Sta. "99E2" 111+62.31, 73.24' Lt.
Const. storm sew. manhole over existing sewer
Inst. 18" storm sew. pipe - 13'
5' Depth

(17) Sta. "L" 704+98.85, Lt.
Adjust inlet

(18) Sta. "L" 704+99.63, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 56'
5' Depth
Trench resurfacing - 26 sq. yd.
Connect to extg. structure

(19) Sta. "B2" 704+10.45, 17.57' Rt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 134'
5' Depth
Inst. 18" storm sew. pipe - 36'
5' Depth
Trench resurfacing - 17 sq. yd.

(20) Sta. "B2" 704+00.42, Lt.
Const. type "G-2" inlet - 18" Sump

(21) Sta. "B2" 705+81.57, 16.67' Lt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 34'
5' Depth
Inst. 18" storm sew. pipe - 173'
10' Depth
Trench resurfacing - 16 sq. yd.

(22) Sta. "B2" 705+77.05, Rt.
Const. type "G-2" inlet - 18" Sump

(23) Sta. "99E2" 113+74.42, 92.04' Lt.
Const. diversion manhole
Inst. 18" storm sew. pipe - 22', S = 1.00%
5' Depth
Connect to bridge drainage
(For details, see sht. HA17)

(24) Sta. "99E2" 113+86.99, 76.38' Lt.
Const. storm sew. manhole over existing sewer
Inst. 18" storm sew. pipe - 21'
5' Depth

(25) See sht. HA05, note 5

(26) Sta. "99E2" 114+24.15, 102.38' Lt. to Sta. "99E2" 115+28.87, 102.40' Lt.
Const. biofiltration swale
(For details, see sht. HA05)

(27) Sta. "A2" 705+01.91, Lt.
Const. storm sew. manhole w/ type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 41'
10' Depth

(28) Sta. "A2" 704+97.19, 18.05' Rt.
Const. storm sew. manhole
Inst. 12" storm sew. pipe - 20'
5' Depth
Inst. 18" storm sew. pipe - 186'
10' Depth

(29) Sta. "B2" 707+66.43, Rt.
Const. type "G-2" inlet - 18" Sump

(30) See sht. HA05, note 7

(31) Sta. "99E2" 115+36.07, 79.48' Lt.
Const. storm sew. manhole over existing sewer
Inst. 18" storm sew. pipe - 19'
10' Depth

(32) Sta. "99E2" 116+45.63, 114.32' Lt. to Sta. "99E2" 115+43.75, 103.51' Lt.
Const. biofiltration swale
(For details, see sht. HA05)

(33) Sta. "99E2" 115+34.87, 121.46' Lt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 143'
10' Depth

(34) Sta. "A2" 703+26.53, Lt.
Const. storm sew. manhole w/ type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 41'
5' Depth
Inst. 18" storm sew. pipe - 150'
5' Depth

(35) Sta. "A2" 701+49.32, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 37'
5' Depth
Trench resufacing - 17 sq. yd.

(36) Sta. "B2" 709+51.44, Rt.
Const. type "G-2" inlet - 18" Sump

(37) Remove pipe - 1170'

(38) Remove inlet - 11

(39) Remove manhole - 3

(40) Sta. "A2" 701+84.25, 21.79' Lt.
Const. diversion manhole
Inst. 18" storm sew. pipe - 134'
5' Depth
(For details, see sht. HA17)

(41) Sta. "B2" 711+46.87, Rt.
Const. type "G-2" inlet - 18" Sump

(42) See sht. HA04, note 6

(43) See sht. HA04, note 8

(44) See sht. HA05, note 6

(45) See sht. HA05, note 8

(46) Sta. "A2" 701+66.72, 21.88' Lt.
Const. pollution control manhole
Inst. 12" storm sew. pipe - 17'
5' Depth
Inst. 12" storm sew. pipe - 17'
5' Depth

(47) Relocate Oregon City water line (By others)

(48) Relocate NW Natural 4 $\frac{1}{2}$" steel gas line (By others)

(49) Relocate CenturyLink fiber optic duct bank (By others)

(50) Protect West Linn 24" water line

(51) Protect PGE UG electric

(52) Relocate PGE UG (By others)

(53) Protect ODOT signal conduits

REGISTERED PROFESSIONAL ENGINEER
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OREGON
MAY 13, 2018
CORY M. GIESEKE
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HDR ENGINEERING, INC
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PORTLAND, OR 97204-1134
503.423.3700

I-205: I-5 - OR213, PHASE 1 SEC.

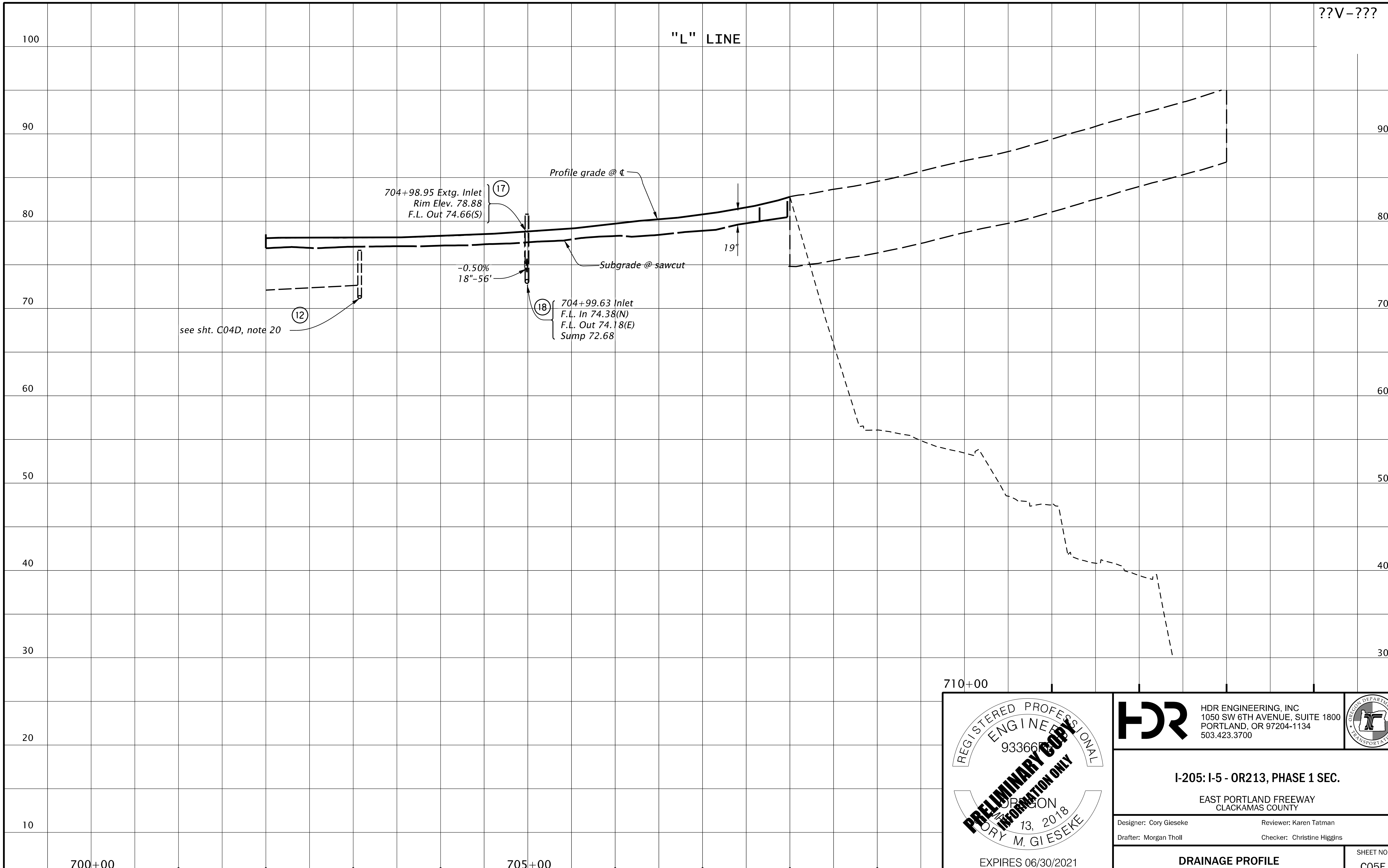
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke	Reviewer: Karen Tatman
Drafter: Morgan Tholl	Checker: Christine Higgins

DRAINAGE & UTILITIES NOTES

SHEET NO. C05D

Rotation: 0° Scale: 1"=100'



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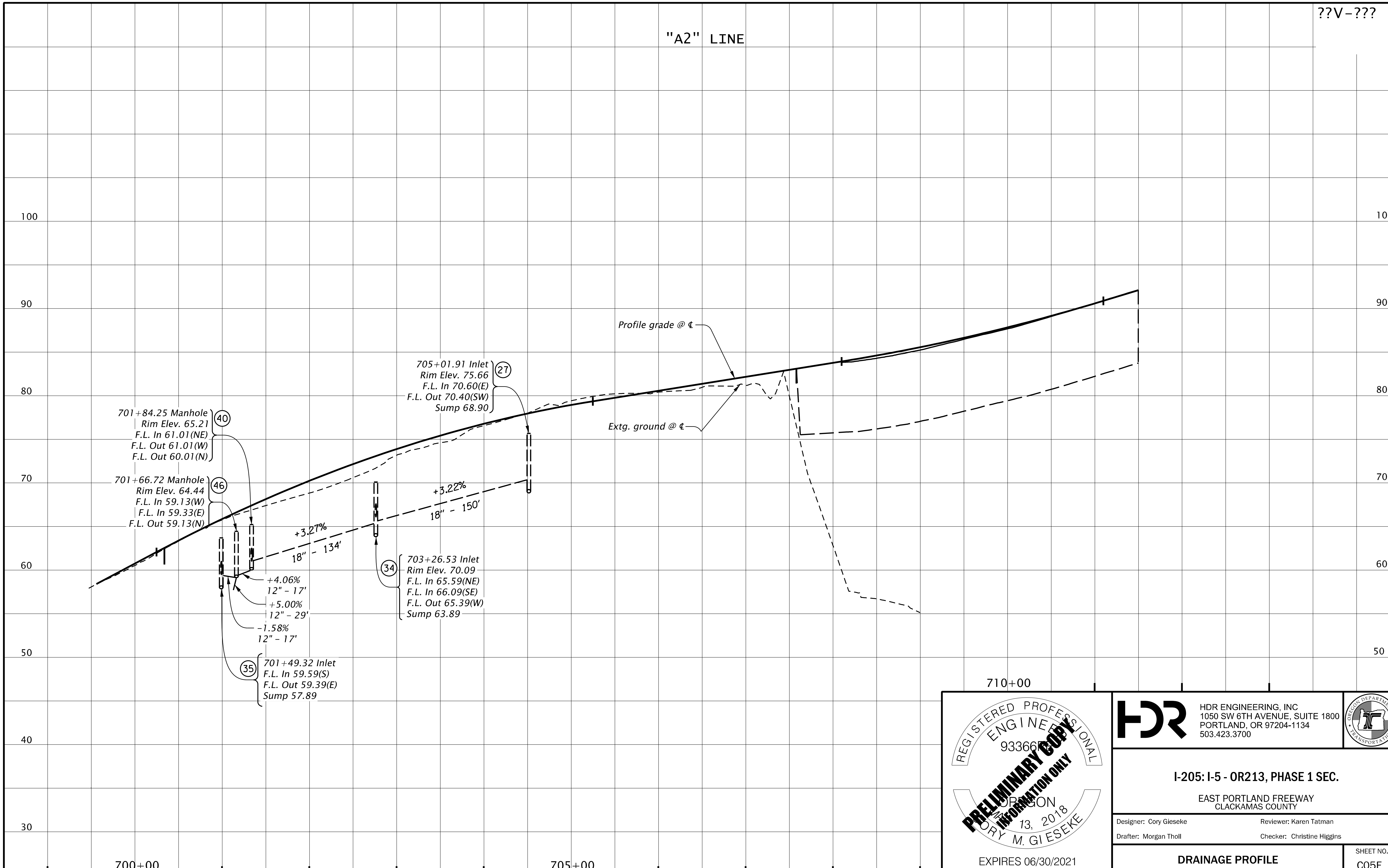
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke	Reviewer: Karen Tatman
Drafter: Morgan Tholl	Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C05E



208

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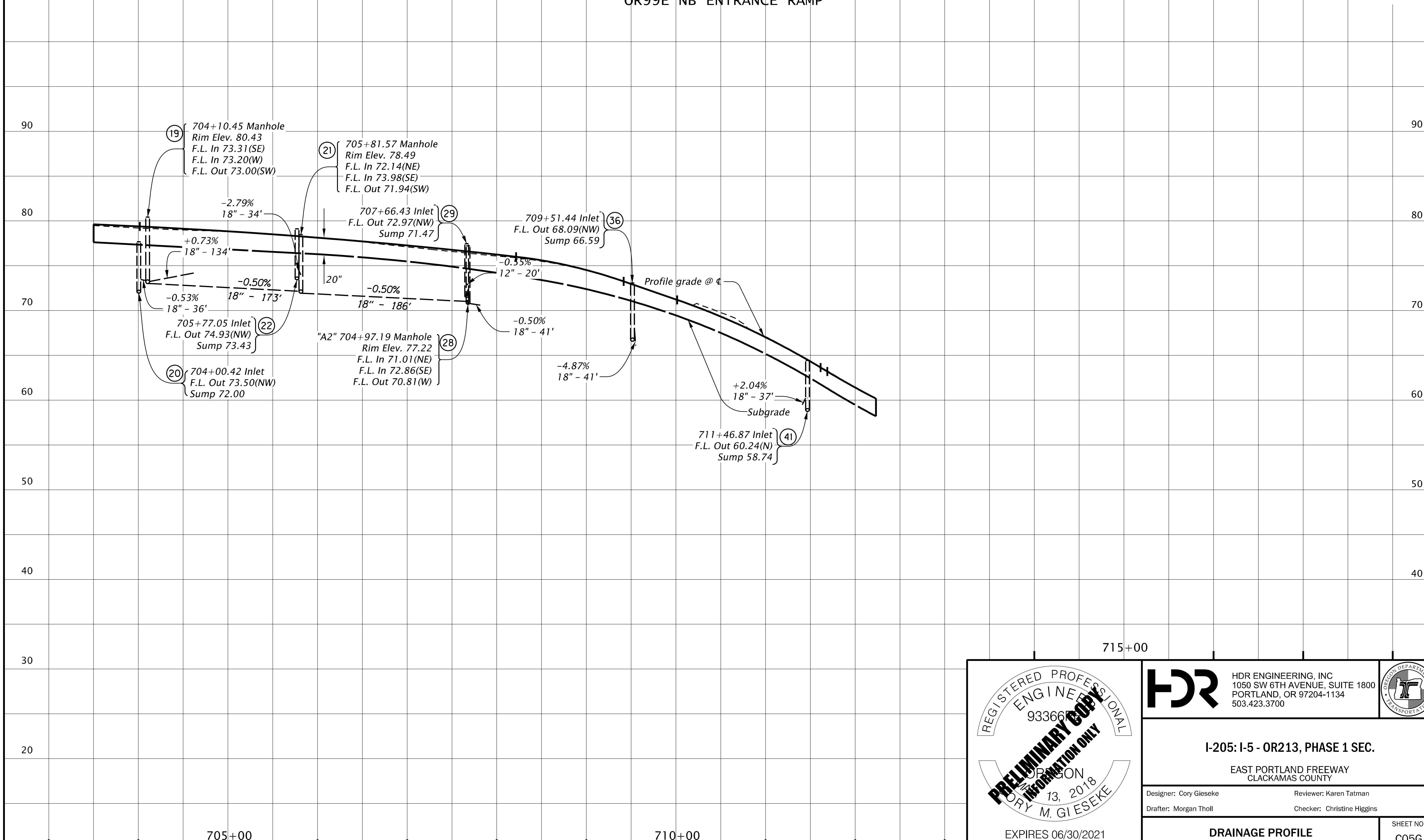
??V-???

"B2" LINE

OR99E NB ENTRANCE RAMP



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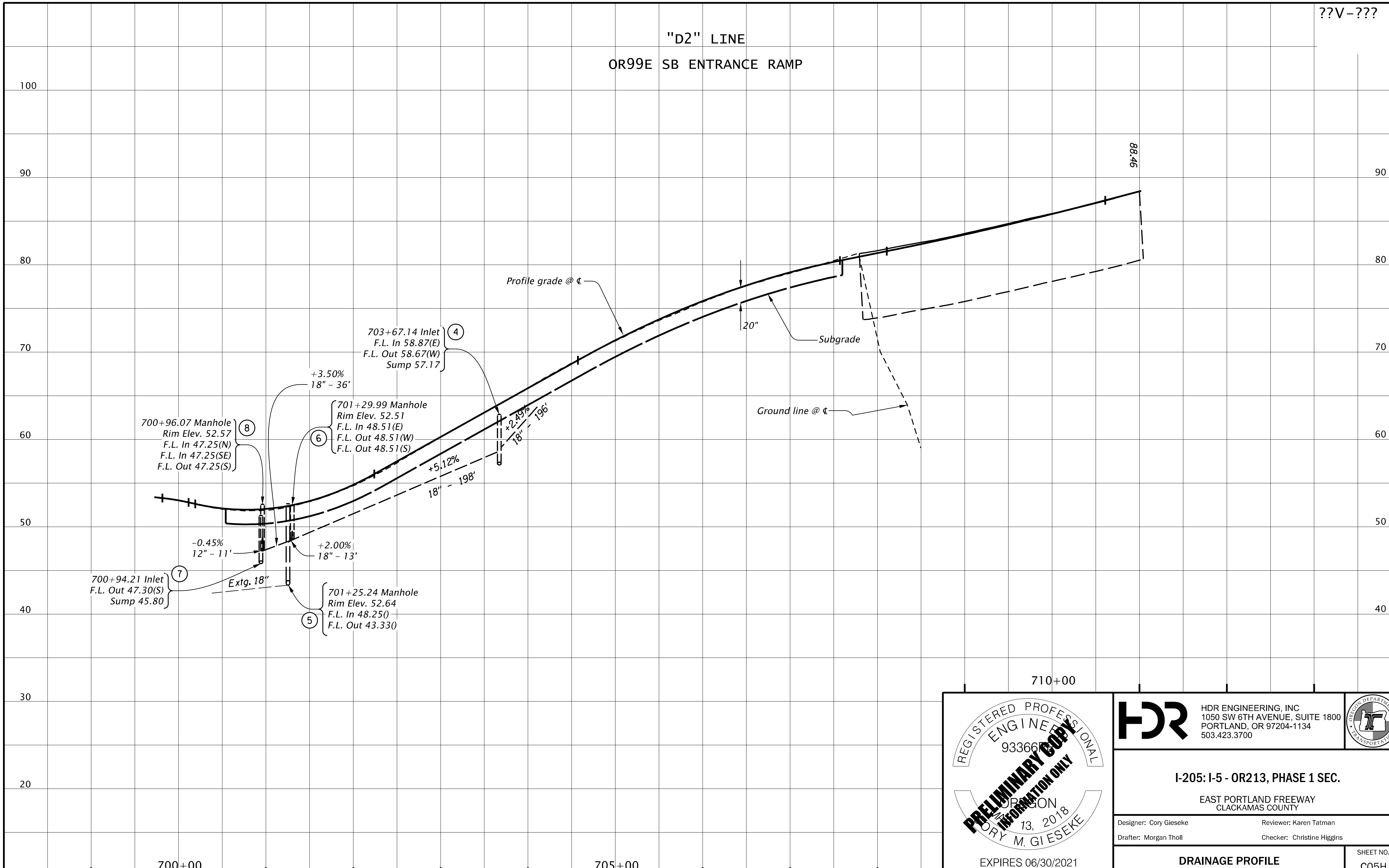
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C05G

??V-???



210

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OREGON
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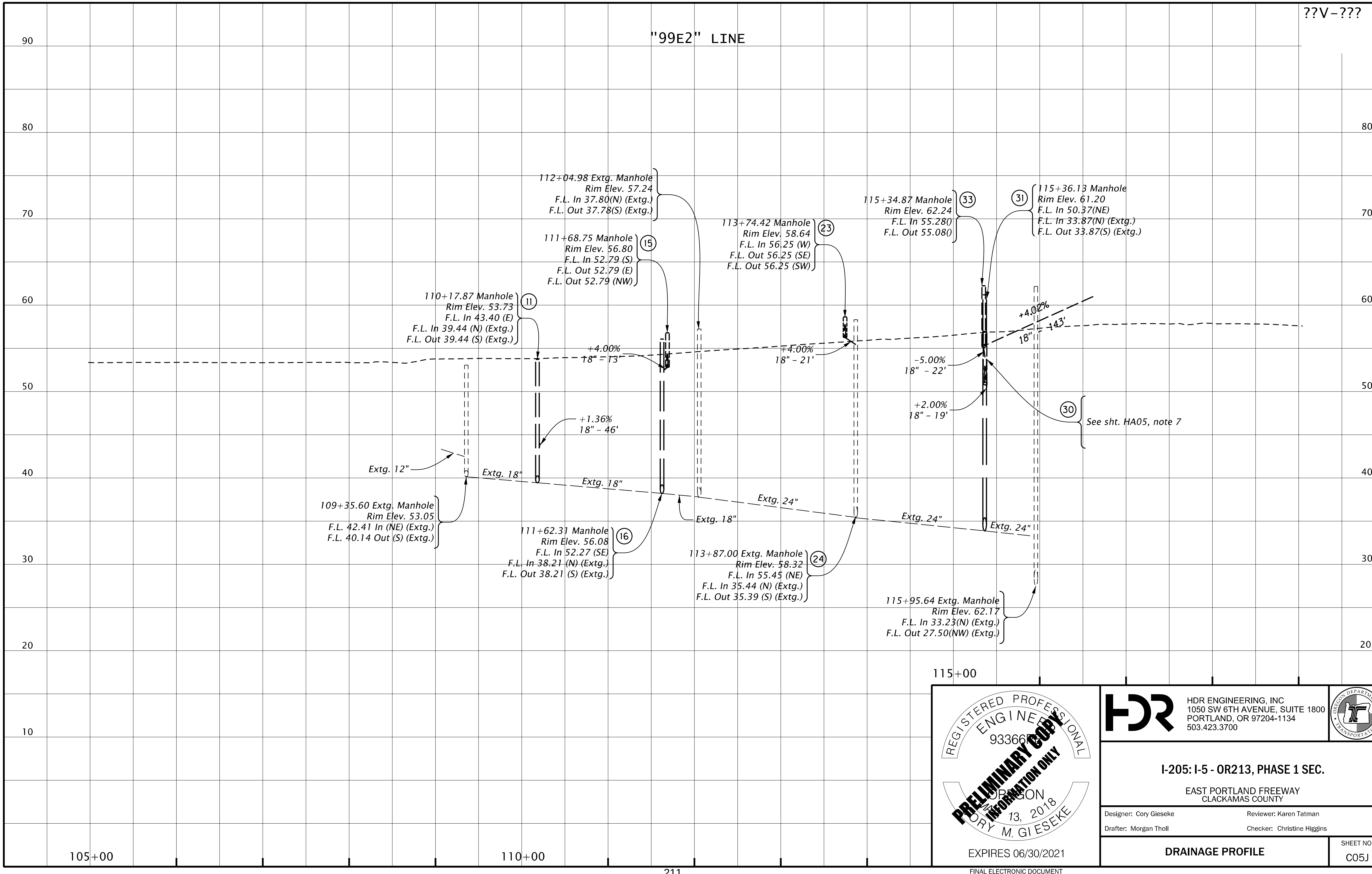
I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C05H


??V-???
"99E2" LINE
90
80
70
60
50
40
30
20
10
112+04.98 Extg. Manhole
Rim Elev. 57.24
F.L. In 37.80(N) (Extg.)
F.L. Out 37.78(S) (Extg.)
111+68.75 Manhole (15)
Rim Elev. 56.80
F.L. In 52.79 (S)
F.L. Out 52.79 (E)
F.L. Out 52.79 (NW)
110+17.87 Manhole (11)
Rim Elev. 53.73
F.L. In 43.40 (E)
F.L. In 39.44 (N) (Extg.)
F.L. Out 39.44 (S) (Extg.)
113+74.42 Manhole (23)
Rim Elev. 58.64
F.L. In 56.25 (W)
F.L. Out 56.25 (SE)
F.L. Out 56.25 (SW)
115+34.87 Manhole (33)
Rim Elev. 62.24
F.L. In 55.28()
F.L. Out 55.08()
(31) 115+36.13 Manhole
Rim Elev. 61.20
F.L. In 50.37(NE)
F.L. In 33.87(N) (Extg.)
F.L. Out 33.87(S) (Extg.)
+4.02%
18" - 143'
+4.00%
18" - 13'
+4.00%
18" - 21'
-5.00%
18" - 22'
+2.00%
18" - 19'
(30) See sht. HA05, note 7
+1.36%
18" - 46'
Extg. 12"
Extg. 18"
Extg. 18"
Extg. 24"
Extg. 24"
Extg. 24"
Extg. 18"
109+35.60 Extg. Manhole
Rim Elev. 53.05
F.L. 42.41 In (NE) (Extg.)
F.L. 40.14 Out (S) (Extg.)
111+62.31 Manhole (16)
Rim Elev. 56.08
F.L. In 52.27 (SE)
F.L. In 38.21 (N) (Extg.)
F.L. Out 38.21 (S) (Extg.)
113+87.00 Extg. Manhole (24)
Rim Elev. 58.32
F.L. In 55.45 (NE)
F.L. In 35.44 (N) (Extg.)
F.L. Out 35.39 (S) (Extg.)
115+95.64 Extg. Manhole
Rim Elev. 62.17
F.L. In 33.23(N) (Extg.)
F.L. Out 27.50(NW) (Extg.)
105+00
110+00
115+00
REGISTERED PROFESSIONAL ENGINEER
93366PE
OREGON
MAY 13, 2018
CORY M. GIESEKE
EXPIRES 06/30/2021
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503.423.3700
OREGON DEPARTMENT OF TRANSPORTATION
I-205: I-5 - OR213, PHASE 1 SEC.
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY
Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins
DRAINAGE PROFILE
SHEET NO.
C05J
211
FINAL ELECTRONIC DOCUMENT
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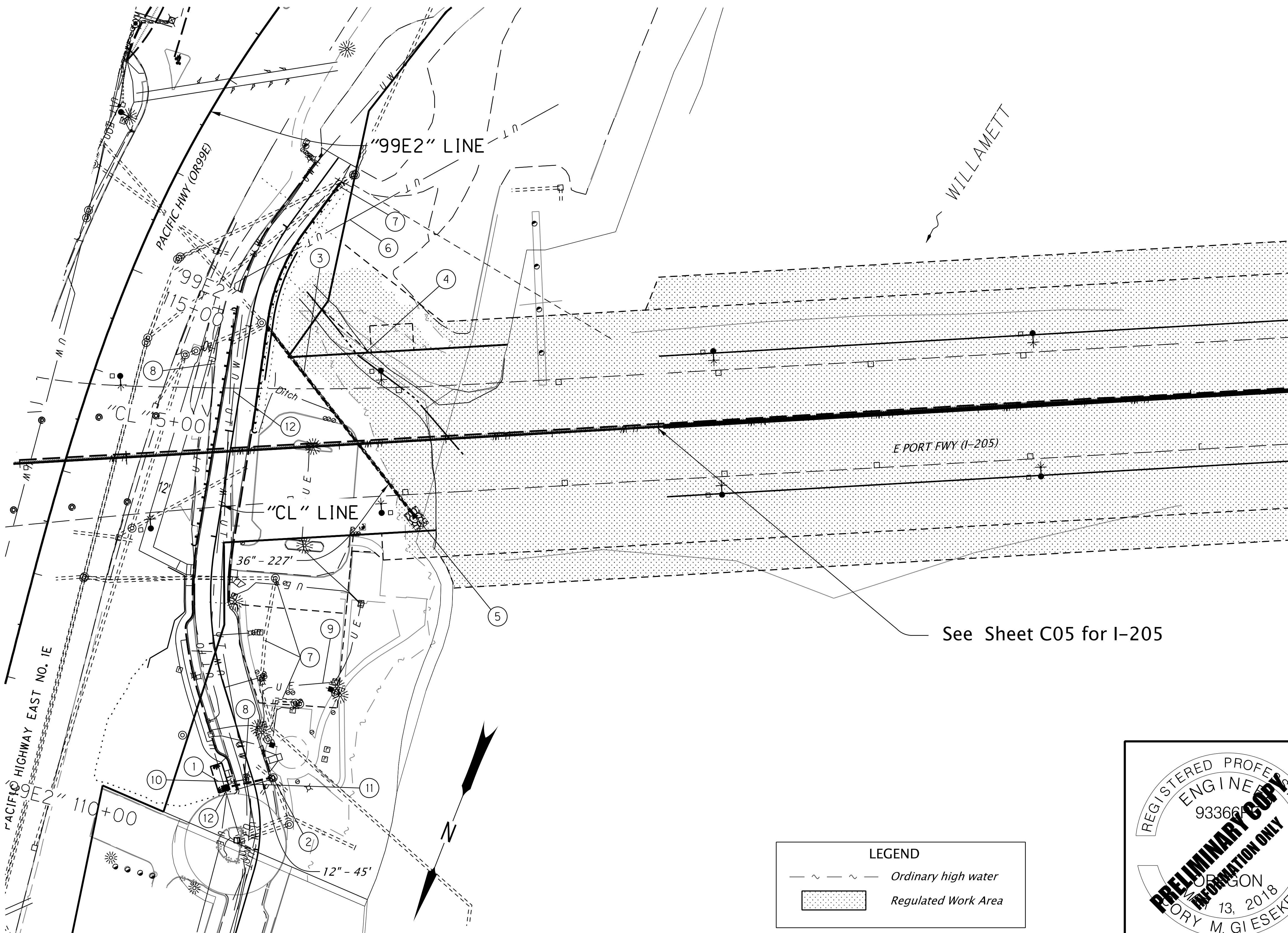
Sec. 30, T. 2 S, R. 2 E, W.M.

OREGON CITY INTERCHANGE



1. Sta. "CL" 11+85.69, 27.58' Lt. to Sta. "CL" 11+62.98, 27.28' Lt.
   Const. stormwater planter
   (For details, see sht. HA10)
2. Sta. "CL" 11+63.04, 18.86' Rt.
   Adjust manhole
   Inst. 12" storm sew. pipe – 45'
   10' Depth
   Connect to existing structure
3. Remove pipe – 227'
4. Const. Abernethy Creek
   (For details, see sht. FC01 – FC02)
5. Sta. "CL" 14+47.54, 181.74' Rt.
   Const. riprap basin
   Loose riprap (class 50) – 5.0 tons
   Inst. 36" storm sew. pipe
   w/ sloped end section – 227'
   20' Depth
6. Protect CenturyLink UG communications
7. Protect Oregon City sanitary sewer
8. Relocate CenturyLink fiber optic duct bank (By others)
9. Relocate PGE UG electric
10. Relocate fire hydrant (By others)
11. Relocate Oregon City waterline (By others)
12. Relocate PG UG Electric (By others)

LEGEND

— ~ — ~ —	Ordinary high water
(dotted box)	Regulated Work Area

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OREGON
MAY 13, 2018
CORY M. GIESEKE
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I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman

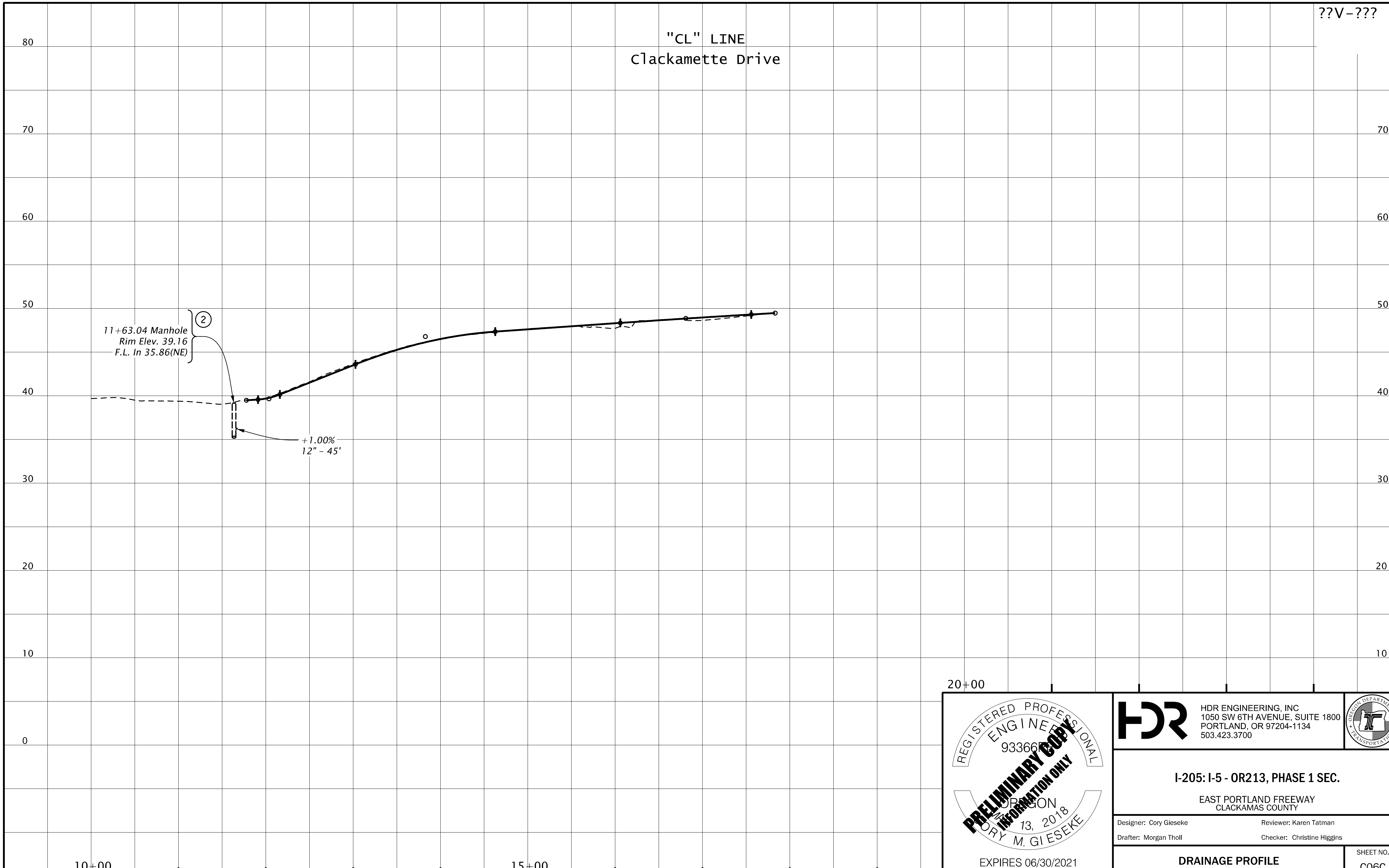
Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE & UTILITIES

SHEET NO. C06B

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

Rotation: 198.4431° Scale: 1"=100'



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13, 2018
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503.423.3700

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke	Reviewer: Karen Tatman
Drafter: Morgan Tholl	Checker: Christine Higgins

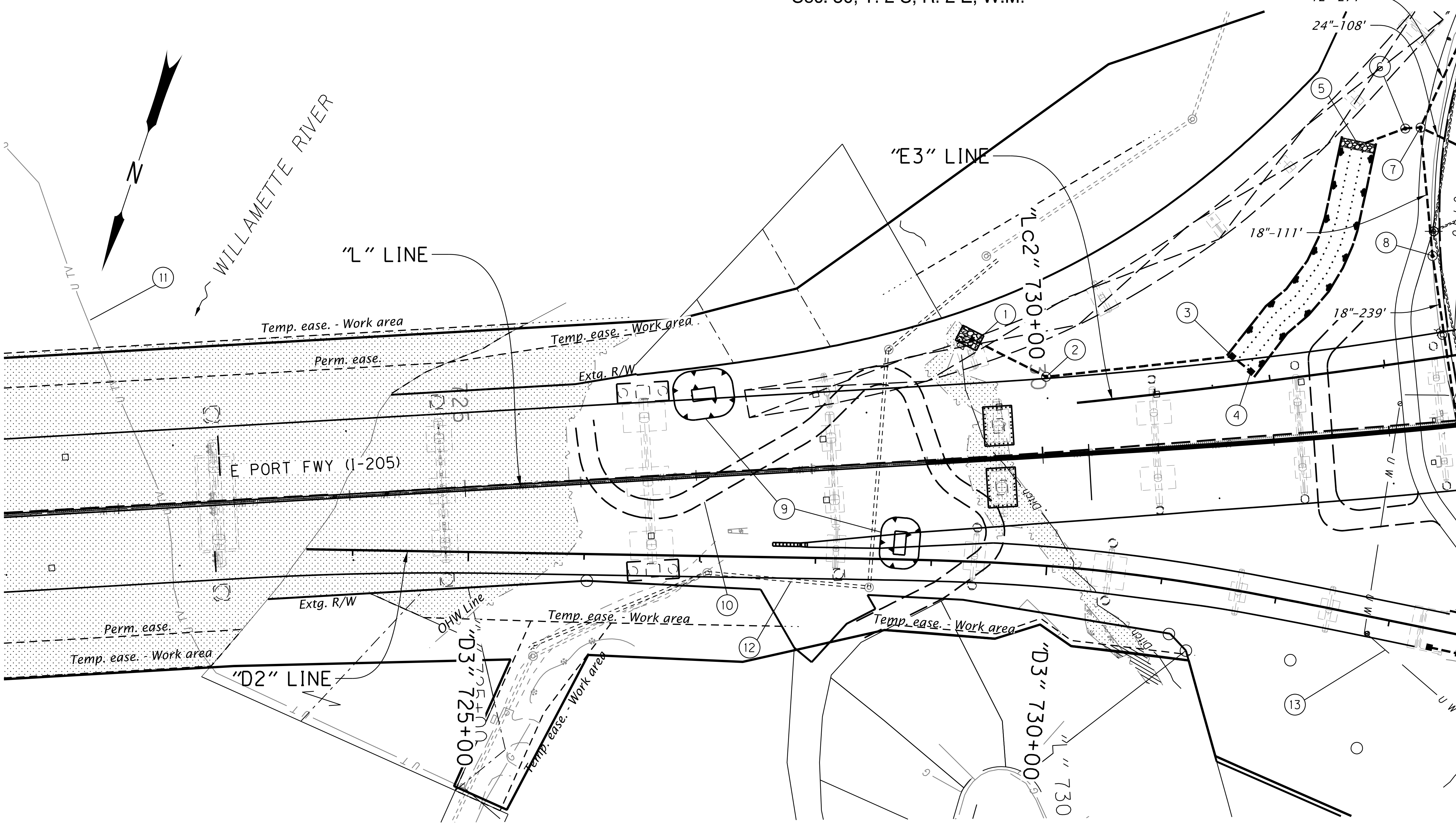
DRAINAGE PROFILE

SHEET NO.
C06C

R_K19786_HDR_drpf_01.dgn :: C06C 7/17/2020 1:56:35 PM CGIESEKE

Rotation: 0° Scale: 1"=100'

Sec. 30, T. 2 S, R. 2 E, W.M.



1. See sht. HA07, note 4
2. See sht. HA07, note 3
3. See sht. HA06, note 5
4. See sht. HA06, note 6
5. Sta. "OR43" 10+12.40, 104.31' Lt. to Sta. "OR43" 8+77.47, 208.62' Lt.
   Const. biofiltration swale
   (For details, see sht. HA06)
6. See sht. HA06, note 8
7. Sta. "OR43" 10+29.84, 53.44' Lt.
   Const. diversion manhole
   Inst. 12" storm sew. pipe - 271'
   10' Depth
   Inst. 18" storm sew. pipe - 111'
   10' Depth
   Inst. 24" storm sew. pipe - 108'
   10' Depth
   (For details, see sht. HA17)
   (For profile, see sht. C08G)
8. Sta. "OR43" 9+31.77, 33.19' Lt.
   Const. storm sew. manhole
   Inst. 18" storm sew. pipe - 239'
   10' Depth
   (For profile, see sht. C08G)
9. Const. water quality facilities for bridge drainage
10. Const. access road
11. Abandon CenturyLink submarine cable (By others)
12. Relocate West Linn sanitary (By others)
13. Relocate West Linn water line (By others)

LEGEND

- Ordinary high water
- Wetlands
- No Work Area
- Regulated Work Area

REGISTERED PROFESSIONAL ENGINEER
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OREGON
... 13, 2018
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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

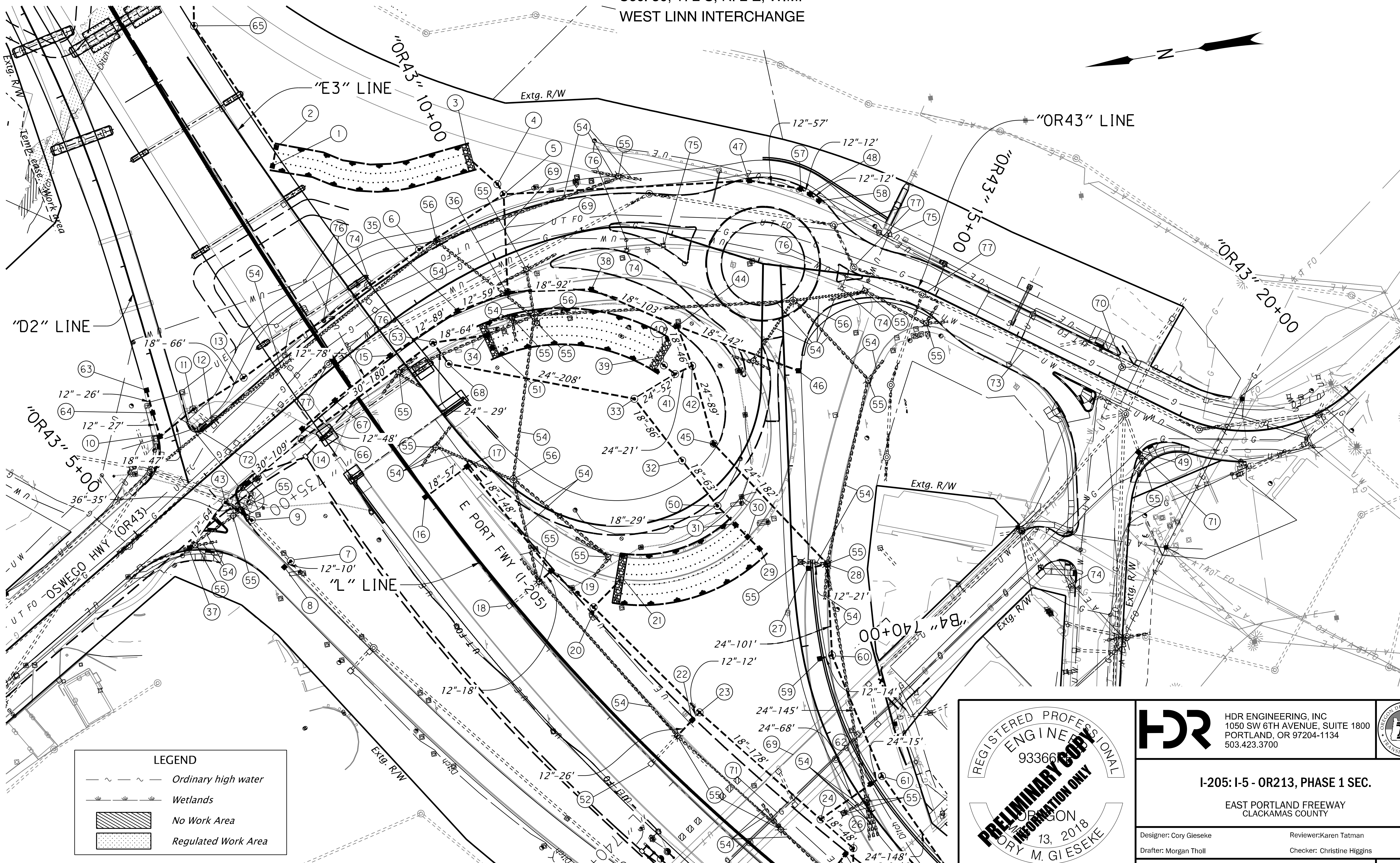
DRAINAGE & UTILITIES

SHEET NO. C07B

214

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

Rotation: 198.4431° Scale: 1"=100'



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13, 2018
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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE & UTILITIES

SHEET NO.
C08C

215

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

Rotation: 260.6437° Scale: 1"=100'

(1) See C07B, note 4

(2) See C07B, note 3

(3) See C07B, note 5

(4) See HA06, note 8

(5) See C07B, note 7

(6) See C07B, note 8

(7) Sta. "C4" 734+99.68, 13.15' Lt.
Const. storm sew. manhole over existing sewer
Inst. 12" storm sew. pipe - 10'
5' Depth

(8) Sta. "C4" 734+99.49, Lt.
Const. type "G-2" inlet - 18" Sump

(9) Sta. "OR43" 6+05.93, 68.69' Rt.
Const. storm sew. manhole over existing sewer

(10) Sta. "D2" 733+92.05, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 27'
5' Depth

(11) Sta. "D2" 733+73.30, 27.71' Lt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 47'
5' Depth
Connect extg. 12" storm sewer pipe

(12) Sta. "D2" 733+94.54, 47.16' Lt.
Adjust inlet

(13) Sta. "OR43" 7+02.39, 55.56' Lt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 66'
5' Depth

(14) Sta. "OR43" 7+06.05, 37.39' Rt.
Const. storm sew. manhole
Inst. 30" storm sew. pipe - 180'
5' Depth

(15) Sta. "OR43" 8+41.86, 32.03' Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 78'
5' Depth

(16) Sta. "L" 735+83.55, Rt.
Const. type "G-2" inlet - 18" Sump

(17) Sta. "E3" 735+77.22, 14.30' Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 57'
5' Depth
Trench resurfacing - 26 sq. yd.

(18) Sta. "L" 737+37.54, Rt.
Adjust inlet

(19) Sta. "L" 737+34.33, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 148'
5' Depth
Trench resurfacing - 16 sq. yd.
Extend extg. 12" pipe - 18'

(20) See sht. HA09, note 4

(21) Sta. "E3" 737+52.57, 56.87' Rt. to Sta. "E3" 738+66.37, 64.42' Rt.
Const. biofiltration swale
Const. riprap basin
(For details, see sht. HA09)

(22) Sta. "L" 739+69.26, Lt.
Const. type "G-2" inlet - 18" Sump
Extend 12" storm sew. pipe - 26'

(23) Sta. "L" 739+65.94, 74.67' Lt.
Const. storm sew. manhole
Inst. 12" storm sew. pipe - 12'
5' Depth
Inst. 18" storm sew. pipe - 178'
10' Depth

(24) Sta. "L" 741+50.10, 79.65' Lt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 48'
10' Depth

(25) Sta. "L" 741+97.14, Lt.
Const. type "G-2" inlet
Inst. 12" storm sew. pipe - 63'
x' Depth

(26) See C09C, note 10

(27) Sta. "B4" 739+13.79, Lt.
Const. type "G-2" inlet - 18" Sump

(28) Sta. "B4" 739+10.44, 37.95' Lt.
Const. storm sew. manhole
Inst. 12" storm sew. pipe - 21'
5' Depth
Inst. 24" storm sew. pipe - 101'
5' Depth

(29) See sht. HA09, note 7

(30) See sht. HA09, note 6

(31) See sht. HA09, note 5

(32) Sta. "E3" 738+63.13, 46.04' Lt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 63'
10' Depth

(33) Sta. "OR43" 12+15.17, 184.58' Rt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 86'
5' Depth
Inst. 24" storm sew. pipe - 52'
5' Depth

(34) See sht. HA08, note 7

(35) Sta. "OR43" 9+35.10, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 89'
5' Depth

(36) Sta. "OR43" 10+02.36, Rt.
Const. storm sew. manhole w/ type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 59'
10' Depth
Inst. 18" storm sew. pipe - 92'
10' Depth

(37) Sta. "OR43" 5+29.79, 49.13' Rt.
Const. type "G-2" inlet over extg. sewer - 18" Sump

(38) Sta. "OR43" 11+11.99, 65.27' Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 103'
5' Depth

(39) Sta. "E3" 740+37.28, 107.23' Lt. to Sta. "OR43" 9+52.79, 60.58' Rt.
Const. biofiltration swale
Const. riprap basin
Inst. 12" storm sew. pipe - 11'
x' Depth
(For details, see sht. HA07)

(40) See sht. HA08, note 5

(41) Sta. "OR43" 12+49.77, 145.15' Rt.
Const. diversion manhole
Inst. 24" storm sew. pipe - 21'
5' Depth
(For details, see sht. HA17)

(42) Sta. "OR43" 12+64.91, 130.68' Rt.
Const. diversion manhole
Inst. 24" storm sew. pipe - 89'
5' Depth
(For details, see shts. HA18)

(43) Sta. "OR43" 5+96.78, 34.94' Rt.
Const. storm sew. manhole over existing sewer
Inst. 12" storm sew. pipe - 64'
5' Depth
Inst. 30" storm sew. pipe - 109'
5' Depth
Inst. 36" storm sew. pipe - 35'
5' Depth

(44) Sta. "OR43" 12+35.36, 96.80' Rt.
Const. manhole with type "G-2" inlet
Inst. 18" storm sew. pipe - 46'
5' Depth
Inst. 18" storm sew. pipe - 142'
10' Depth

(45) Sta. "E3" 739+15.44, 32.23' Lt.
Const. manhole with type "D" inlet
Inst. 24" storm sew. pipe - 182'
10' Depth

(46) Sta. "B4" 736+95.67, 18.07' Lt.
Const. type "G-2" inlet - 18" Sump

(47) Sta. "OR43" 12+62.73, 85.28' Lt.
Const. type "G-2" inlet
Inst. 12" storm sew. pipe - 57'
5' Depth

(48) Sta. "OR43" 13+49.43, 84.54' Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 12'
5' Depth

(49) Sta. "OR43" 17+76.87, 55.36' Rt.
Const. type "G-2" inlet - 18" Sump
Connect existing sewer

(50) Sta. "E3" 738+61.43, 17.19' Rt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 29'
5' Depth

(51) See sht. HA08, note 6

(52) Sta. "L" 739+68.75, Rt.
Adjust inlet

(53) Sta. "OR43" 8+90.34, 45.60' Rt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 64'
5' Depth
Inst. 24" storm sew. pipe - 29'
5' Depth

(54) Remove pipe - 3612'

(55) Remove inlet - 21

(56) Remove manhole - 4

(57) Sta. "OR43" 13+39.72, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 12'
5' Depth

(58) Sta. "OR43" 13+61.62, Lt.
Const. type "G-2" inlet - 18" Sump

(59) Sta. "B4" 740+17.26, 16.85' Lt.
Const. type "G-2" inlet - 18" Sump

(60) Sta. "B4" 740+15.99, 31.35' Lt.
Const. storm sew. manhole
Inst. 12" storm sew. pipe - 14'
5' Depth
Inst. 24" storm sew. pipe - 145'
10' Depth

(61) Sta. "B4" 741+73.01, 32.09' Lt.
Const. storm sew. manhole
Inst. 24" storm sew. pipe - 15'
5' Depth
Inst. 24" storm sew. pipe - 148'
5' Depth

(62) Sta. "B4" 741+73.00, 16.92' Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 24" storm sew. pipe - 68'
10' Depth

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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE & UTILITIES NOTES

SHEET NO. C08D

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

Rotation: 0° Scale: 1"=100'

63 *Sta. 733+38.11, Rt.*
Const. type "G-2" inlet - 18" Sump

64 *Sta. 733+64.02, Rt.*
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 26'
5' Depth

65 *See C07B, note 2*

66 *Sta. "OR43" 7+11.01, Rt.*
Const. type "G-2" inlet - 18" Sump

67 *Sta. "OR43" 7+59.10, Rt.*
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 48'
5' Depth

68 *Sta. "OR43" 8+83.90, 89.84' Rt.*
Const. storm sew. manhole
Inst. 24" storm sew. pipe - 208'
10' Depth

69 *Relocate CenturyLink-Local (By others)*

70 *Adjust CenturyLink-Local manhole (By others)*

71 *Relocate NW Natural (By others)*

72 *Relocate PGE UG electric (By others)*

73 *Relocate West Linn waterline (By others)*

74 *Relocate West Linn fire hydrant (By others)*

75 *Relocate West Linn water meter (By others)*

76 *Adjust West Linn water valves (By others)*

77 *Adjust West Linn sanitary manhole (By others)*

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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

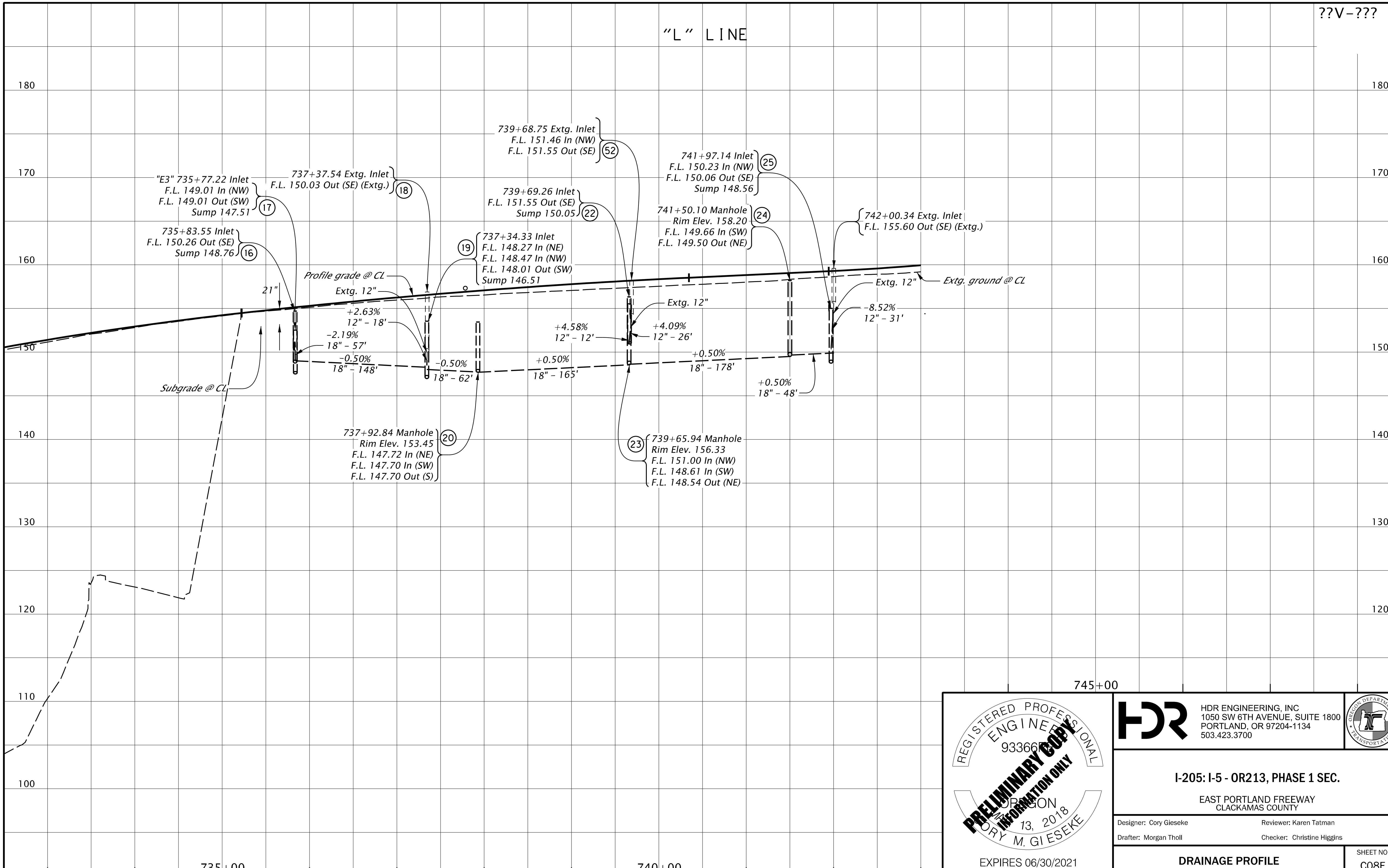
Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE & UTILITIES NOTES

SHEET NO.
C08E

Rotation: 0° Scale: 1"=100'

??V-???



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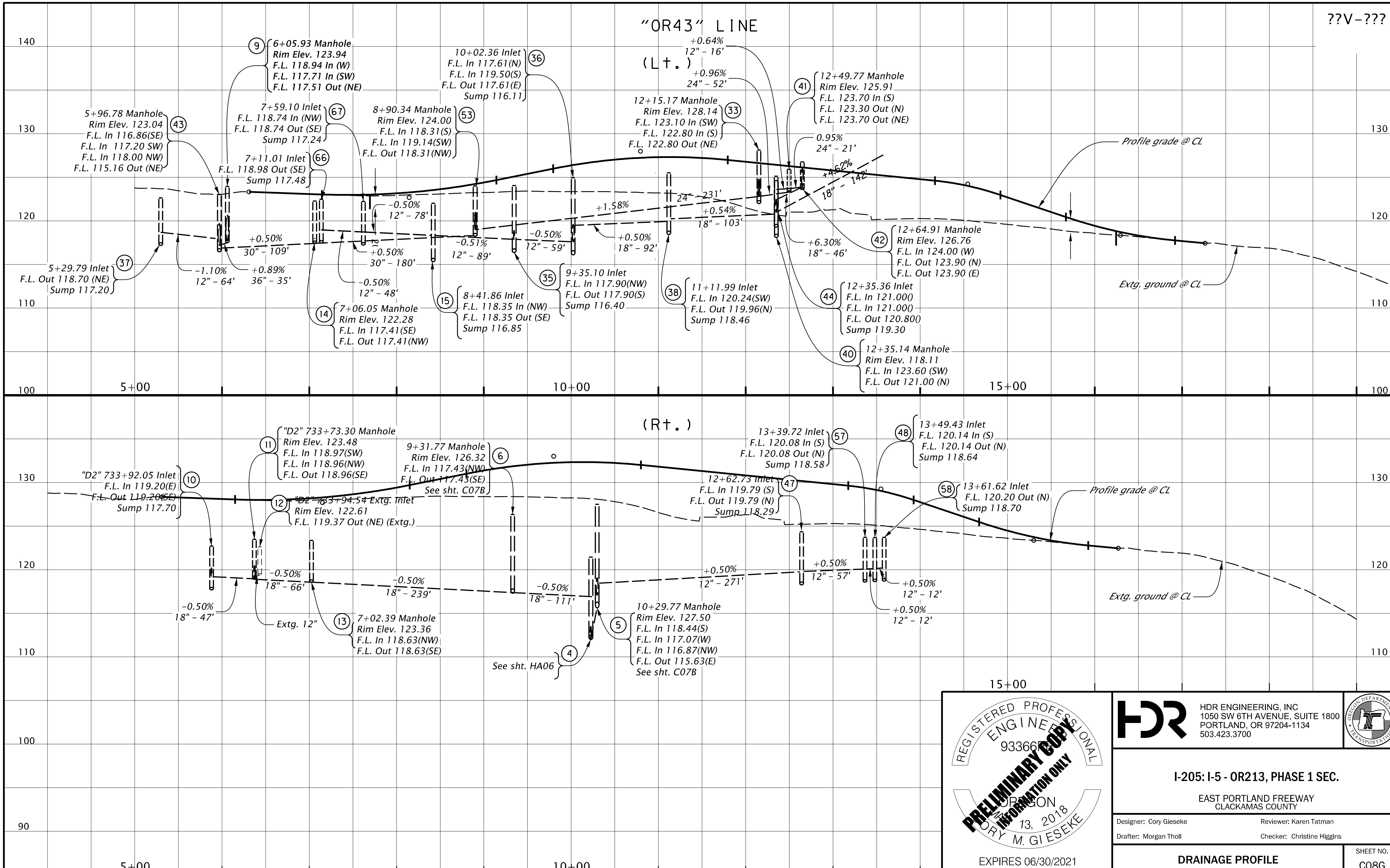
DRAINAGE PROFILE

SHEET NO.
C08F



"OR43" LINE
??V-???
(Lt.)
6+05.93 Manhole
Rim Elev. 123.94
F.L. 118.94 In (W)
F.L. 117.71 In (SW)
F.L. 117.51 Out (NE)
10+02.36 Inlet
F.L. In 117.61(N)
F.L. In 119.50(S)
F.L. Out 117.61(E)
Sump 116.11
+0.64%
12" - 16'
+0.96%
24" - 52'
12+49.77 Manhole
Rim Elev. 125.91
F.L. 123.70 In (S)
F.L. 123.30 Out (N)
F.L. 123.70 Out (NE)
12+15.17 Manhole
Rim Elev. 128.14
F.L. 123.10 In (SW)
F.L. 122.80 In (S)
F.L. 122.80 Out (NE)
0.95%
24" - 21'
+4.62%
18" - 142'
Profile grade @ CL
5+96.78 Manhole
Rim Elev. 123.04
F.L. In 116.86(SE)
F.L. In 117.20 SW)
F.L. In 118.00 NW)
F.L. 115.16 Out (NE)
7+59.10 Inlet
F.L. 118.74 In (NW)
F.L. 118.74 Out (SE)
Sump 117.24
8+90.34 Manhole
Rim Elev. 124.00
F.L. In 118.31(S)
F.L. In 119.14(SW)
F.L. Out 118.31(NW)
7+11.01 Inlet
F.L. 118.98 Out (SE)
Sump 117.48
-0.50%
12" - 78'
+1.58%
24" - 231'
+0.54%
18" - 103'
+0.50%
30" - 109'
+0.50%
30" - 180'
-0.51%
12" - 89'
-0.50%
12" - 59'
+0.50%
18" - 92'
+6.30%
18" - 46'
12+64.91 Manhole
Rim Elev. 126.76
F.L. In 124.00 (W)
F.L. Out 123.90 (N)
F.L. Out 123.90 (E)
5+29.79 Inlet
F.L. Out 118.70 (NE)
Sump 117.20
-1.10%
12" - 64'
+0.89%
36" - 35'
-0.50%
12" - 48'
9+35.10 Inlet
F.L. In 117.90(NW)
F.L. Out 117.90(S)
Sump 116.40
11+11.99 Inlet
F.L. In 120.24(SW)
F.L. Out 119.96(N)
Sump 118.46
12+35.36 Inlet
F.L. In 121.00()
F.L. In 121.00()
F.L. Out 120.80()
Sump 119.30
Extg. ground @ CL
7+06.05 Manhole
Rim Elev. 122.28
F.L. In 117.41(SE)
F.L. Out 117.41(NW)
8+41.86 Inlet
F.L. 118.35 In (NW)
F.L. 118.35 Out (SE)
Sump 116.85
12+35.14 Manhole
Rim Elev. 118.11
F.L. In 123.60 (SW)
F.L. Out 121.00 (N)
5+00
10+00
15+00
(Rt.)
"D2" 733+73.30 Manhole
Rim Elev. 123.48
F.L. In 118.97(SW)
F.L. In 118.96(NW)
F.L. Out 118.96(SE)
9+31.77 Manhole
Rim Elev. 126.32
F.L. In 117.43(NW)
F.L. Out 117.43(SE)
See sht. C07B
13+39.72 Inlet
F.L. 120.08 In (S)
F.L. 120.08 Out (N)
Sump 118.58
13+49.43 Inlet
F.L. 120.14 In (S)
F.L. 120.14 Out (N)
Sump 118.64
"D2" 733+92.05 Inlet
F.L. In 119.20(E)
F.L. Out 119.20(SE)
Sump 117.70
"D2" 733+94.54 Extg. Inlet
Rim Elev. 122.61
F.L. 119.37 Out (NE) (Extg.)
12+62.73 Inlet
F.L. In 119.79 (S)
F.L. Out 119.79 (N)
Sump 118.29
13+61.62 Inlet
F.L. 120.20 Out (N)
Sump 118.70
Profile grade @ CL
-0.50%
18" - 66'
-0.50%
18" - 239'
-0.50%
18" - 111'
+0.50%
12" - 271'
+0.50%
12" - 57'
+0.50%
12" - 12'
+0.50%
12" - 12'
-0.50%
18" - 47'
Extg. 12"
Extg. ground @ CL
7+02.39 Manhole
Rim Elev. 123.36
F.L. In 118.63(NW)
F.L. Out 118.63(SE)
10+29.77 Manhole
Rim Elev. 127.50
F.L. In 118.44(S)
F.L. In 117.07(W)
F.L. In 116.87(NW)
F.L. Out 115.63(E)
See sht. C07B
See sht. HA06
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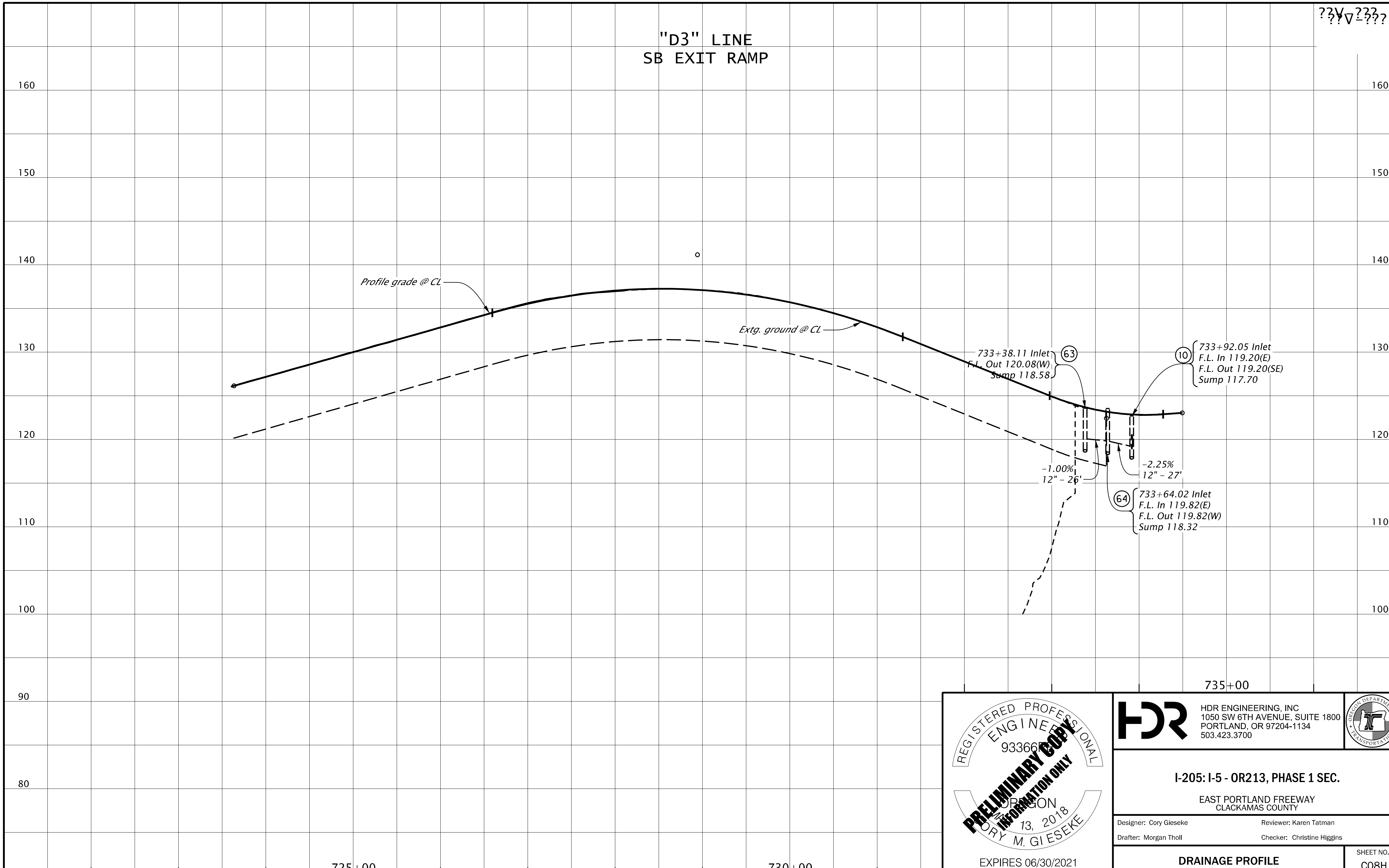
CLACKAMAS COUNTY
Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins
DRAINAGE PROFILE
SHEET NO.
C08G

219



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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

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Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C08H

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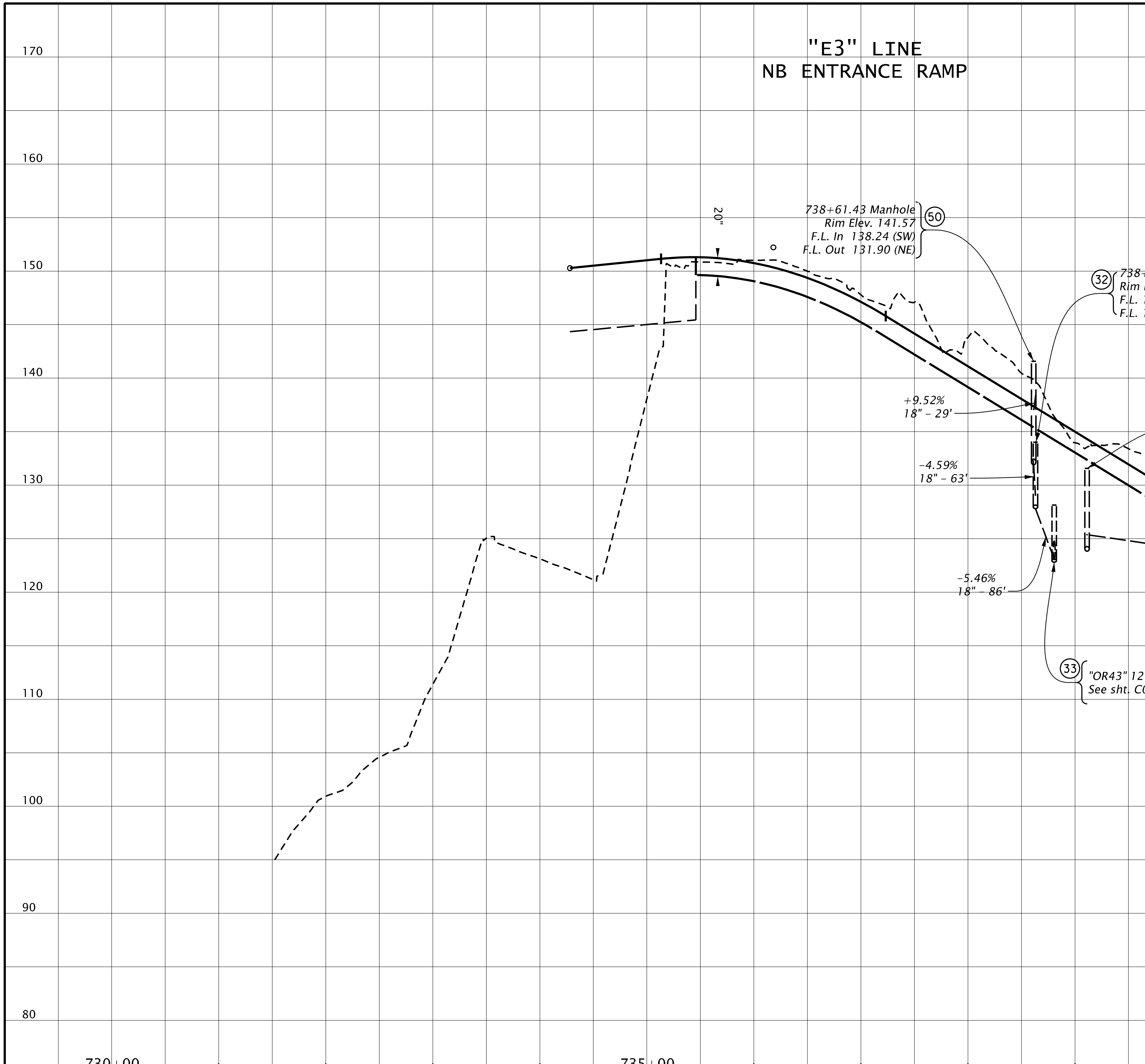
Rotation: 0° Scale: 1"=100'



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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

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Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C08J

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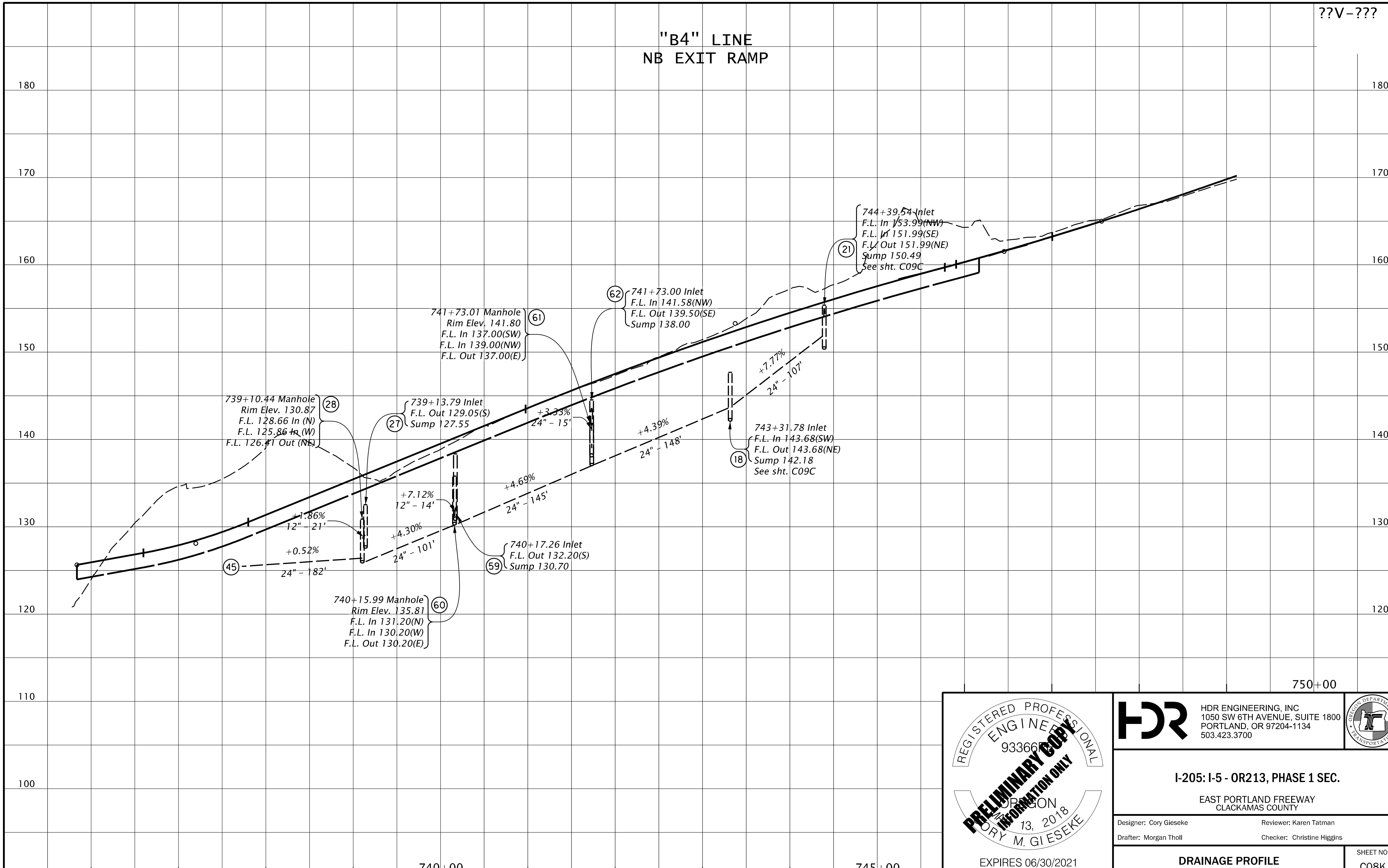

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OREGON DEPARTMENT OF TRANSPORTATION

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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke	Reviewer: Karen Tatman
Drafter: Morgan Tholl	Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C08K

R_K19786_HDR_drpf_01.dgn :: C08K 7/17/2020 1:57:40 PM CGIESEKE

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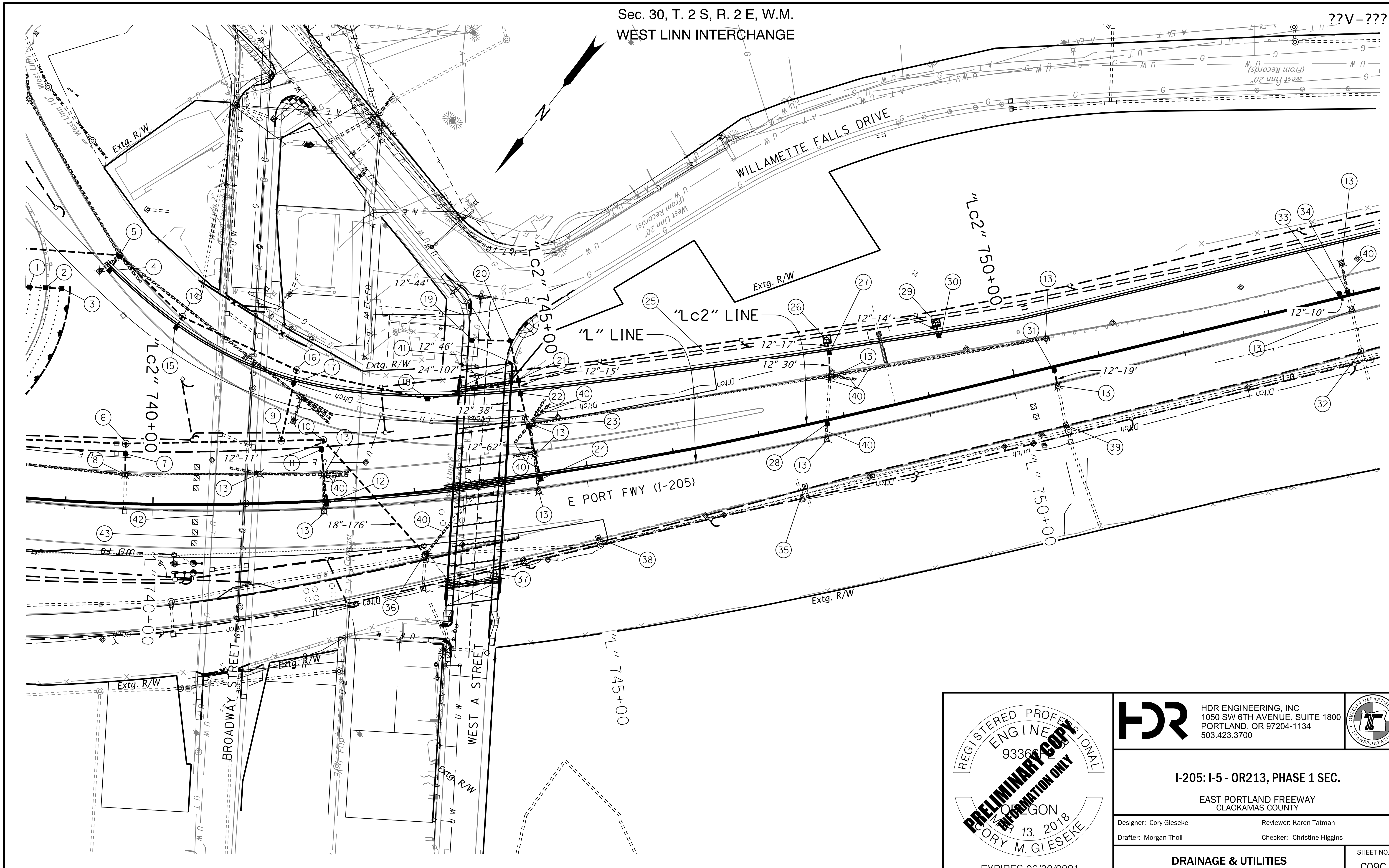
Rotation: 0° Scale: 1"=100'



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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE & UTILITIES

SHEET NO. C09C

Rotation: 218.1362° Scale: 1"=100'

1. *See C08C, note 31*
2. *See C08C, note 30*
3. *See C08C, note 29*
4. *See C08C, note 27*
5. *See C08C, note 28*
6. *See C08C, note 23*
7. *See C08C, note 22*
8. *See C08C, note 55*
9. *See C08C, note 24*
10. *Sta. "Lc2" 741+99.97, 68.63' Lt.*
    Const. storm sew. manhole
    Inst. 12" storm sew. pipe - 11'
    5' Depth
    Inst. 18" storm sew. pipe - 176'
    5' Depth
    Trench resurfacing - 81 sq. yd.
11. *See C08C, note 25*
12. *Sta. "Lc2" 741+98.86, Rt.*
    Const. type "G-2" inlet - 18" Sump
13. *Remove inlet - 12*
14. *See C08C, note 60*
15. *See C08C, note 59*
16. *See C08C, note 61*
17. *See C08C, note 62*
18. *Sta. "B4" 743+31.78, Lt.*
    Const. type "G-2" inlet - 18" Sump
    Inst. 24" storm sew. pipe - 107'
    5' Depth
    For profile, see sht. C08K
19. *Sta. "WA3" 741+97.36, Rt.*
    Const. type "G-2" inlet - 18" Sump
20. *Sta. "WA3" 741+96.02, Lt.*
    Const. type "G-2" inlet - 18" Sump
    Inst. 12" storm sew. pipe - 44'
    5' Depth
21. *Sta. "B4" 744+39.54, 32.48' Lt.*
    Const. type "D" inlet - 18" Sump
    Inst. 12" storm sew. pipe - 15'
    5' Depth
    Inst. 12" storm sew. pipe - 46'
    10' Depth
    For profile, see sht. C08K
22. *Sta. "B4" 744+40.80, Lt.*
    Const. type "G-2" inlet - 18" Sump
    Inst. 12" storm sew. pipe - 38'
    5' Depth
23. *Sta. "Lc2" 744+40.37, Lt.*
    Const. type "G-2" inlet - 18" Sump
    Inst. 12" storm sew. pipe - 62', S = 5.69%
    5' Depth
    Trench resurfacing - 21 sq. yd.
24. *Sta. "Lc2" 744+45.59, Rt.*
    Const. type "G-2" inlet - 18" Sump
25. *Sta. "Lc2" 744+36.93, 111.87' Lt. to Sta. "Lc2" 763+50.54, 73.54' Lt.*
    Const. ditch
26. *Sta. "Lc2" 748+00.18, 89.14' Lt.*
    Const. riprap pad
    Loose riprap (class 50) - 5.0 tons
    Inst. 12" storm sew. pipe - 17', S = 0.94%
    5' Depth
27. *Sta. "Lc2" 747+99.34, Lt.*
    Const. type "G-2" inlet - 18" Sump
    Extend 12" storm sew. pipe - 30', S = 2.99%
28. *Sta. "Lc2" 747+79.20, Rt.*
    Const. type "G-2" inlet - 18" Sump
    Connect extg. pipe
29. *Sta. "Lc2" 749+26.79, 79.57' Lt.*
    Const. riprap pad
    Loose riprap (class 50) - 5.0 tons
    Inst. 12" storm sew. pipe - 14', S = 1.00%
    5' Depth
30. *Sta. "Lc2" 749+26.39, Rt.*
    Const. type "G-2" inlet - 18" Sump
31. *Sta. "Lc2" 750+46.08, Rt.*
    Const. type "G-2" inlet - 18" Sump
    Extend 12" storm sew. pipe - 19'
    Trench resurfacing - 6 sq. yd.
32. *Sta. "Lc2" 753+97.90, Rt.*
    Adjust inlet
33. *Sta. "Lc2" 753+83.29, Lt.*
    Const. type "G-2" inlet - 18" Sump
34. *Sta. "Lc2" 753+93.62, Lt.*
    Const. type "G-2" inlet - 18" Sump
    Inst. 12" storm sew. pipe - 10', S = 0.50%
    5' Depth
    Connect existing pipe
35. *Sta. "Lc2" 747+39.13, Rt.*
    Adjust inlet
36. *Sta. "Lc2" 743+04.78, 72.78' Rt.*
    Adjust manhole
37. *Sta. "C4" 742+95.53, Lt.*
    Adjust inlet
38. *Sta. "C4" 744+93.97, Rt.*
    Adjust inlet
39. *Sta. "Lc2" 750+44.15, Rt.*
    Adjust inlet
40. *Remove pipe - 957'*
41. *Relocate West Linn waterline (By others)*
42. *Relocate Century Link UG (By others)*
43. *Relocate NW Natural Gas (By others)*

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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
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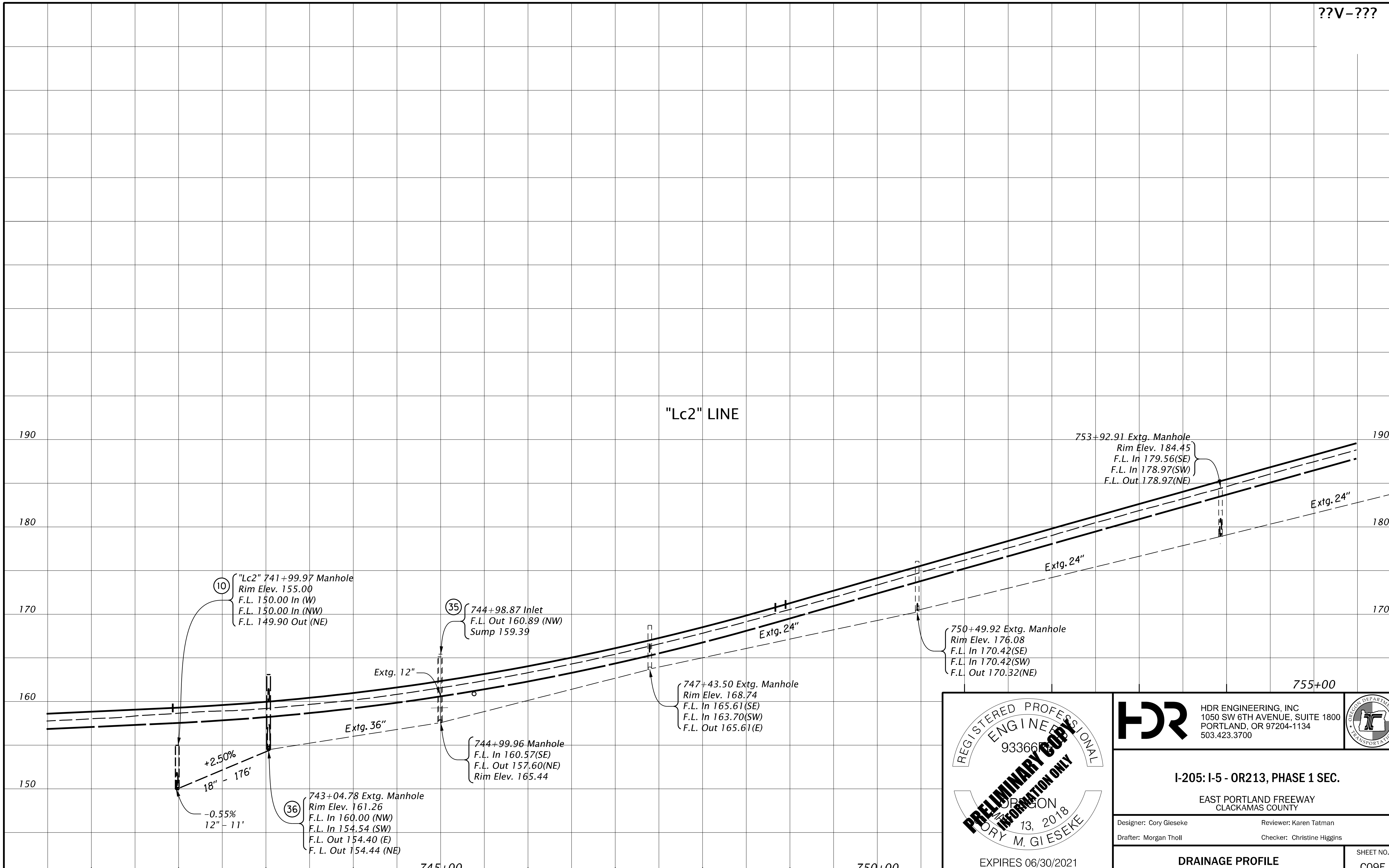
DRAINAGE & UTILITIES NOTES

SHEET NO. C09D

Rotation: 218.1362° Scale: 1"=100'



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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

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Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C09E

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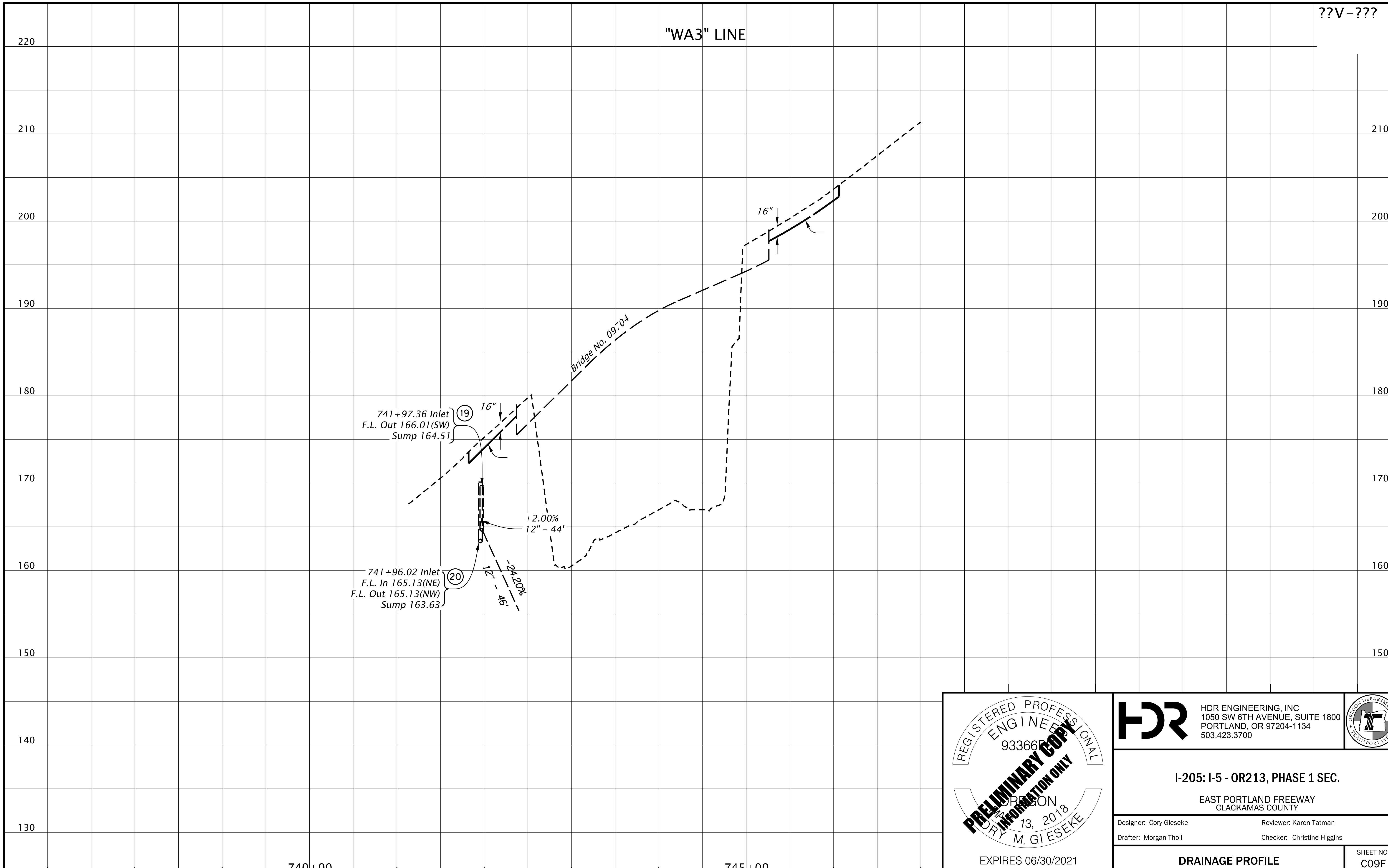
Rotation: 0° Scale: 1"=100'

??V–???



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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

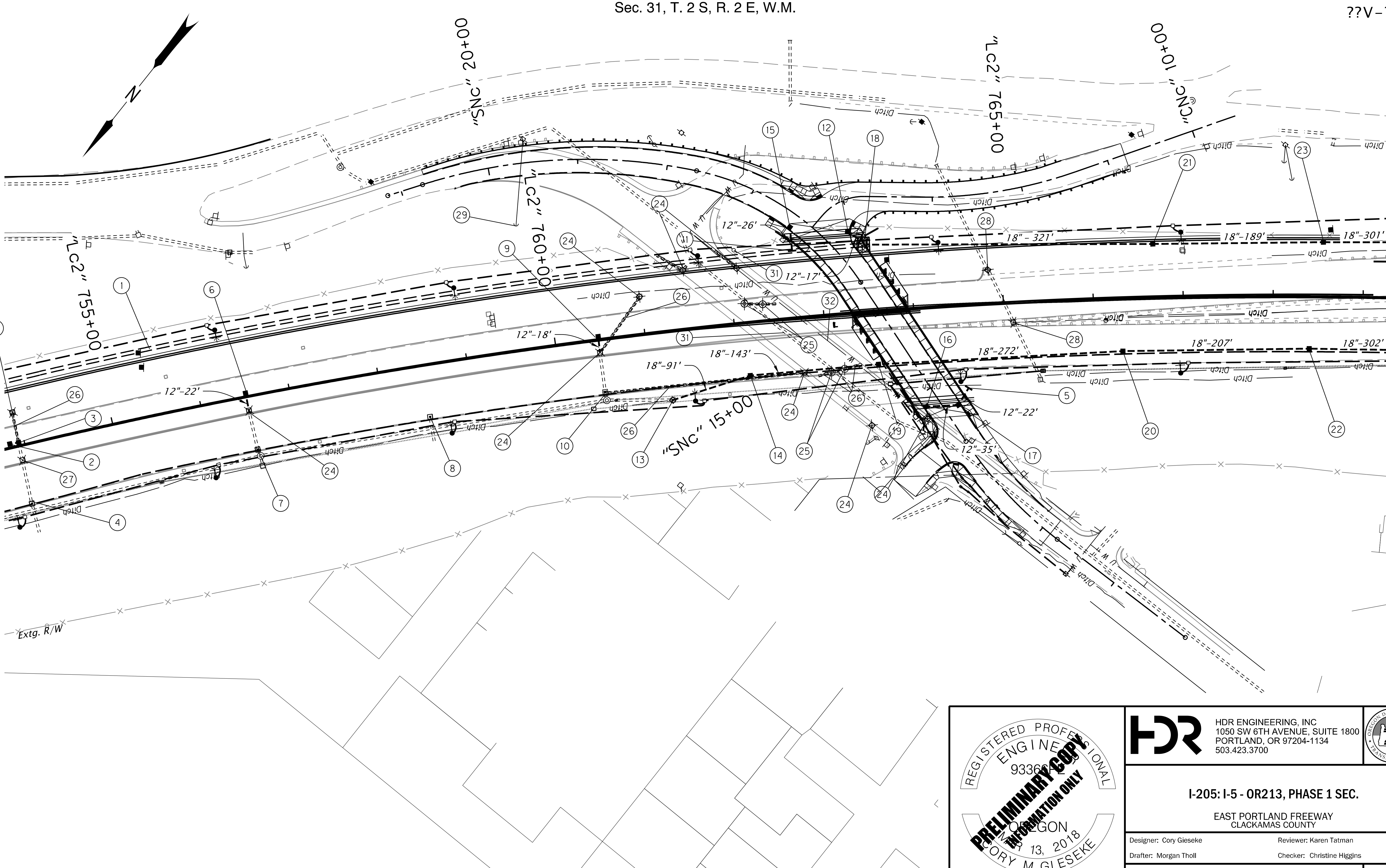
Designer: Cory Gieseke	Reviewer: Karen Tatman
Drafter: Morgan Tholl	Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO. C09F

Sec. 31, T. 2 S, R. 2 E, W.M.

??V-???



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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke	Reviewer: Karen Tatman
Drafter: Morgan Tholl	Checker: Christine Higgins

DRAINAGE & UTILITIES

SHEET NO.
C10C

Rotation: 218.5198° Scale: 1"=100'

1. See C09C, note 25
2. See C09C, note 33
3. See C09C, note 34
4. See C09C, note 32
5. Sta. "SNc" 13+76.51, 34.95' Rt.
   Inst. 12" storm sew. pipe - 22'
   5' Depth
6. Sta. "Lc2" 756+51.40, Lt.
   Const. type "G-2" inlet - 18" Sump
   Extend 12" storm sew. pipe - 22'
   Trench resurfacing - 7 sq. yd.
7. Sta. "Lc2" 756+52.77, Rt.
   Adjust inlet
8. Sta. "Lc2" 758+50.00, Rt.
   Adjust inlet
9. Sta. "Lc2" 760+48.19, Lt.
   Const. type "G-2" inlet - 18" Sump
   Extend 12" storm sew. pipe - 18'
   Trench resurfacing - 6 sq. yd.
10. Sta. "Lc2" 760+48.41, Rt.
    Adjust inlet
11. Sta. "Lc2" 762+71.42, 74.14' Lt.
    Inst. 12" storm sew. pipe - 26', S = 37.85%
    5' Depth
12. Sta. "SNc" 15+91.70, Rt.
    Const. type "G-2" inlet - 18" Sump
13. Sta. "Lc2" 761+22.45, 77.57' Rt.
    Adjust inlet
    Inst. 18" storm sew. pipe - 91'
    5' Depth
14. Sta. "Lc2" 762+11.78, Rt.
    Const. type "G-2" inlet - 18" Sump
    Inst. 18" storm sew. pipe - 143'
    5' Depth
15. Sta. "SNc" 16+42.55, Lt.
    Const. type "G-2" inlet - 18" Sump
16. Sta. "SNc" 13+85.05, Lt.
    Const. type "G-2" inlet - 18" Sump
17. Sta. "SNc" 13+67.01, Rt.
    Const. type "G-2" inlet - 18" Sump
    Inst. 12" storm sew. pipe - 35'
    5' Depth
18. Sta. "Lc2" 763+55.53, 70.83' Lt.
    Const. riprap pad
    Loose riprap (class 50) - 5.0 tons
    Inst. 12" storm sew. pipe - 17', S = 60.29%
    5' Depth
    Inst. 18" storm sew. pipe - 321'
    5' Depth
19. Sta. "Lc2" 763+56.41, Rt.
    Const. type "G-2" inlet - 18" Sump
    Inst. 18" storm sew. pipe - 272'
    5' Depth
20. Sta. "Lc2" 766+31.15, Rt.
    Const. type "G-2" inlet - 18" Sump
    Inst. 18" storm sew. pipe - 207'
    5' Depth
21. Sta. "Lc2" 766+67.81, Lt.
    Const. type "G-2" inlet - 18" Sump
    Inst. 18" storm sew. pipe - 189'
    5' Depth
22. Sta. "Lc2" 768+40.11, Rt.
    Const. type "G-2" inlet - 18" Sump
    Inst. 18" storm sew. pipe - 302'
    5' Depth
23. Sta. "Lc2" 768+55.24, Lt.
    Const. type "G-2" inlet - 18" Sump
    Inst. 18" storm sew. pipe - 301'
    5' Depth
24. Remove inlet - 7
25. Remove manhole - 3
26. Remove pipe - XX'
27. See C08C, note 13
28. Cap inlet - 2
29. Relocate Utility Anchor (By others)
30. Relocate Utility Pole (By others)
31. Relocate West Linn sanitary (By others)
32. Relocate West Linn waterline (By others)

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OREGON DEPARTMENT OF TRANSPORTATION

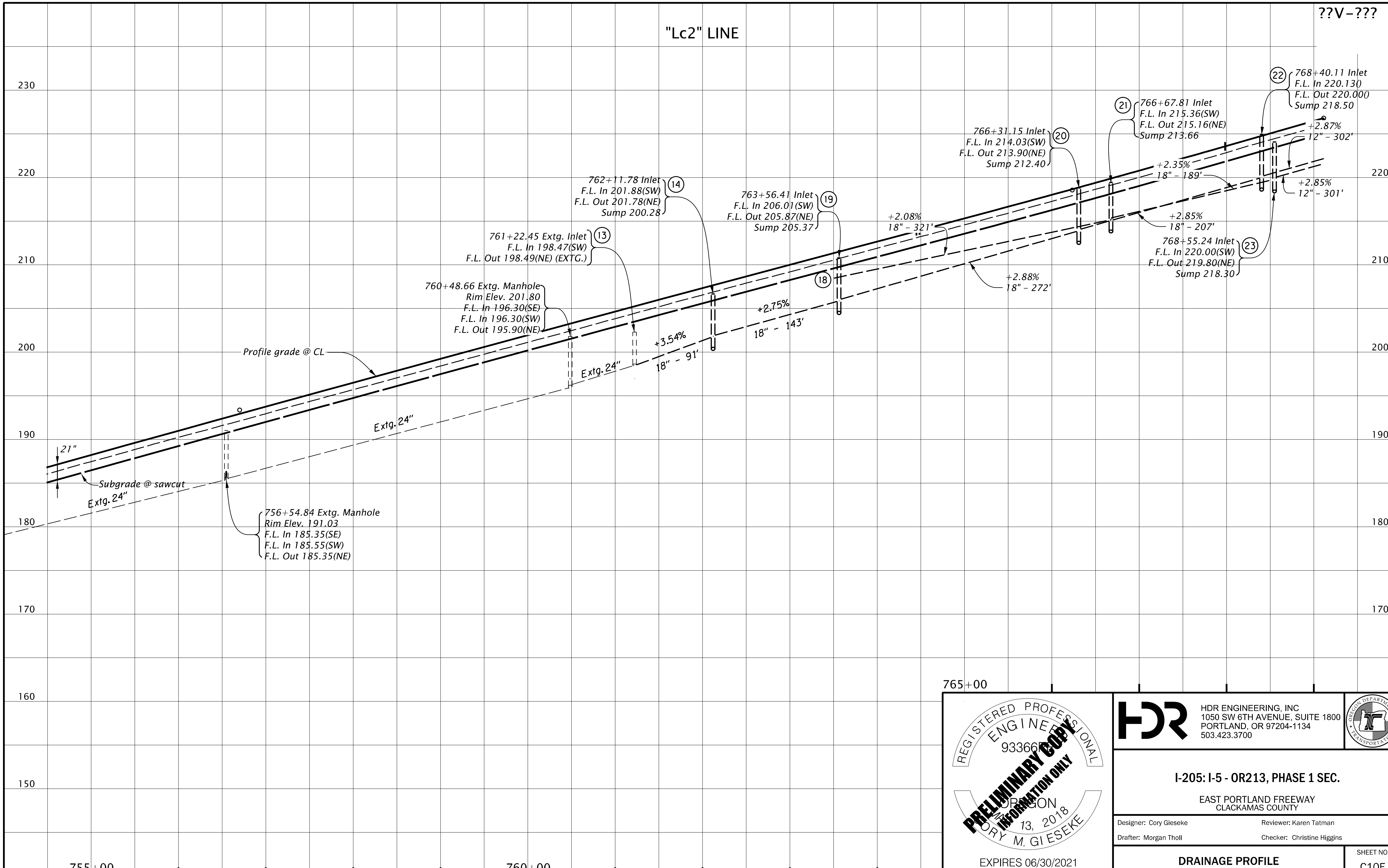
I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE & UTILITIES NOTES | SHEET NO. C10D

Rotation: 0° Scale: 1"=100'



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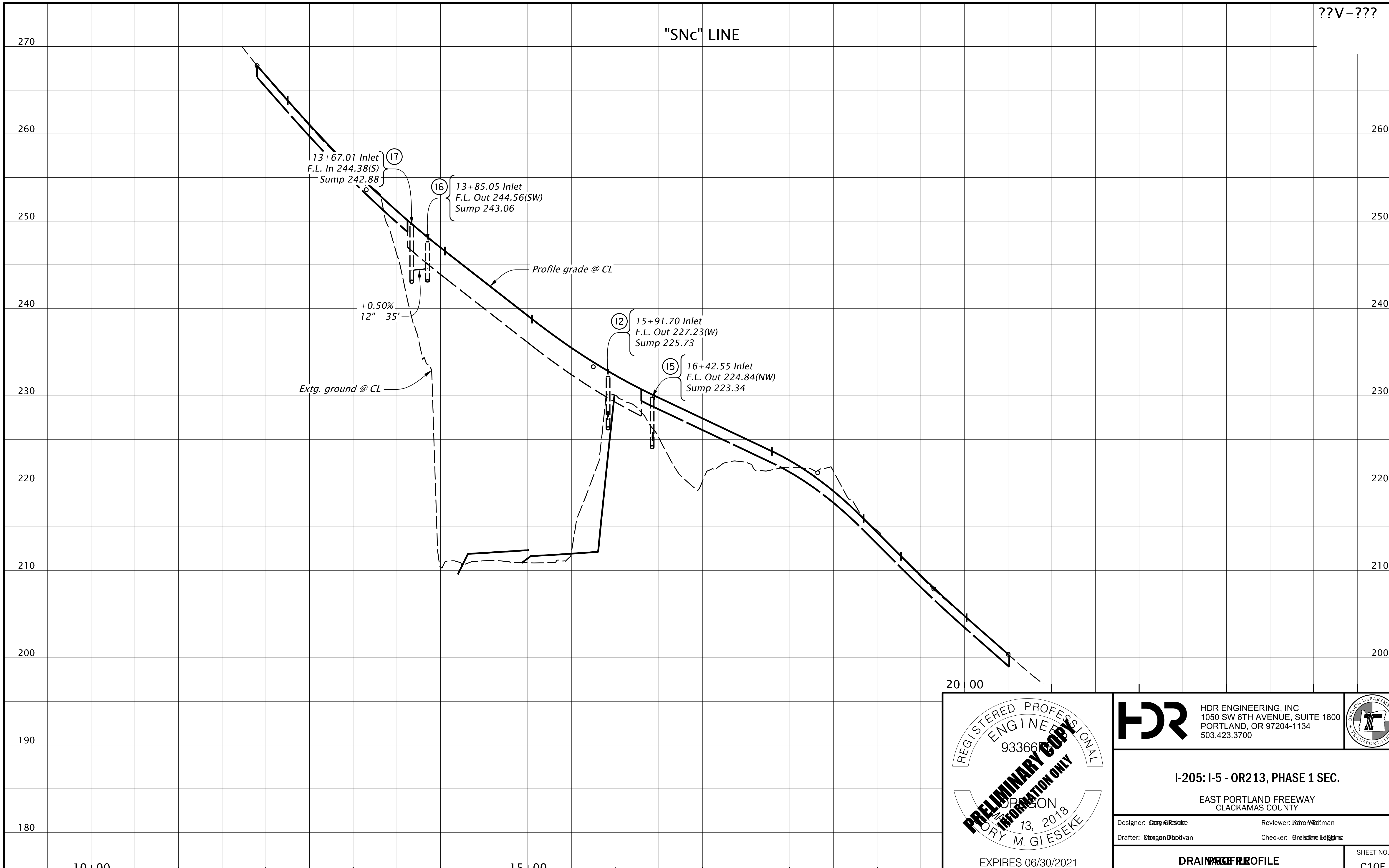
DRAINAGE PROFILE

SHEET NO.
C10E



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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

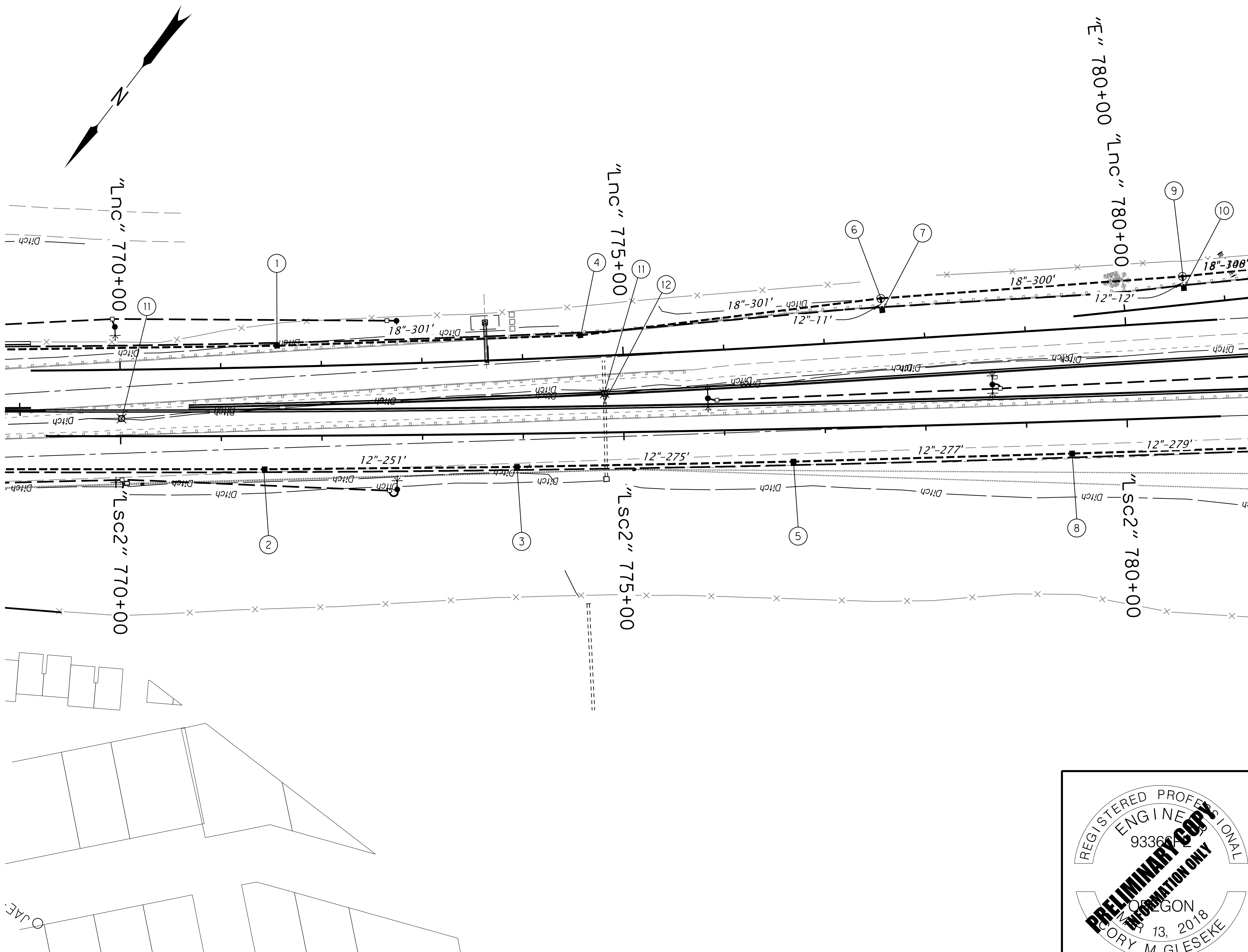
Designer: Cory Gieseke
Reviewer: Kate Wattman
Drafter: Morgan Donovan
Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C10F

230

Sec. 31, T. 2 S, R 2 E & Sec. 36, T. 2 S, R. 1 E, W.M.



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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Reviewer:
Drafter: Checker:

DRAINAGE & UTILITIES

SHEET NO. C11B

Rotation: 217.6195° Scale: 1"=100'

1. *Sta. "Lnc" 771+56.27, Lt.*
   Const. type "G-2" inlet - 18" Sump
   Inst. 18" storm sew. pipe - 301'
   5' Depth

2. *Sta. "Lsc2" 771+42.83, Rt.*
   Const. type "G-2" inlet - 18" Sump
   Inst. 12" storm sew. pipe - 251'
   5' Depth

3. *Sta. "Lsc2" 773+93.32, Rt.*
   Const. type "G-2" inlet - 18" Sump
   Inst. 12" storm sew. pipe - 275'
   5' Depth

4. *Sta. "Lnc" 774+57.81, Lt.*
   Const. type "G-2" inlet - 18" Sump
   Inst. 18" storm sew. pipe - 301'
   5' Depth

5. *Sta. "Lsc2" 776+67.90, Rt.*
   Const. type "G-2" inlet - 18" Sump
   Inst. 12" storm sew. pipe - 277'
   5' Depth

6. *Sta. "Lnc" 777+58.88, 41.26' Lt.*
   Const. storm sew. manhole
   Inst. 12" storm sew. pipe - 11'
   5' Depth
   Inst. 18" storm sew. pipe - 300'
   5' Depth

7. *Sta. "Lnc" 777+59.72, Lt.*
   Const. type "G-2" inlet - 18" Sump

8. *Sta. "Lsc2" 779+44.19, Rt.*
   Const. type "G-2" inlet - 18" Sump
   Inst. 12" storm sew. pipe - 279'
   5' Depth

9. *Sta. "Lnc" 780+59.25, 44.93' Lt.*
   Const. storm sew. manhole
   Inst. 12" storm sew. pipe - 12'
   5' Depth
   Inst. 18" storm sew. pipe - 148'
   5' Depth

10. *Sta. "Lnc" 780+60.09, Lt.*
    Const. type "G-2" inlet - 18" Sump

11. *Remove inlet - 2*

12. *Remove pipe - 8'*

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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Reviewer:
Drafter: Checker:

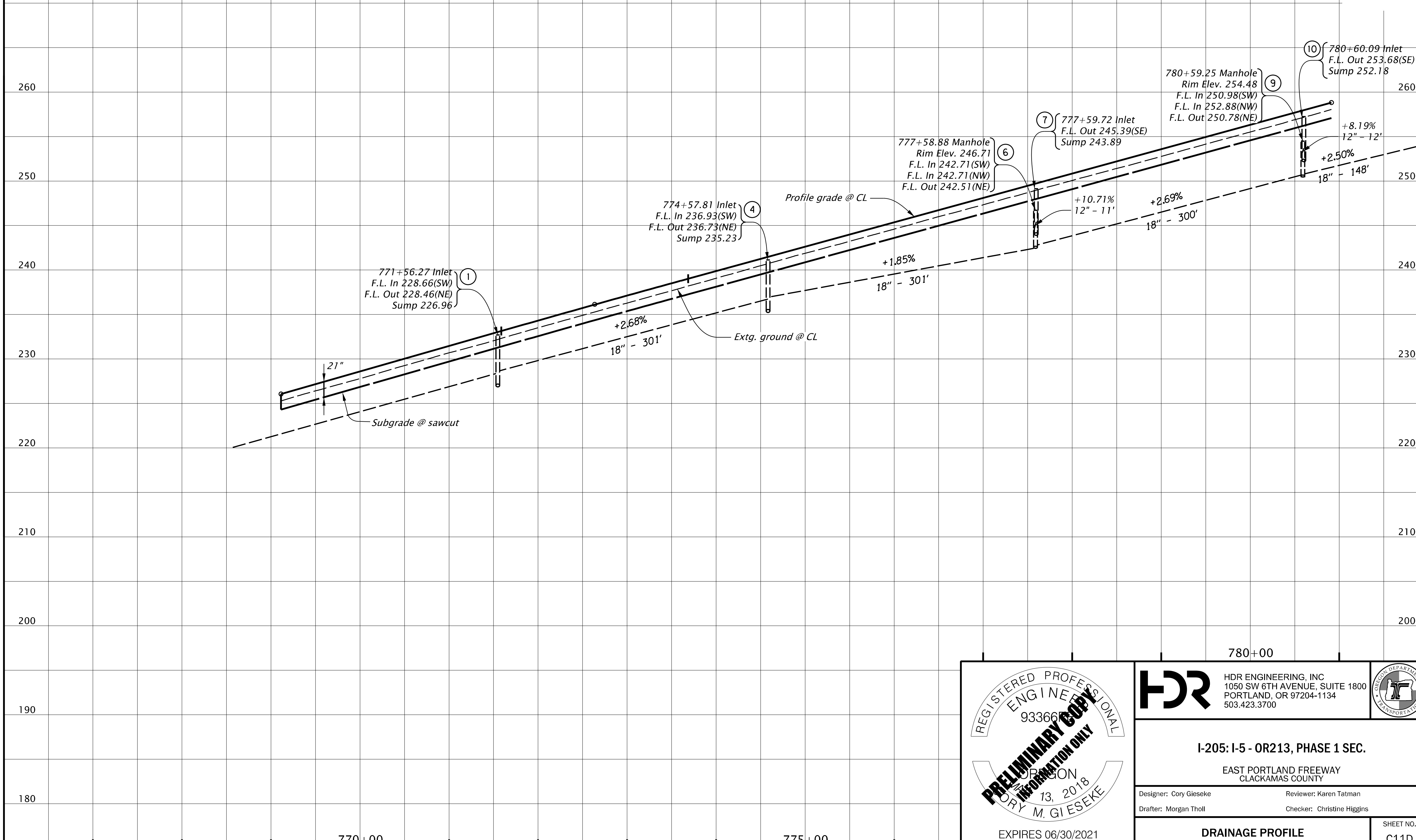
DRAINAGE & UTILITIES NOTES

SHEET NO. C11C

Rotation: 0° Scale: 1"=100'

??V–???

"Lnc" LINE



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I-205: I-5 - OR213, PHASE 1 SEC.

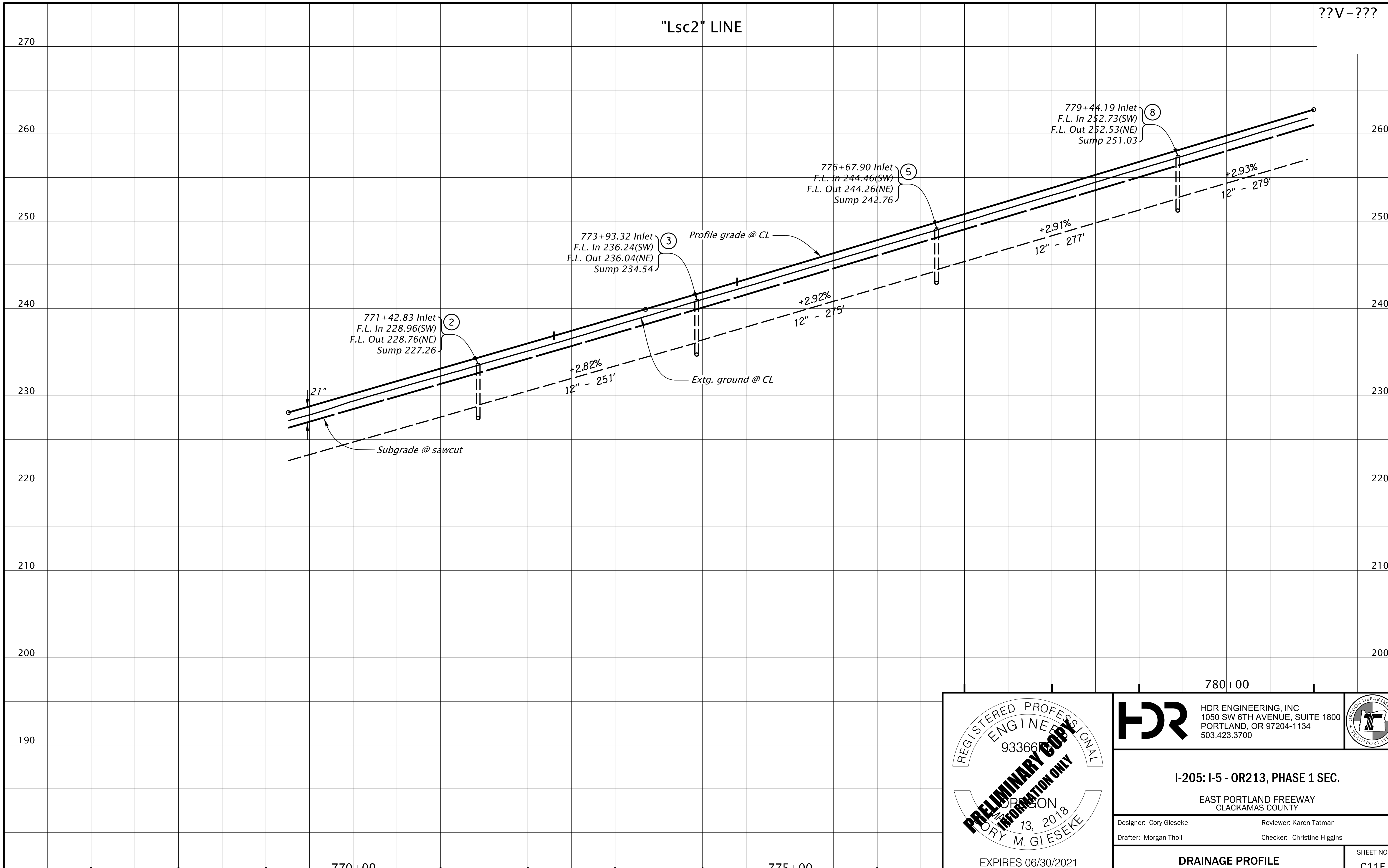
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C11D

233



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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

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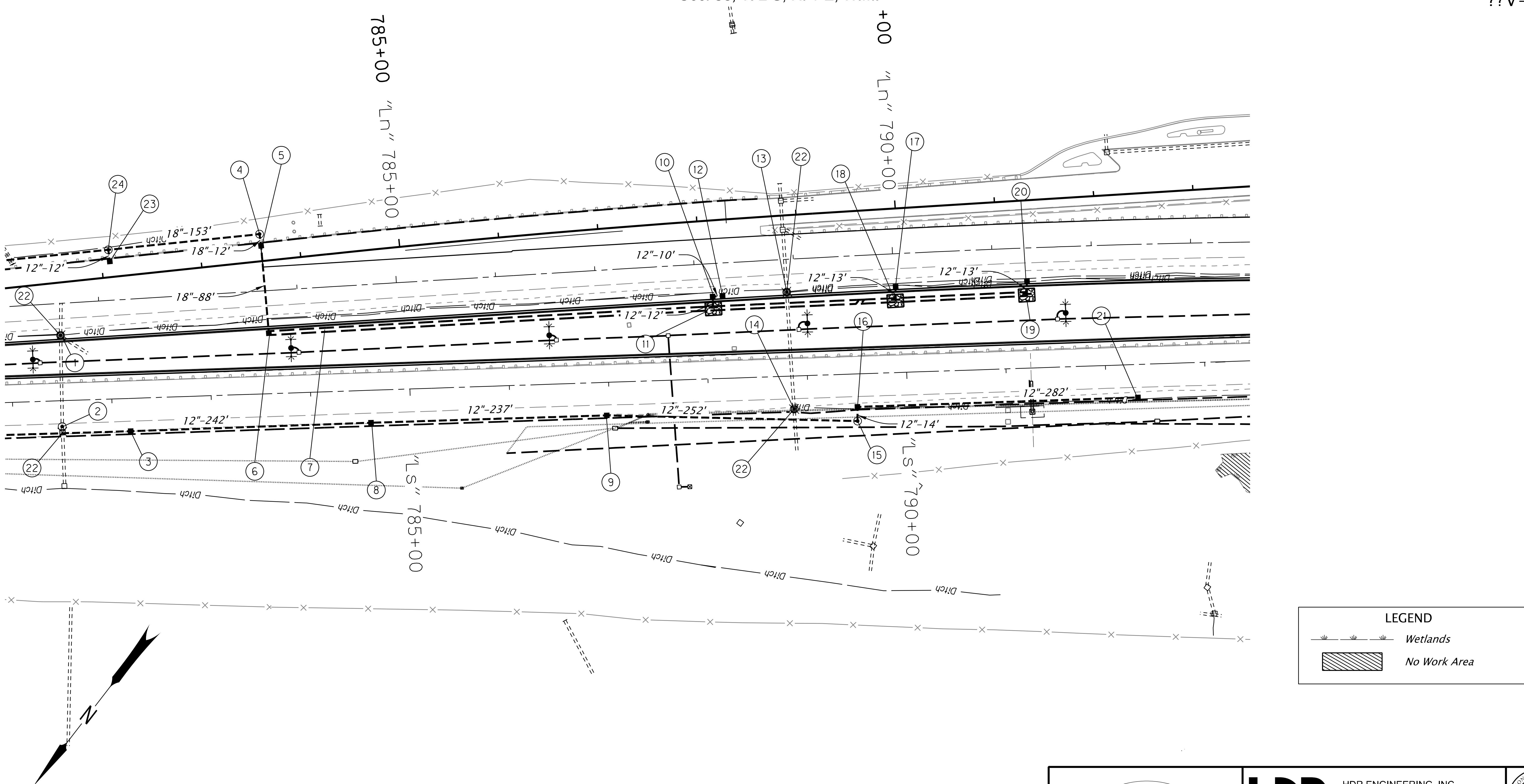
Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C11E

Sec. 36, T. 2 S, R. 1 E, W.M.

??V-???



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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer:
Reviewer:
Drafter:
Checker:

DRAINAGE & UTILITIES

SHEET NO.
C12B

235

Rotation: 217.6195° Scale: 1"=100'

(1) *Sta. "Ln" 781+59.91, 31.89' Rt.*
Const. storm sew. manhole
Connect extg. pipes

(2) *Sta. "Ls" 781+49.24, 25.74' Rt.*
Const. storm sew. manhole over existing sewer

(3) *Sta. "Ls" 782+17.89, Rt.*
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 242'
5' Depth

(4) *Sta. "Ln" 783+65.66, 57.28' Lt.*
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 12'
5' Depth

(5) *Sta. "Ln" 783+66.59, Lt.*
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 88'
5' Depth
Trench resurfacing - 41 sq. yd.

(6) *Sta. "Ln" 783+68.80, 39.29' Rt.*
Const. type "D" inlet

(7) *Sta. "Lnc" 783+69.21, 42.39' Rt. to Sta. "Lnc" 791+33.46, 46.49' Rt.*
Const. ditch

(8) *Sta. "Ls" 784+59.81, Rt.*
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 237'
5' Depth

(9) *Sta. "Ls" 786+96.91, Rt.*
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 252'
5' Depth

(10) *Sta. "Ln" 788+16.53, Rt.*
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 10'
5' Depth

(11) *Sta. "Ln" 788+16.47, 44.94' Rt.*
Const. riprap pad
Loose riprap (class 50) - 5.0 tons
Inst. 12" storm sew. pipe - 12'
5' Depth

(12) *Sta. "Ln" 788+26.84, Rt.*
Const. type "G-2" inlet

(13) *Sta. "Ln" 788+91.69, 31.55' Rt.*
Const. storm sew. manhole
Connect extg. pipes

(14) *Sta. "Ls" 788+85.35, 33.28' Rt.*
Const. storm sew. manhole
Connect extg. pipes

(15) *Sta. "Ls" 789+49.28, 47.67' Rt.*
Const. storm sew. manhole
Inst. 12" storm sew. pipe - 14'
10' Depth

(16) *Sta. "Ls" 789+49.56, Rt.*
Const. type "G-2" inlet
Inst. 12" storm sew. pipe - 282'
5' Depth

(17) *Sta. "Ln" 790+01.30, Rt.*
Const. type "G-2" inlet

(18) *Sta. "Ln" 790+01.10, 47.51' Rt.*
Const. riprap pad
Loose riprap (class 50) - 5.0 tons
Inst. 12" storm sew. pipe - 13'
5' Depth

(19) *Sta. "Ln" 791+33.46, 46.49' Rt.*
Const. riprap pad
Loose riprap (class 50) - 5.0 tons
Inst. 12" storm sew. pipe - 13'
5' Depth

(20) *Sta. "Ln" 791+33.97, Rt.*
Const. type "G-2" inlet

(21) *Sta. "Ls" 792+31.61, Rt.*
Const. type "G-2" inlet

(22) *Remove inlet - 4*

(23) *Sta. "Ln" 782+13.41, Rt.*
Const. type "G-2" inlet

(24) *Sta. "Ln" 782+13.00, 50.75' Rt.*
Const. storm sew. manhole
Inst. 12"' storm sew. pipe - 12'
5' Depth
Inst. 18" storm sew. pipe - 153'
5' Depth

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OREGON
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I-205: I-5 - OR213, PHASE 1 SEC.

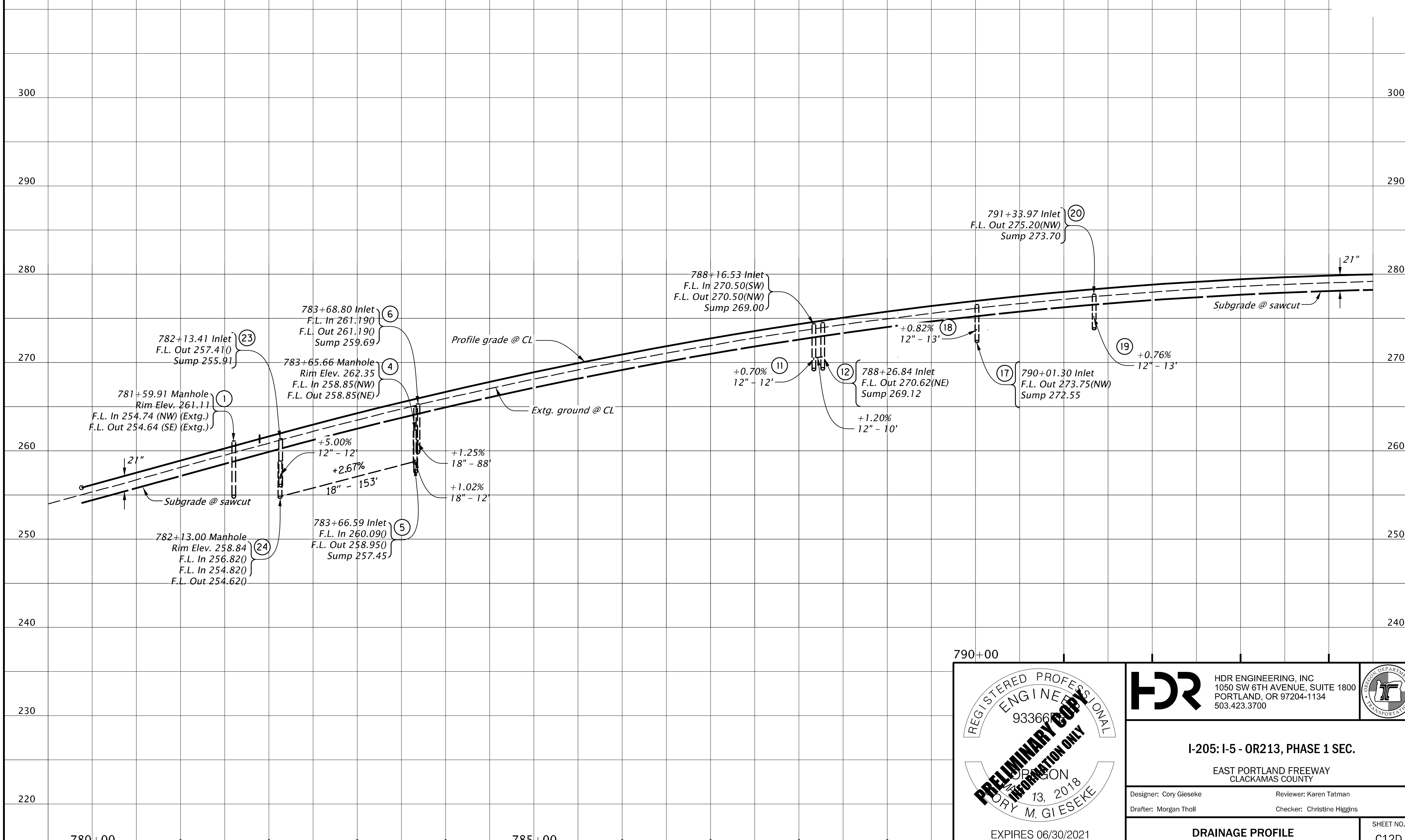
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Reviewer:
Drafter: Checker:

DRAINAGE & UTILITIES NOTES

SHEET NO. C12C

"Ln" LINE



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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

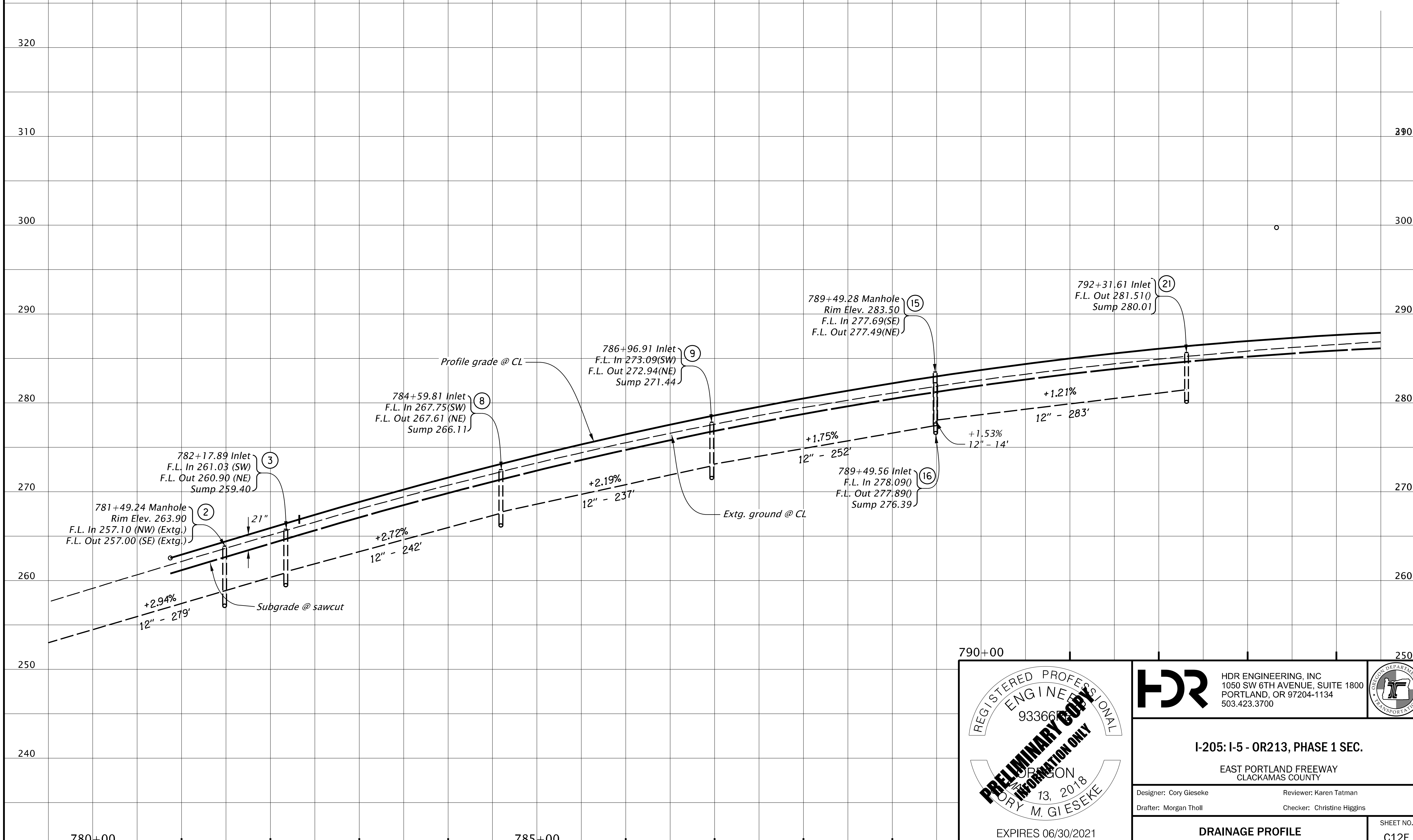
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C12D

"Ls" LINE



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CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
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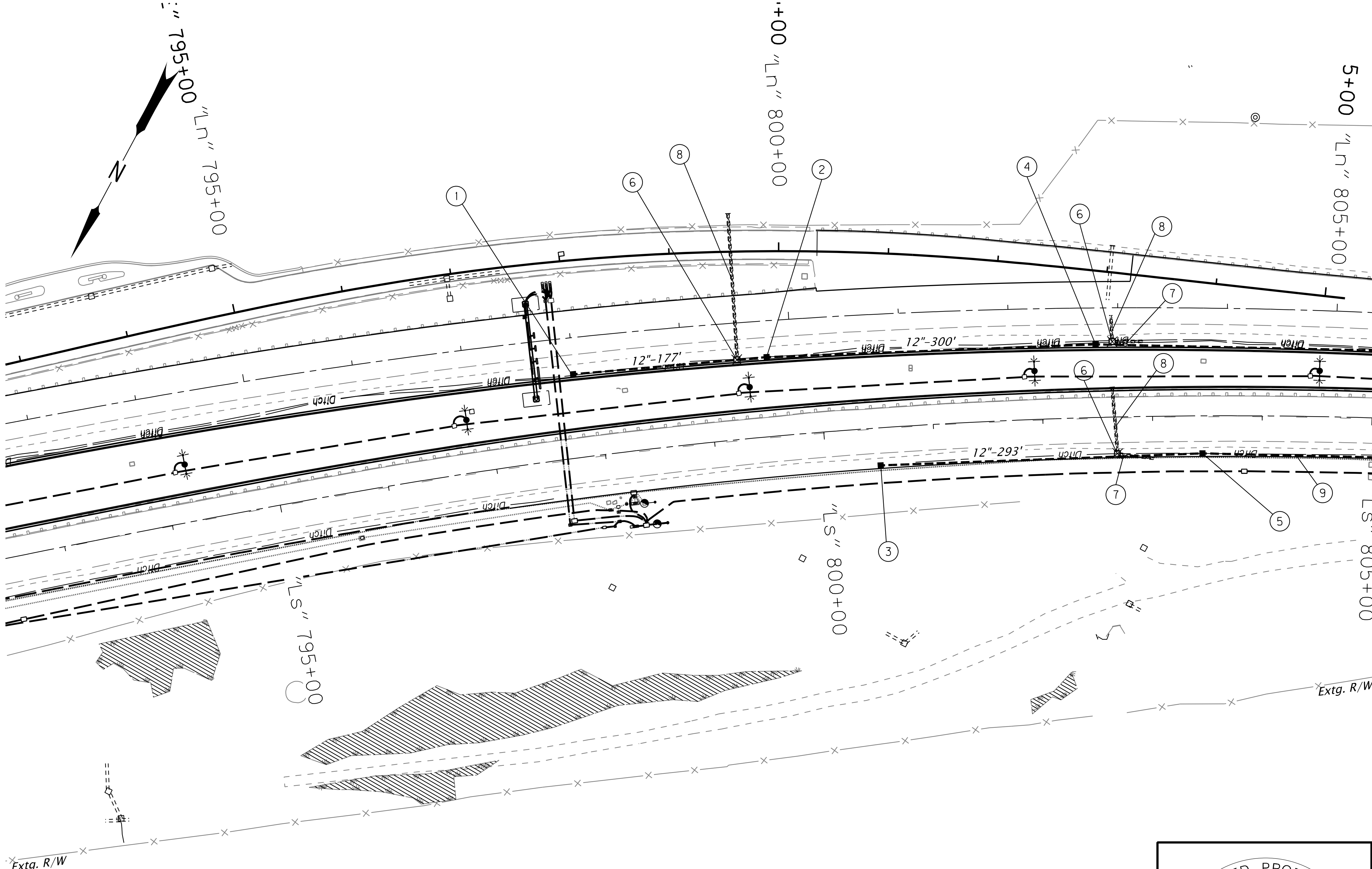
DRAINAGE PROFILE

SHEET NO.
C12E

Sec. 36, T. 2 S, R. 1 E, W.M.

??V-???



1. Sta. "Ln" 797+99.30, Rt.
   Const. type "G-2" inlet - 18" Sump
2. Sta. "Ln" 799+77.68, Rt.
   Const. type "G-2" inlet - 18" Sump
   Inst. 12" storm sew. pipe - 177'
   5' Depth
3. Sta. "Ls" 800+49.62, Rt.
   Const. type "G-2" inlet - 18" Sump
4. Sta. "Ln" 802+79.53, Rt.
   Const. type "G-2 inlet" - 18" Sump
   Inst. 12" storm sew. pipe - 300'
   5' Depth
5. Sta. "Ls" 803+45.57, Rt.
   Const. type "G-2" inlet - 18" Sump
   Inst. 12" storm sew. pipe - 293'
   5' Depth
6. Remove inlet - 3
7. Remove pipe - 57'
8. Abandon pipe
9. Relocate PGE UG (By others)

LEGEND

Wetlands

No Work Area

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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

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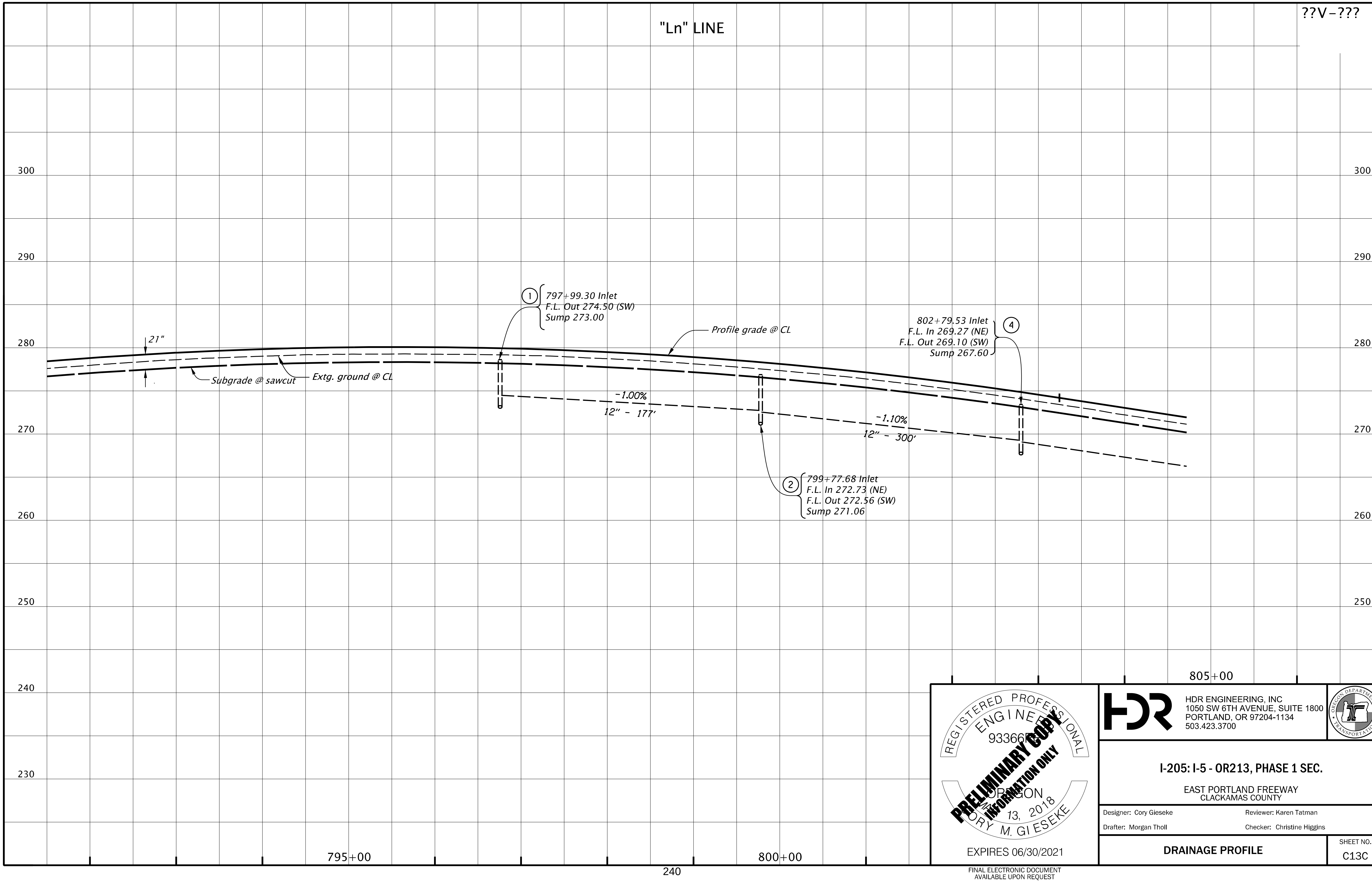
Drafter: Checker:

DRAINAGE & UTILITIES

SHEET NO.
C13B

Rotation: 208.1457° Scale: 1"=100'


??V-???
"Ln" LINE
300
290
280
270
260
250
240
230
21"
Subgrade @ sawcut
Extg. ground @ CL
Profile grade @ CL
1
797+99.30 Inlet
F.L. Out 274.50 (SW)
Sump 273.00
-1.00%
12" - 177'
2
799+77.68 Inlet
F.L. In 272.73 (NE)
F.L. Out 272.56 (SW)
Sump 271.06
-1.10%
12" - 300'
4
802+79.53 Inlet
F.L. In 269.27 (NE)
F.L. Out 269.10 (SW)
Sump 267.60
795+00
800+00
805+00
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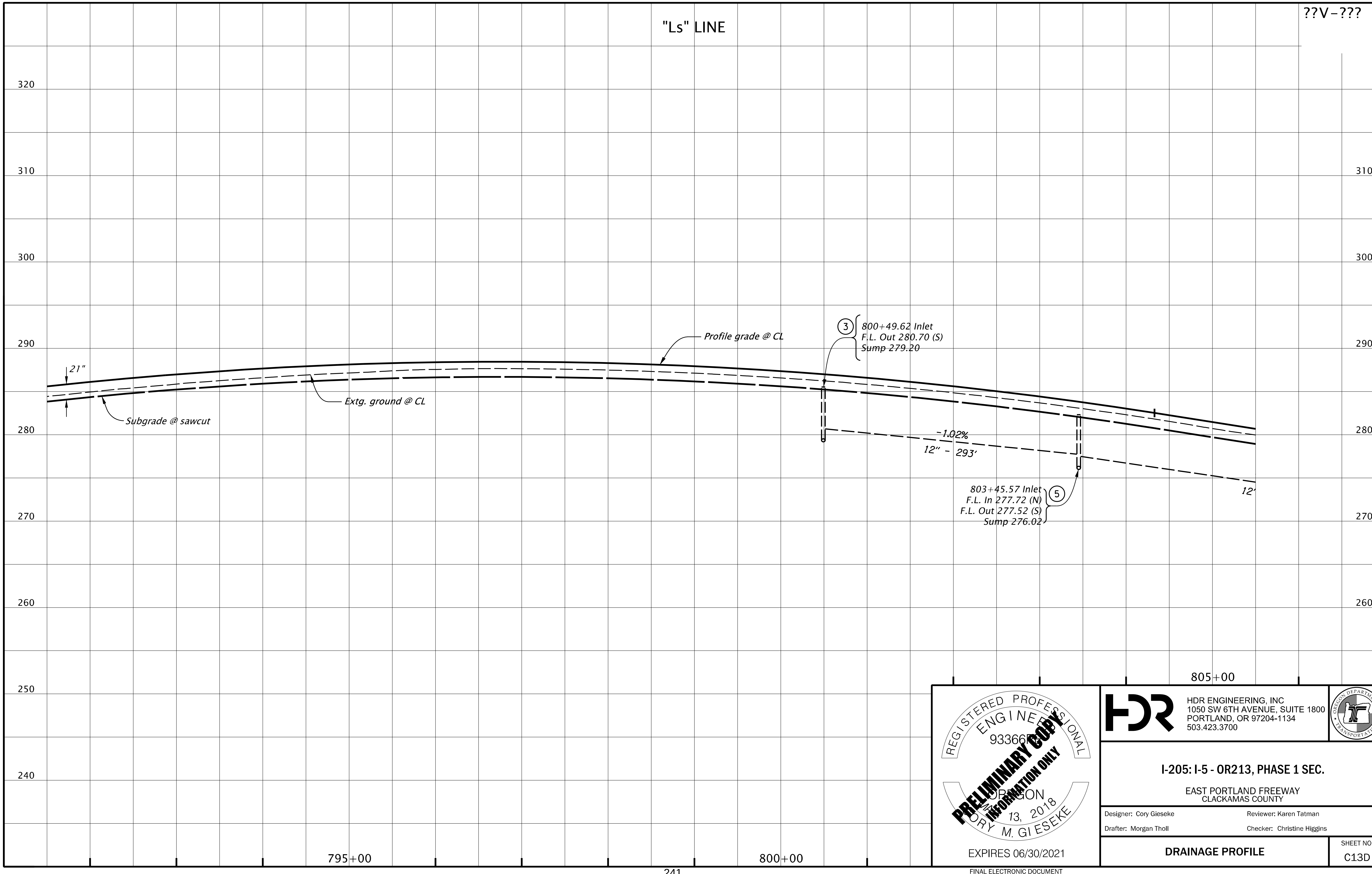
I-205: I-5 - OR213, PHASE 1 SEC.
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY
Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins
DRAINAGE PROFILE
SHEET NO.
C13C

240



??V-???
"Ls" LINE
320
310
300
290
280
270
260
250
240
21"
Subgrade @ sawcut
Extg. ground @ CL
Profile grade @ CL
3
800+49.62 Inlet
F.L. Out 280.70 (S)
Sump 279.20
-1.02%
12" - 293'
5
803+45.57 Inlet
F.L. In 277.72 (N)
F.L. Out 277.52 (S)
Sump 276.02
12'
795+00
800+00
805+00
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13, 2018
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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY
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DRAINAGE PROFILE
SHEET NO.
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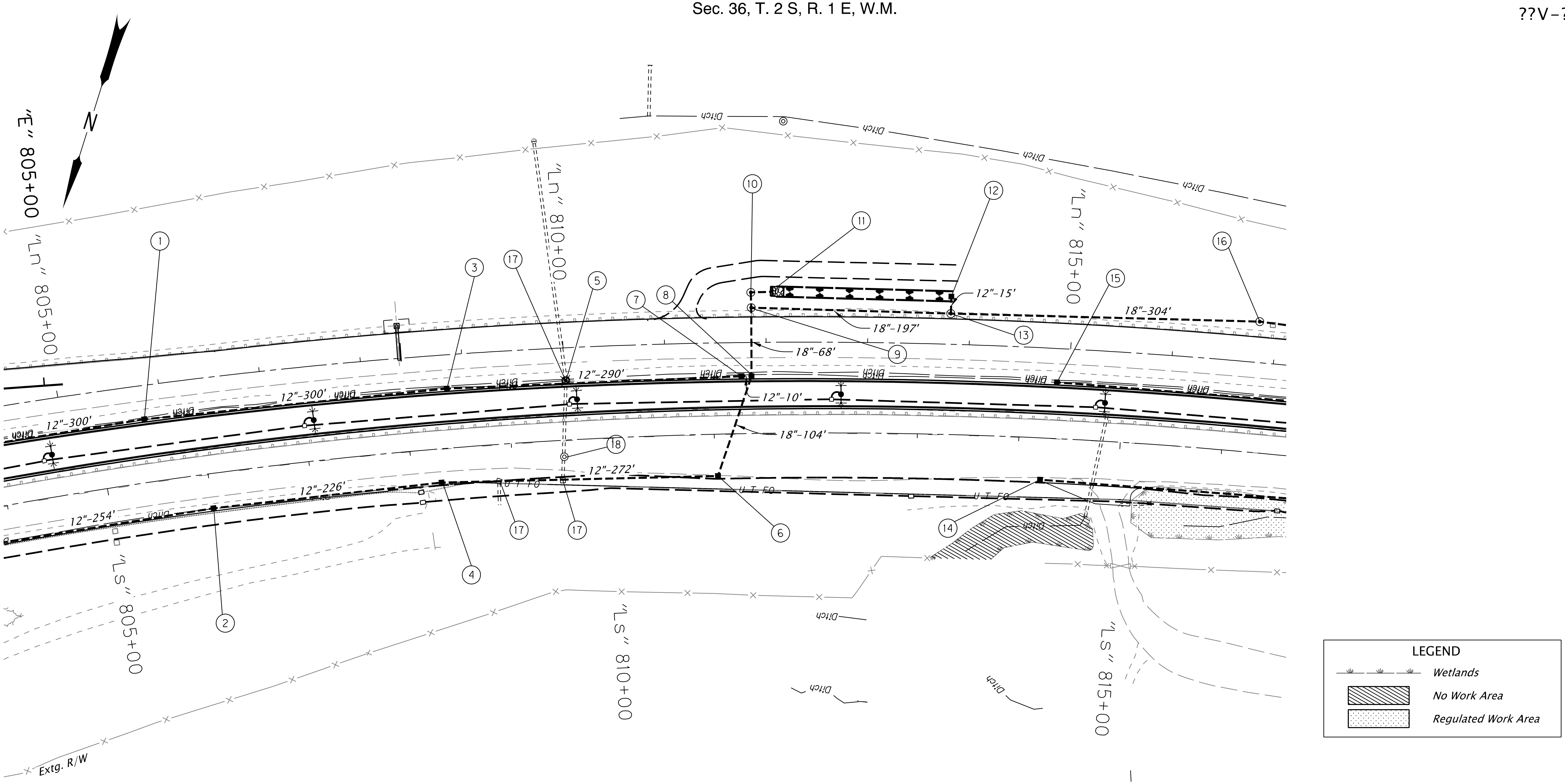
241

Sec. 36, T. 2 S, R. 1 E, W.M.

??V–???



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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer:	Reviewer:
Drafter:	Checker:

DRAINAGE & UTILITIES

SHEET NO. C14B

Rotation: 197.6361° Scale: 1"=100'

1 Sta. "Ln" 805+81.61, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 300'
5' Depth

2 Sta. "Ls" 806+00.75, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 254'
5' Depth

3 Sta. "Ln" 808+83.32, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 300'
5' Depth

4 Sta. "Ls" 808+28.16, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 226'
5' Depth

5 Sta. "Ln" 810+01.57, 31.78' Rt.
Const. storm sew. manhole
Connect extg. pipes

6 Sta. "Ls" 811+02.95, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 272'
5' Depth

7 Sta. "Ln" 811+75.35, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 290'
5' Depth

8 Sta. "Ln" 811+85.08, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 10'
5' Depth
Inst. 18" storm sew. pipe - 104'
5' Depth
Trench resurfacing - 48 sq. yd.

9 Sta. "Ln" 811+85.97, 34.08' Lt.
Const. diversion manhole
Inst. 18" storm sew. pipe - 68'
5' Depth
Trench resurfacing - 31 sq. yd.
(For details, see sht. HA18)

10 See sht. HA11, note 3

11 Sta. "Ln" 812+11.63, 49.46' Lt. to Sta. "Ln" 813+82.31, 47.34' Lt.
Const. biofiltration swale
(For details, see sht. HA11)

12 See sht. HA11, note 4

13 Sta. "Ln" 813+81.04, 30.37' Lt.
Const. storm sew. manhole
Inst. 12" storm sew. pipe - 15'
5' Depth
Inst. 18" storm sew. pipe - 197'
5' Depth

14 Sta. "Ls" 814+22.78, Rt.
Const. type "G-2" inlet - 18" Sump

15 Sta. "Ln" 814+87.95, Rt.
Const. type "G-2" inlet - 18" Sump

16 Sta. "Ln" 816+83.11, 40.15' Lt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 304'
5' Depth

17 Remove inlet - 3

18 Sta. "Ls" 809+51.46, 16.38' Rt.
Adjust manhole

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OREGON
MAY 13, 2018
CORY M. GIESEKE
EXPIRES 06/30/2021

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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

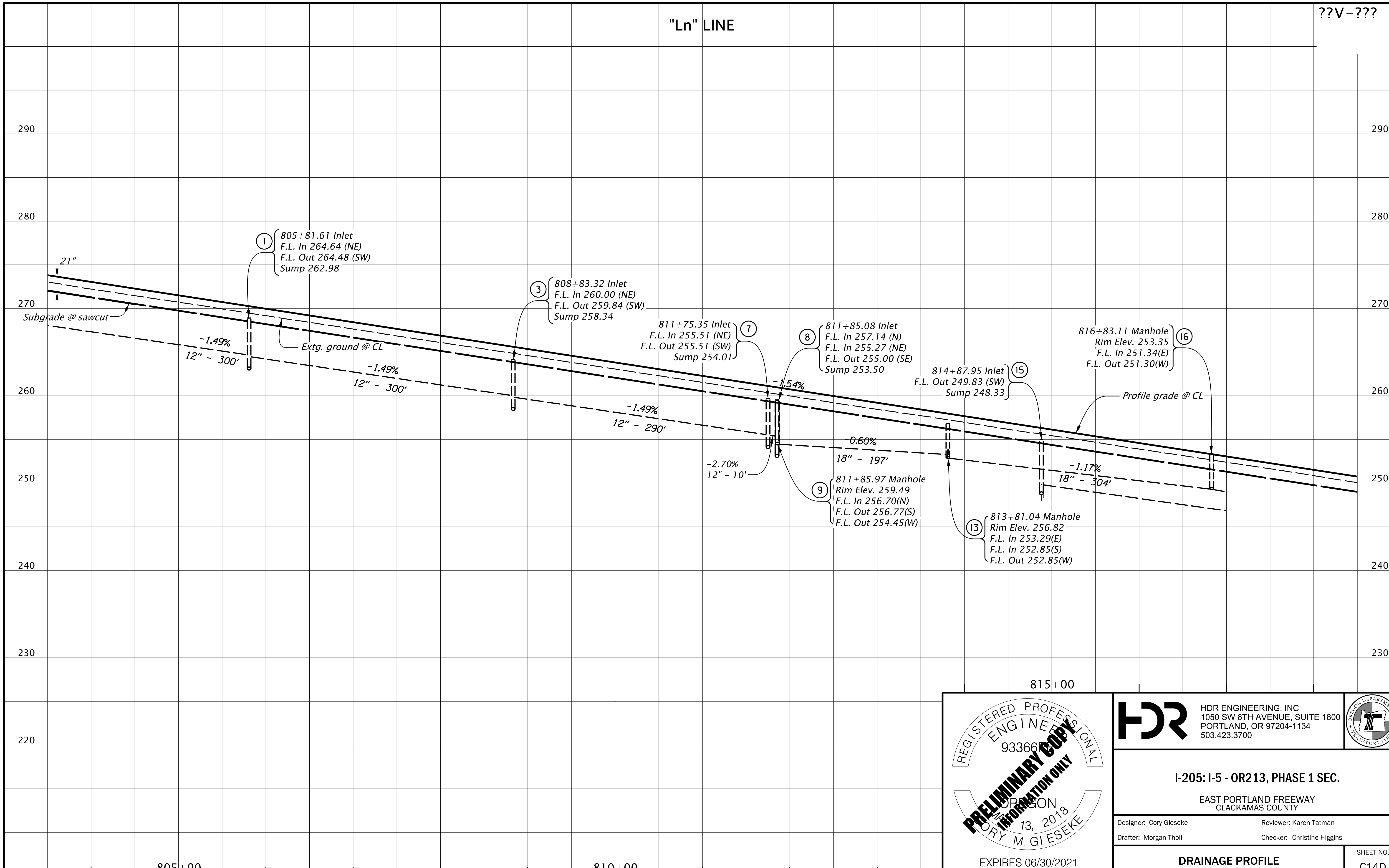
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer:
Reviewer:
Drafter:
Checker:

DRAINAGE & UTILITIES NOTES

SHEET NO.
C14C

Rotation: 0° Scale: 1"=100'



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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C14D

R_K19786_HDR_drpf_01.dgn :: C14D 7/17/2020 2:01:43 PM CGIESEKE

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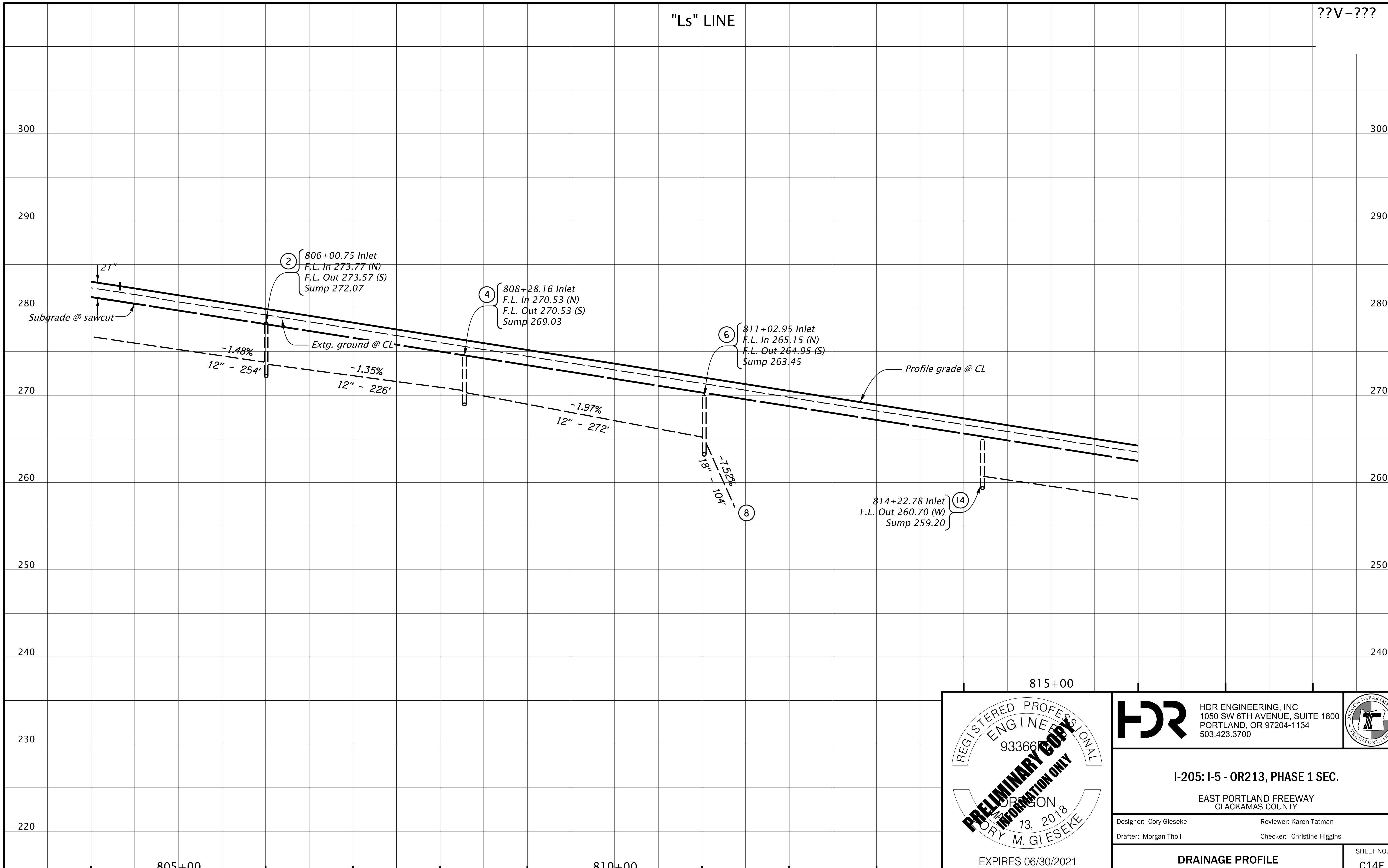
Rotation: 0° Scale: 1"=100'



245

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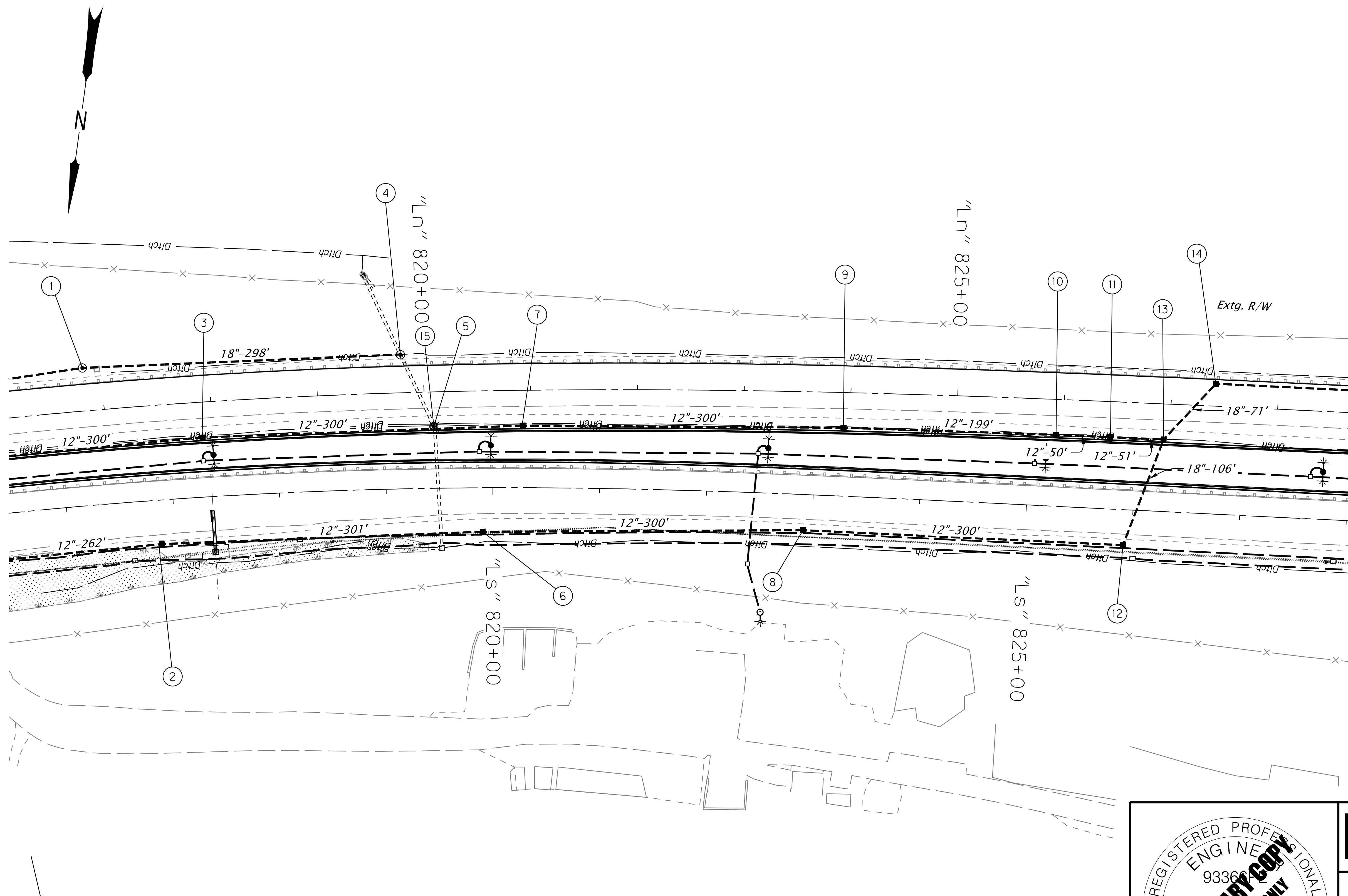
Sec. 36, T. 2 S, R. 1 E, W.M.

??V–???



LEGEND

Wetlands

Regulated Work Area

REGISTERED PROFESSIONAL ENGINEER
93360PE
OREGON
MAY 13, 2018
CORY M. GIESEKE
EXPIRES 06/30/2021

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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer:

Reviewer:

Drafter:

Checker:

DRAINAGE & UTILITIES

SHEET NO.
C15B

246

Rotation: 187.5797°   Scale: 1"=100'

(1) See C14C, note 16

(2) Sta. "Ls" 816+86.77, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 262'
5' Depth

(3) Sta. "Ln" 817+90.21, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 300'
5' Depth

(4) Sta. "Ln" 819+79.18, 35.70' Lt.
Const. storm sew. manhole over existing sewer
Inst. 18" storm sew. pipe - 298'
5' Depth

(5) Sta. "Ln" 820+08.43, 32.26' Rt.
Const. storm sew. manhole
Connect extg. pipes

(6) Sta. "Ls" 819+90.29, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 301'
5' Depth

(7) Sta. "Ln" 820+92.09, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 300'
5' Depth

(8) Sta. "Ls" 822+92.01, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 300'
5' Depth

(9) Sta. "Ln" 823+93.70, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 300'
5' Depth

(10) Sta. "Ln" 825+93.38, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 199'
5' Depth

(11) Sta. "Ln" 826+43.80, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 50'
5' Depth

(12) Sta. "Ls" 825+92.20, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 300'
5' Depth

(13) Sta. "Ln" 826+94.48, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 51'
5' Depth
Inst. 18" storm sew. pipe - 106'
5' Depth
Trench resurfacing - 49 sq. yd.

(14) Sta. "Ln" 827+40.96, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 71'
5' Depth
Trench resurfacing - 33 sq. yd.

(15) Remove inlet

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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

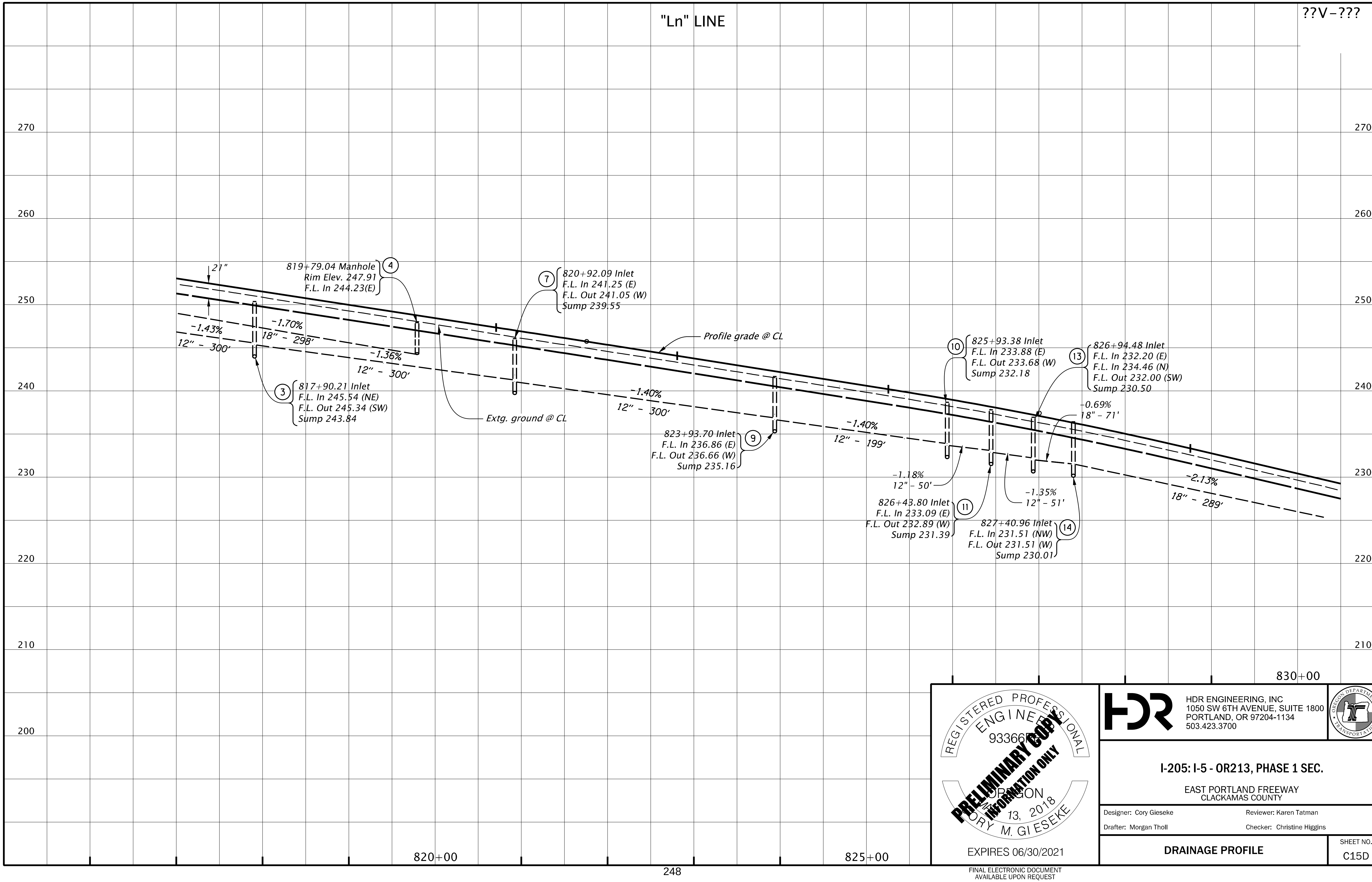
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE & UTILITIES NOTES

SHEET NO. C15C

Rotation: 0° Scale: 1"=100'



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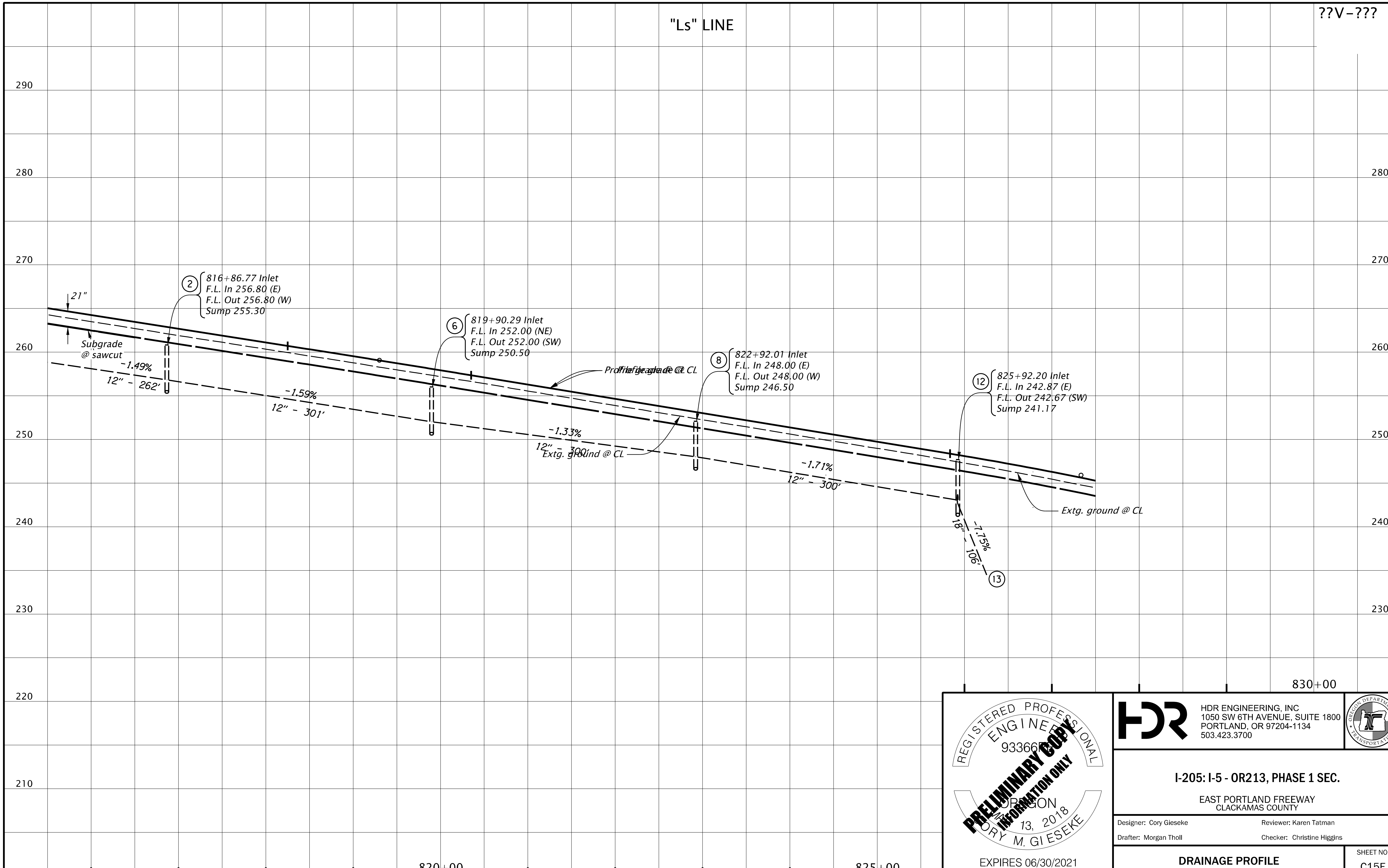

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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

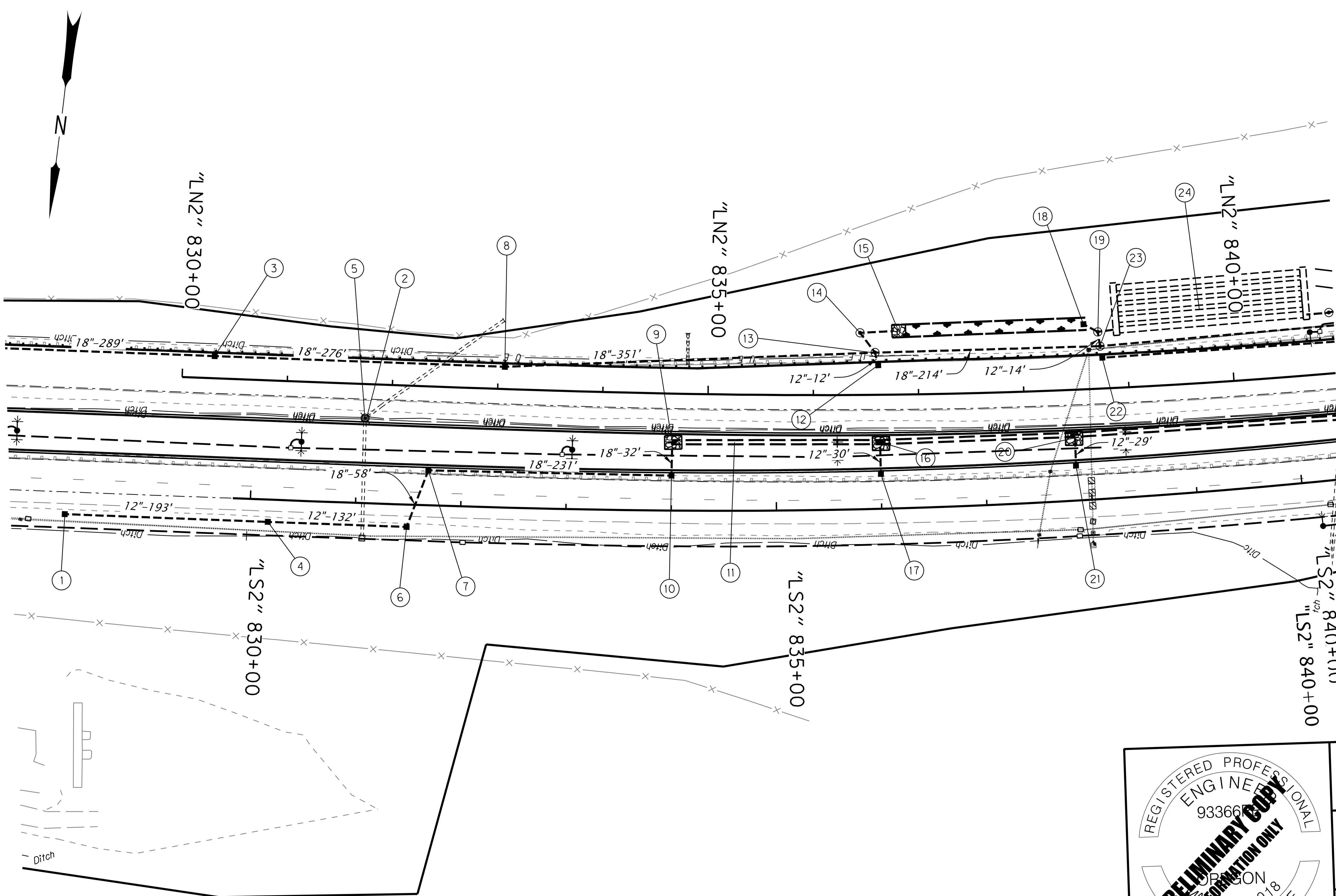
Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C15E

??V-???

Sec. 35 & 36, T. 2 S, R. 1 E, W.M.



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I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE & UTILITIES

SHEET NO. C16B

Rotation: 188.8482° Scale: 1"=100'

(1) Sta. "Ls2" 828+24.24, Rt.
Const. type "G-2" inlet - 18" Sump

(2) Remove inlet

(3) Sta. "Ln2" 830+30.43, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 289'
5' Depth

(4) Sta. "Ls2" 830+17.30, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 193'
5' Depth

(5) Sta. "Ln2" 831+75.35, 32.42' Rt.
Const. storm sew. manhole
Connect extg. pipes

(6) Sta. "Ls2" 831+48.88, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 132'
5' Depth

(7) Sta. "Ls2" 831+68.26, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 58'
5' Depth
Trench resurfacing - 27 sq. yd.

(8) Sta. "Ln2" 833+06.36, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 276'
5' Depth

(9) Sta. "Ls2" 834+00.45, 65.16' Lt.
Const. riprap pad
Loose riprap (class 50) - 5.0 tons
Inst. 18" storm sew. pipe - 32'
5' Depth

(10) Sta. "Ls2" 833+99.72, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 231'
5' Depth

(11) Sta. "Ln2" 834+00.45, 65.16' Lt. to Sta. "Ls2" 840+63.09, 57.81' Lt.
Const. ditch

(12) Sta. "Ln2" 836+62.06, Lt.
Const. type "G-2" inlet - 18" Sump

(13) Sta. "Ln2" 836+58.92, 40.04' Lt.
Const. diversion manhole
Inst. 12" storm sew. pipe - 12'
5' Depth
Inst. 18" storm sew. pipe - 351'
5' Depth

(14) See sht. HA12, note 2

(15) Sta. "Ln2" 836+82.56, 60.48' Lt. to Sta. "Ln2" 838+59.54, 61.72' Lt.
Const. biofiltration swale
(For details, see sht. HA12)

(16) Sta. "Ls2" 836+01.22, 62.20' Lt.
Const. riprap pad
Loose riprap (class 50) - 5.0 tons
Inst. 12" storm sew. pipe - 30'
5' Depth

(17) Sta. "Ls2" 836+00.39, Lt.
Const. type "G-2" inlet - 18" Sump

(18) See sht. HA12, note 4

(19) See sht. HA12, note 5

(20) Sta. "Ls2" 837+86.56, 59.09' Lt.
Const. riprap pad
Loose riprap (class 50) - 5.0 tons
Inst. 12" storm sew. pipe - 29'
5' Depth

(21) Sta. "Ls2" 837+86.82, Lt.
Const. type "G-2" inlet - 18" Sump

(22) Sta. "Ln2" 838+75.93, Lt.
Const. type "G-2" inlet - 18" Sump

(23) Sta. "Ln2" 838+74.55, 40.43' Lt.
Const. storm sew. manhole
Inst. 12" storm sew. pipe - 14'
5' Depth
Inst. 18" storm sew. pipe - 214'
5' Depth

(24) Sta. "Ln2" 838+90.37 to Sta. "Ln2" 840+73.42
Const. underground detention system
(For details, see sht. HA13)

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OREGON DEPARTMENT OF TRANSPORTATION

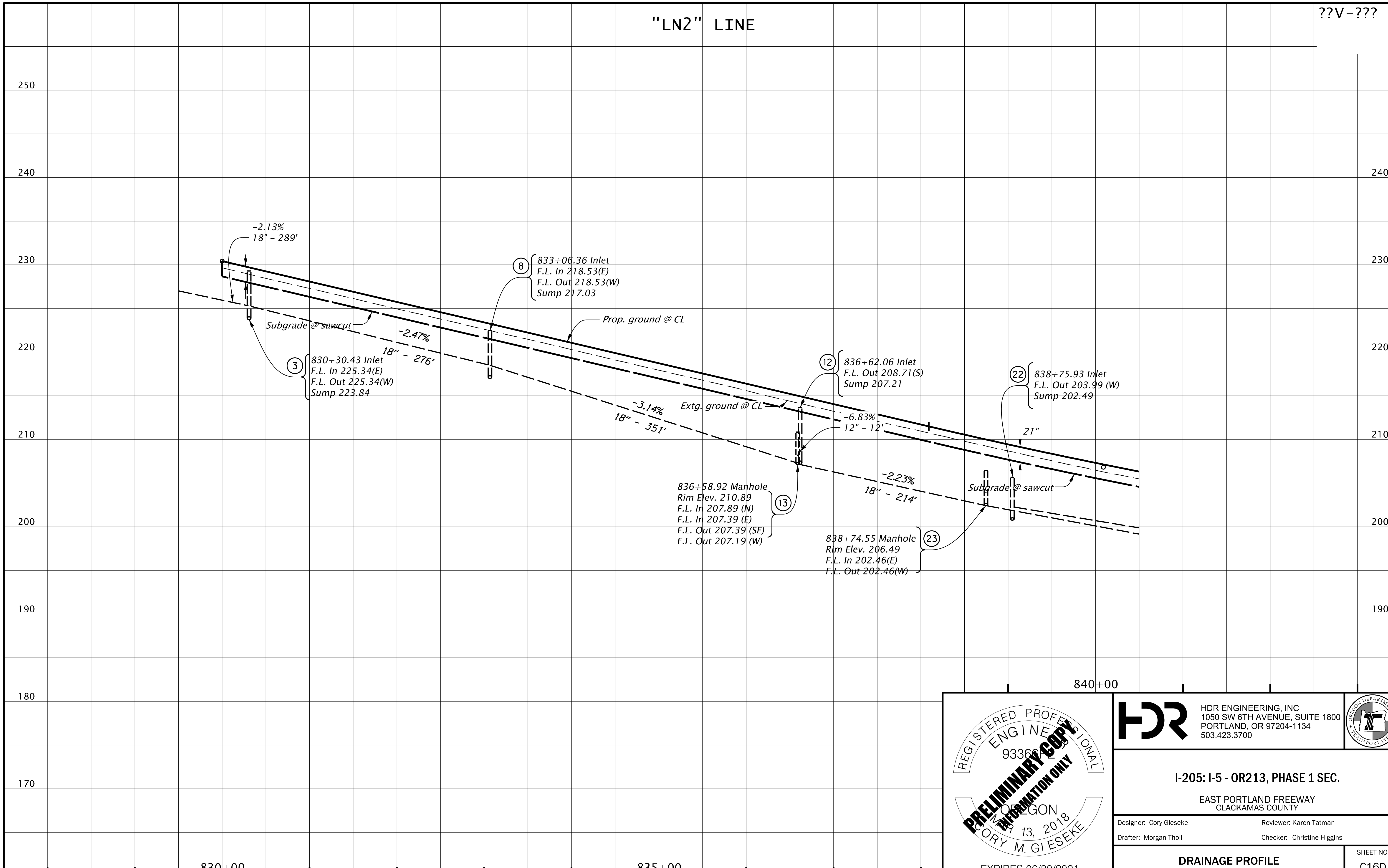
I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE & UTILITIES NOTES
SHEET NO. C16C

Rotation: 0° Scale: 1"=100'



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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
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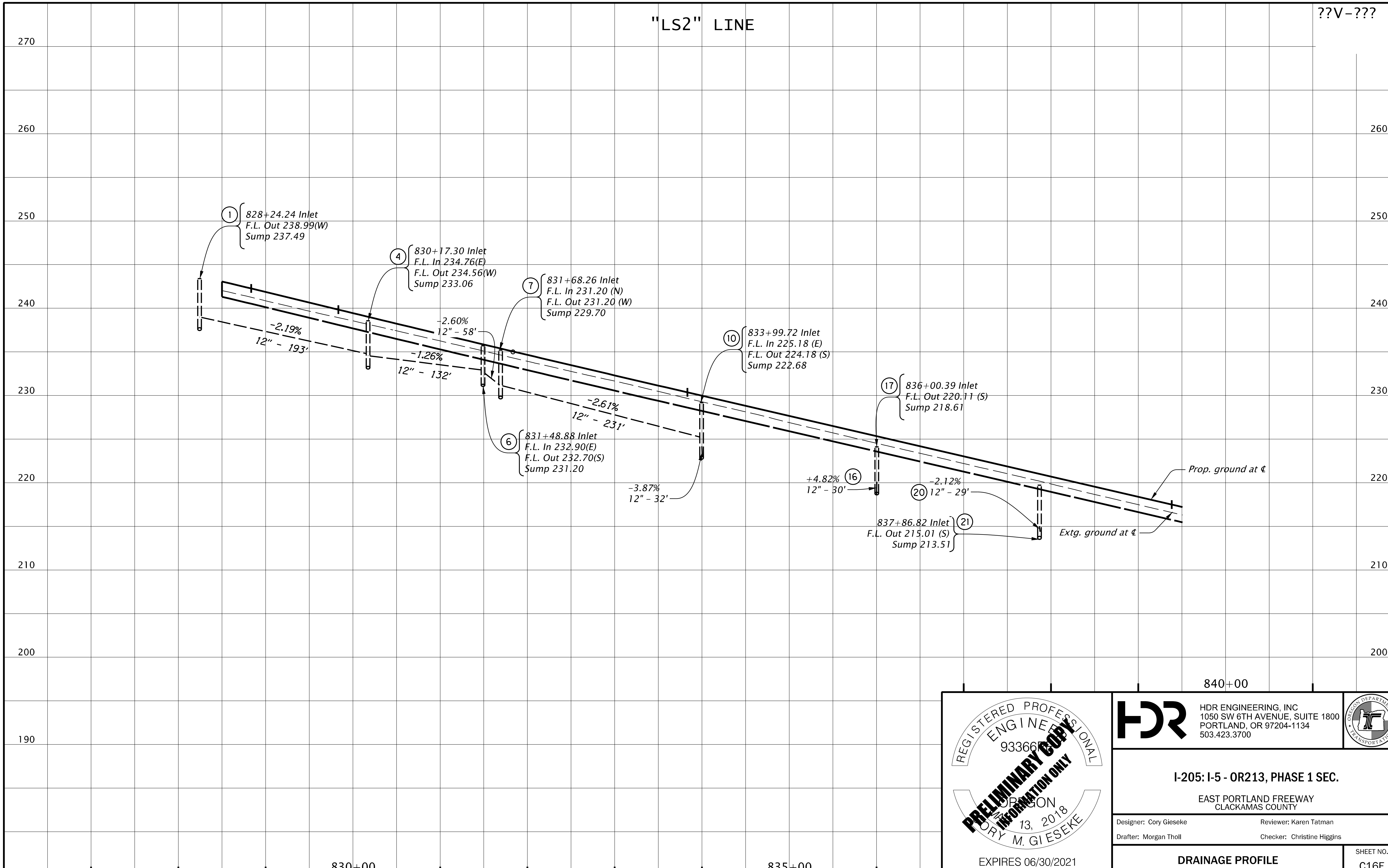
Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C16D



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OREGON DEPARTMENT OF TRANSPORTATION

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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
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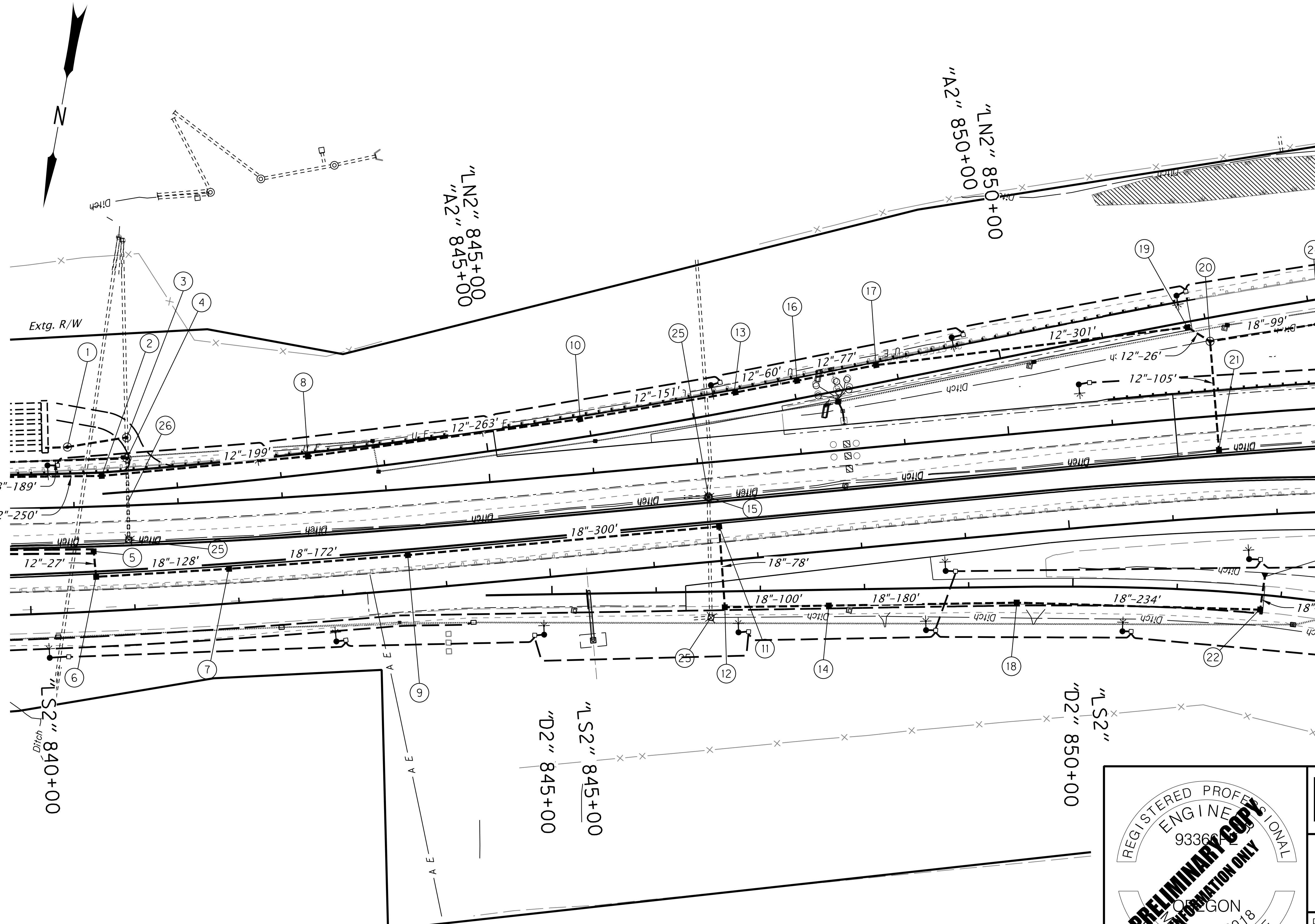
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C16E

Sec. 35, T. 2 S, R. 1 E, W.M.
S. WEST LINN INTERCHANGE

??V-???



LEGEND

Wetlands

No Work Area

REGISTERED PROFESSIONAL ENGINEER
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OREGON
MAY 13, 2018
CORY M. GIESEKE
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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE & UTILITIES

SHEET NO.
C17B

254

Rotation: 190.2392° Scale: 1"=100'

1. See sht. HA13, note 3

2. Sta. "Ln2" 841+27.32, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 250'
5' Depth

3. See sht. HA13, note 4

4. Sta. "Ln2" 841+52.35, 44.93' Lt.
Const. storm sew. manhole over existing pipe
Inst. 18" storm sew. pipe - 189'
5' Depth

5. Sta. "Ls2" 840+63.09, 57.81' Lt.
Const. type "D" inlet

6. Sta. "Ls2" 840+64.22, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 27'
10' Depth

7. Sta. "Ls2" 841+91.78, 32.98' Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 128'
5' Depth

8. Sta. "Ln2" 843+27.33, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 199'
5' Depth

9. Sta. "Ls2" 843+65.22, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 172'
10' Depth

10. Sta. "Ln2" 845+91.45, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 263'
5' Depth

11. Sta. "Ls2" 846+65.26, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 300'
10' Depth

12. Sta. "Ls2" 846+63.83, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 78'
5' Depth

13. Sta. "A2" 847+43.18, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 151'
5' Depth

14. Sta. "Ls2" 847+63.10, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 100'
5' Depth

15. Sta. "Ln2" 847+07.48, 32.96' Rt.
Const. storm sew. manhole
Connect extg. pipes

16. Sta. "A2" 848+03.87, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 60'
5' Depth

17. Sta. "A2" 848+80.88, Lt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 77'
5' Depth

18. Sta. "D2" 849+45.81, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 180'
5' Depth

19. Sta. "A2" 851+81.63, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 301'
5' Depth

20. Sta. "A2" 852+00.51, 22.77' Rt.
Const. storm sew. manhole
Inst. 12" storm sew. pipe - 26'
5' Depth
Inst. 12" storm sew. pipe - 105'
5' Depth
Trench resurfacing - 16 sq. yd.

21. Sta. "Ln2" 852+00.03, Rt.
Const. type "G-2" inlet - 18" Sump

22. Sta. "D2" 851+81.16, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 18" storm sew. pipe - 234'
5' Depth

23. Sta. "D2" 851+82.27, 18.68' Lt.
Inst. 18" storm sew. pipe - 33'
5' Depth
Trench resurfacing - 11 sq. yd.

24. Sta. "A2" 853+00.36, 23.84' Rt.
Inst. 18" storm sew. pipe - 99'
5' Depth

25. Remove inlet - 3

26. Remove pipe - 78'

REGISTERED PROFESSIONAL ENGINEER
93360PE
OREGON
MAY 13, 2018
CORY M. GIESEKE
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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

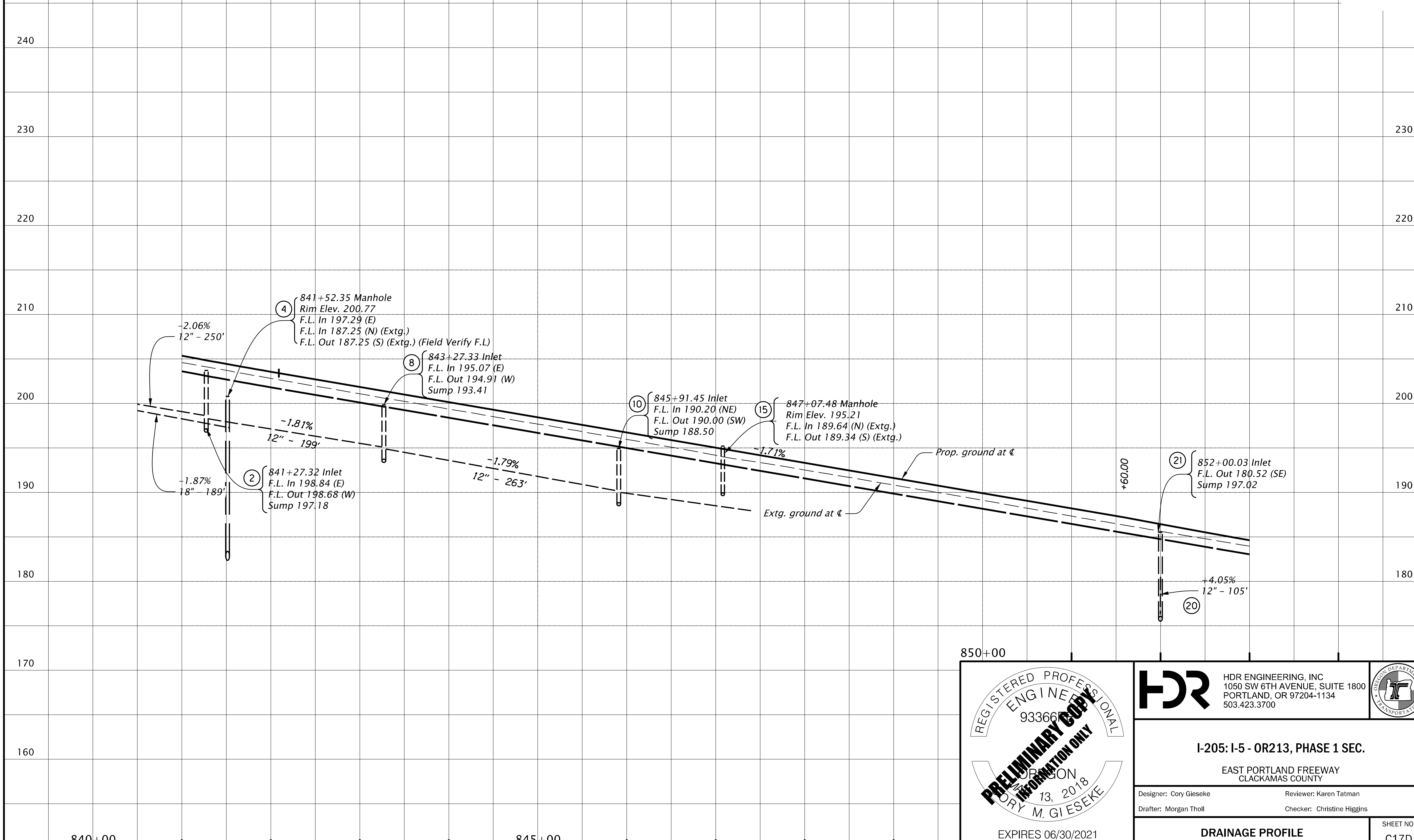
Designer: Cory Gieseke	Reviewer: Karen Tatman
Drafter: Morgan Tholl	Checker: Christine Higgins

DRAINAGE & UTILITIES NOTES — SHEET NO. C17C

Rotation: 0° Scale: 1"=100'

??V-???

"LN2" LINE



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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

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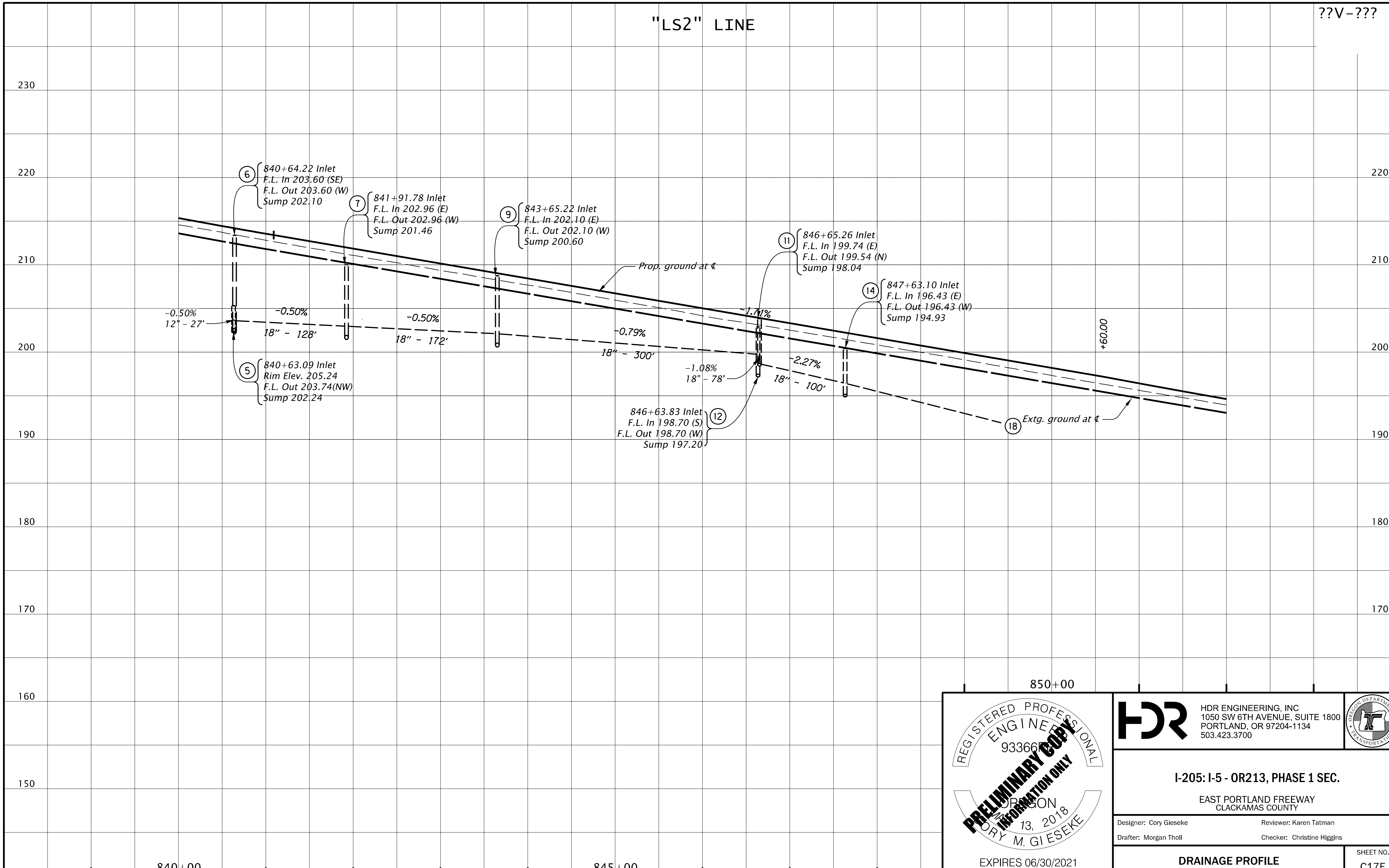
DRAINAGE PROFILE

SHEET NO.
C17D



REGISTERED PROFESSIONAL ENGINEER
93366PE
OREGON
MAY 13, 2018
CORY M. GIESEKE
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503.423.3700

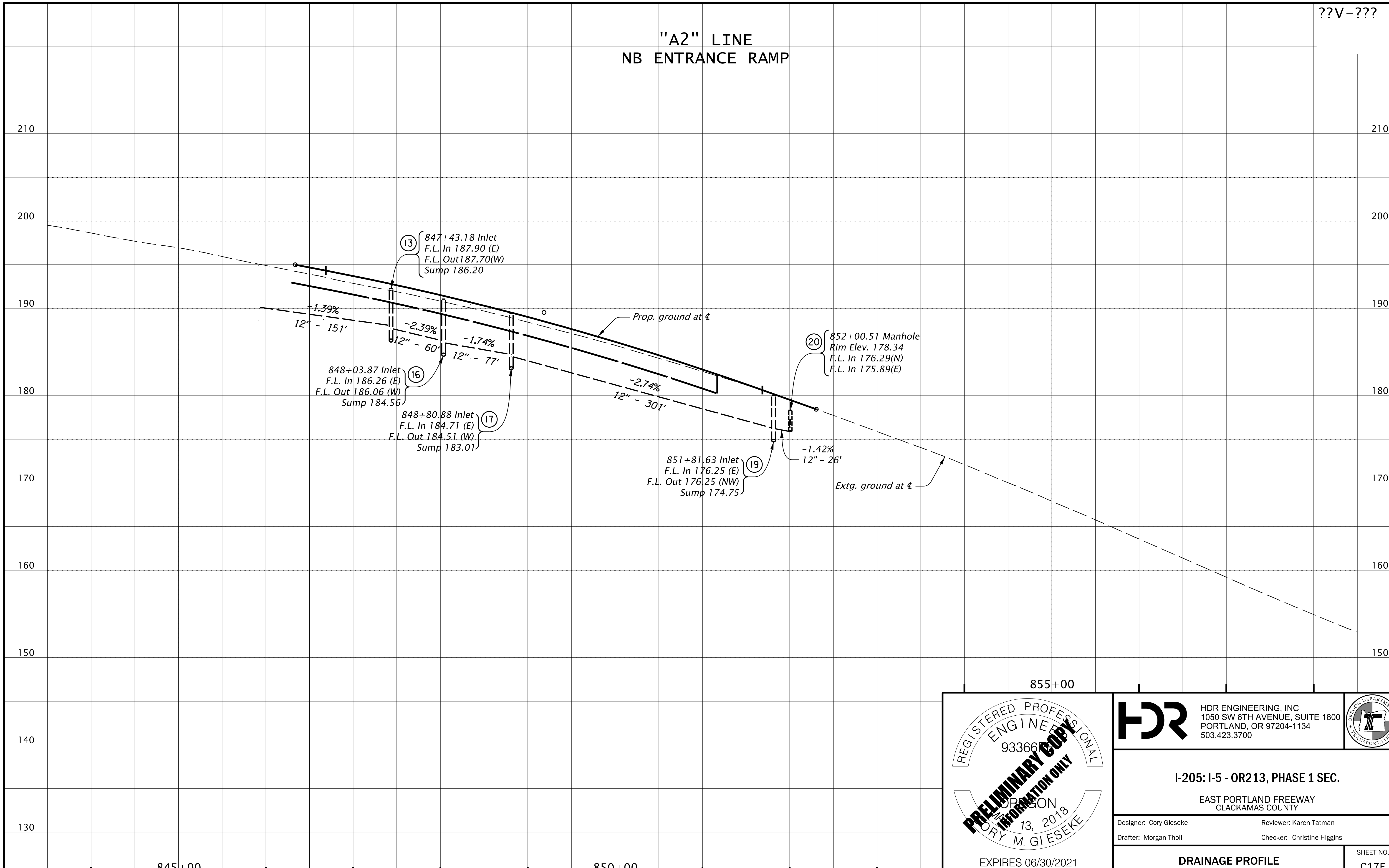
I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO.
C17E



R_K19786_HDR_drpf_01.dgn :: C17F 7/17/2020 2:03:34 PM CGIESEKE

258

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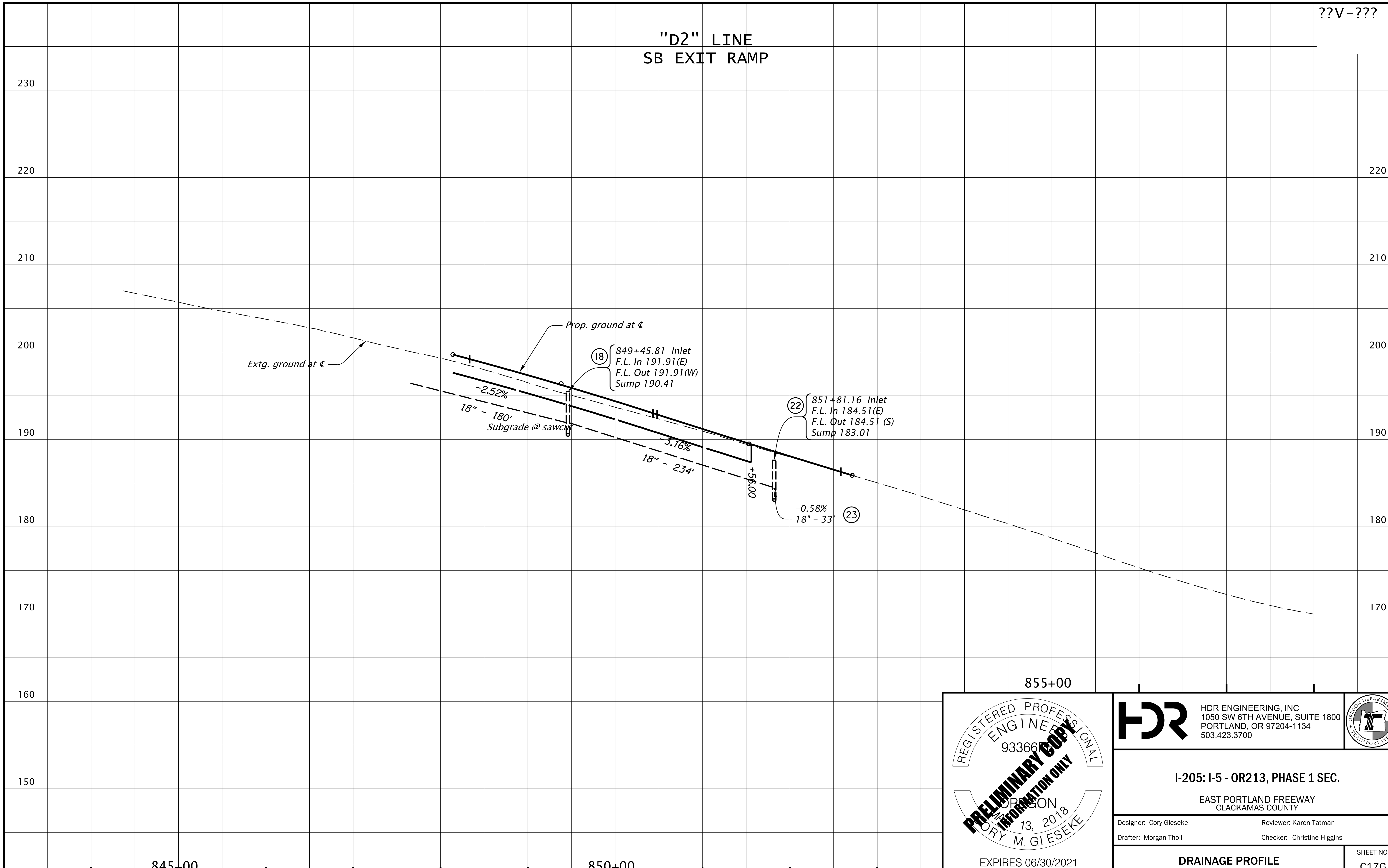
Rotation: 0° Scale: 1"=100'



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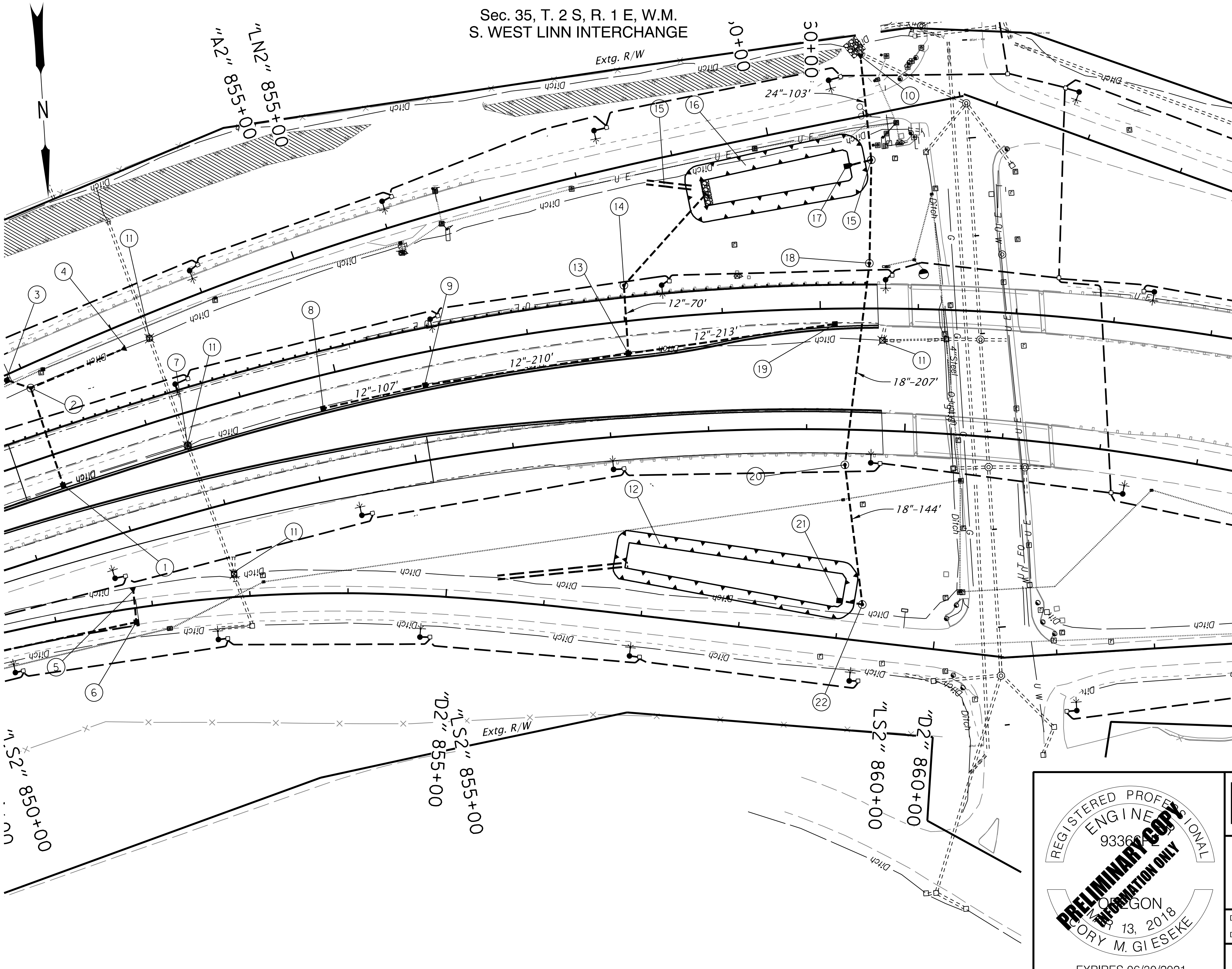
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO. C17G



LEGEND

Wetlands

No Work Area

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I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke	Reviewer: Karen Tatman
Drafter: Morgan Tholl	Checker: Christine Higgins

DRAINAGE & UTILITIES

SHEET NO.
C18B

Rotation: 176.5124° Scale: 1"=100'

(1) See C17C, note 21

(2) See C17C, note 20

(3) See C17C, note 19

(4) See C17C, note 24

(5) See C17C, note 23

(6) See C17C, note 22

(7) Sta. "LN2" 853+34.32, 32.75' Rt.
Const. storm sew. manhole
Connect extg. pipes

(8) Sta. "LN2" 854+78.76, Rt.
Const. type "G-2" inlet - 18" Sump

(9) Sta. "LN2" 855+87.23, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 107'
5' Depth

(10) Sta. "A2" 861+07.74, 56.03' Lt.
Inst. 24" storm sew. pipe - 103'
5' Depth
Trench resurfacing - 57 sq. yd.

(11) Removed inlet - 4

(12) Sta. "D2" 856+66.70, 60.41' Lt. to Sta. 859+14.63, 48.14' Lt.
Const. bioretention pond
(For details, see sht. HA14)

(13) Sta. "LN2" 858+00.13, Rt.
Const. type "G-2" inlet - 18" Sump
Inst. 12" storm sew. pipe - 210'
5' Depth
Inst. 12" storm sew. pipe - 213'
5' Depth

(14) Sta. "LN2" 858+03.00, 36.58' Lt.
Const. pollution control manhole
Inst. 12" storm sew. pipe - 70'
5' Depth
Trench resurfacing - 19 sq. yd.

(15) See sht. HA15, note 4

(16) Sta. "A2" 859+06.98, 45.55' Rt. to Sta. "A2" 860+91.75, 46.62' Rt.
Const. bioretention pond
(For details, see sht. HA15)

(17) See sht. HA15, note 3

(18) Sta. "LN2" 860+50.05, 46.11' Lt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 207'
5' Depth
Trench resurfacing - 31 sq. yd.

(19) Sta. "LN2" 860+15.03, Rt.
Const. type "G-2" inlet - 18" Sump

(20) Sta. "LS2" 859+39.59, 36.06' Rt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 144'
5' Depth

(21) See sht. HA14, note 2

(22) See sht. HA14, note 3

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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

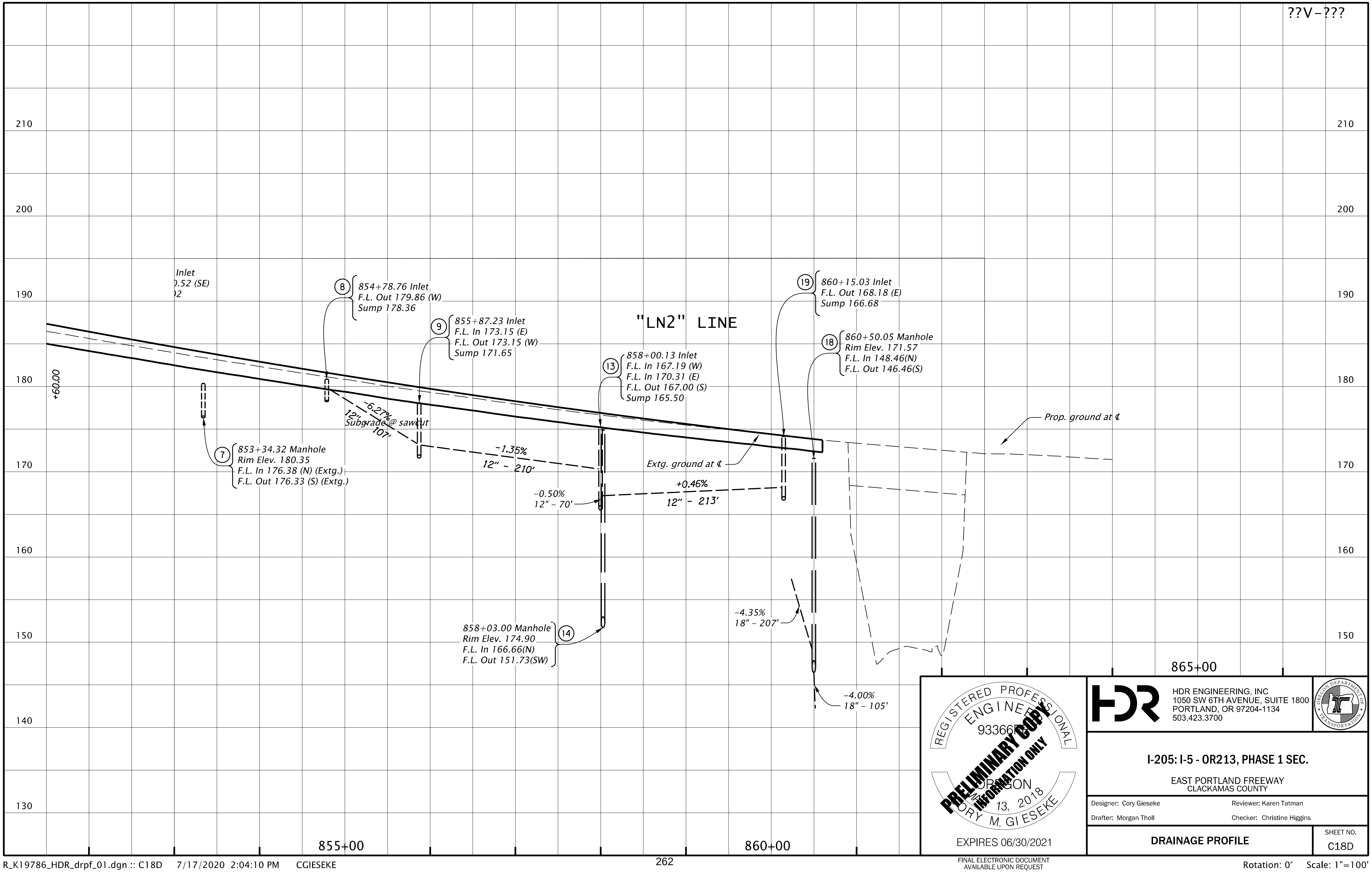
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

DRAINAGE & UTILITIES NOTES

SHEET NO. C18C

Rotation: 176.5124° Scale: 1"=100'


??V-???
"LN2" LINE
Inlet
.52 (SE)
2
854+78.76 Inlet
F.L. Out 179.86 (W)
Sump 178.36
855+87.23 Inlet
F.L. In 173.15 (E)
F.L. Out 173.15 (W)
Sump 171.65
858+00.13 Inlet
F.L. In 167.19 (W)
F.L. In 170.31 (E)
F.L. Out 167.00 (S)
Sump 165.50
860+15.03 Inlet
F.L. Out 168.18 (E)
Sump 166.68
860+50.05 Manhole
Rim Elev. 171.57
F.L. In 148.46(N)
F.L. Out 146.46(S)
853+34.32 Manhole
Rim Elev. 180.35
F.L. In 176.38 (N) (Extg.)
F.L. Out 176.33 (S) (Extg.)
858+03.00 Manhole
Rim Elev. 174.90
F.L. In 166.66(N)
F.L. Out 151.73(SW)
-6.27%
12" - 107'
Subgrade @ sawcut
-1.35%
12" - 210'
-0.50%
12" - 70'
+0.46%
12" - 213'
-4.35%
18" - 207'
-4.00%
18" - 105'
Extg. ground at ℄
Prop. ground at ℄
+60.00
210
200
190
180
170
160
150
140
130
855+00
860+00
865+00
REGISTERED PROFESSIONAL ENGINEER
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OREGON
13, 2018
CORY M. GIESEKE
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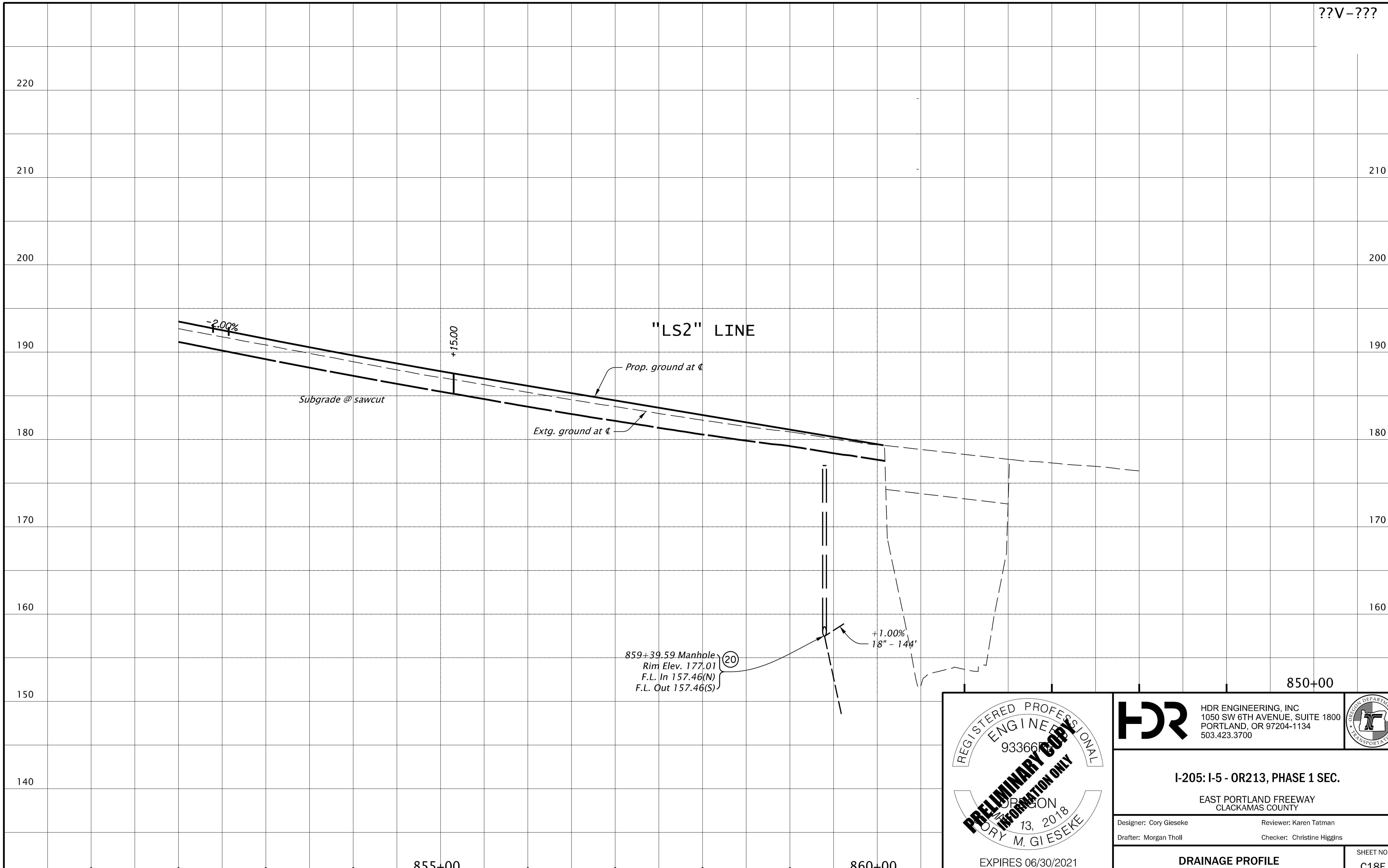
OREGON DEPARTMENT OF TRANSPORTATION
I-205: I-5 - OR213, PHASE 1 SEC.
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY
Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins
DRAINAGE PROFILE
SHEET NO.
C18D
262
R_K19786_HDR_drpf_01.dgn :: C18D 7/17/2020 2:04:10 PM CGIESEKE
Rotation: 0° Scale: 1"=100'



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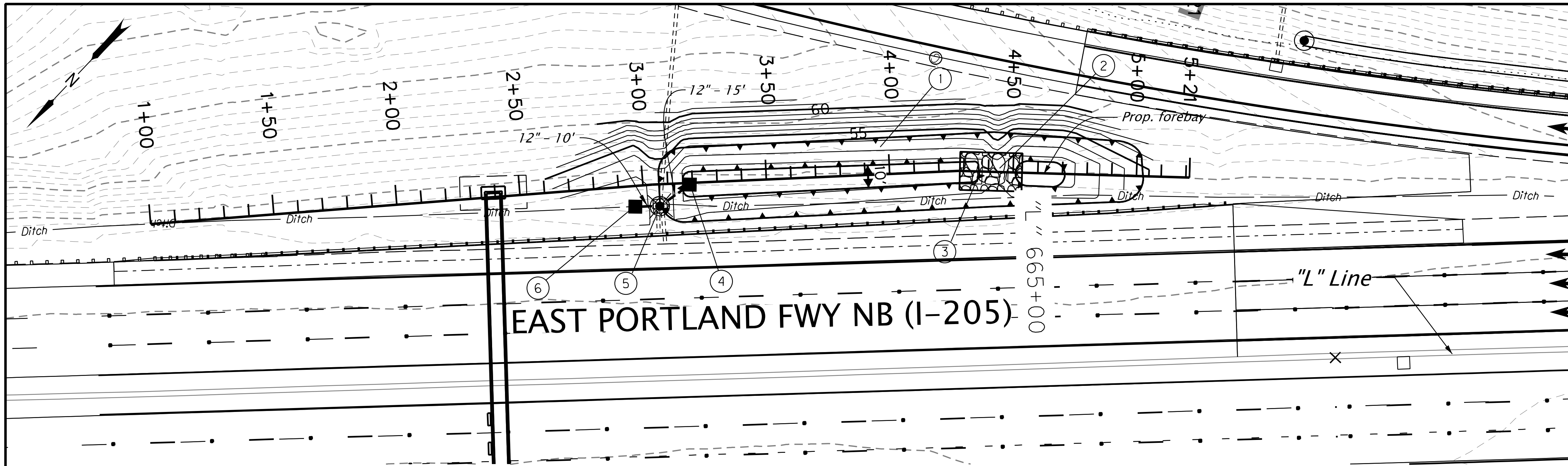
I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

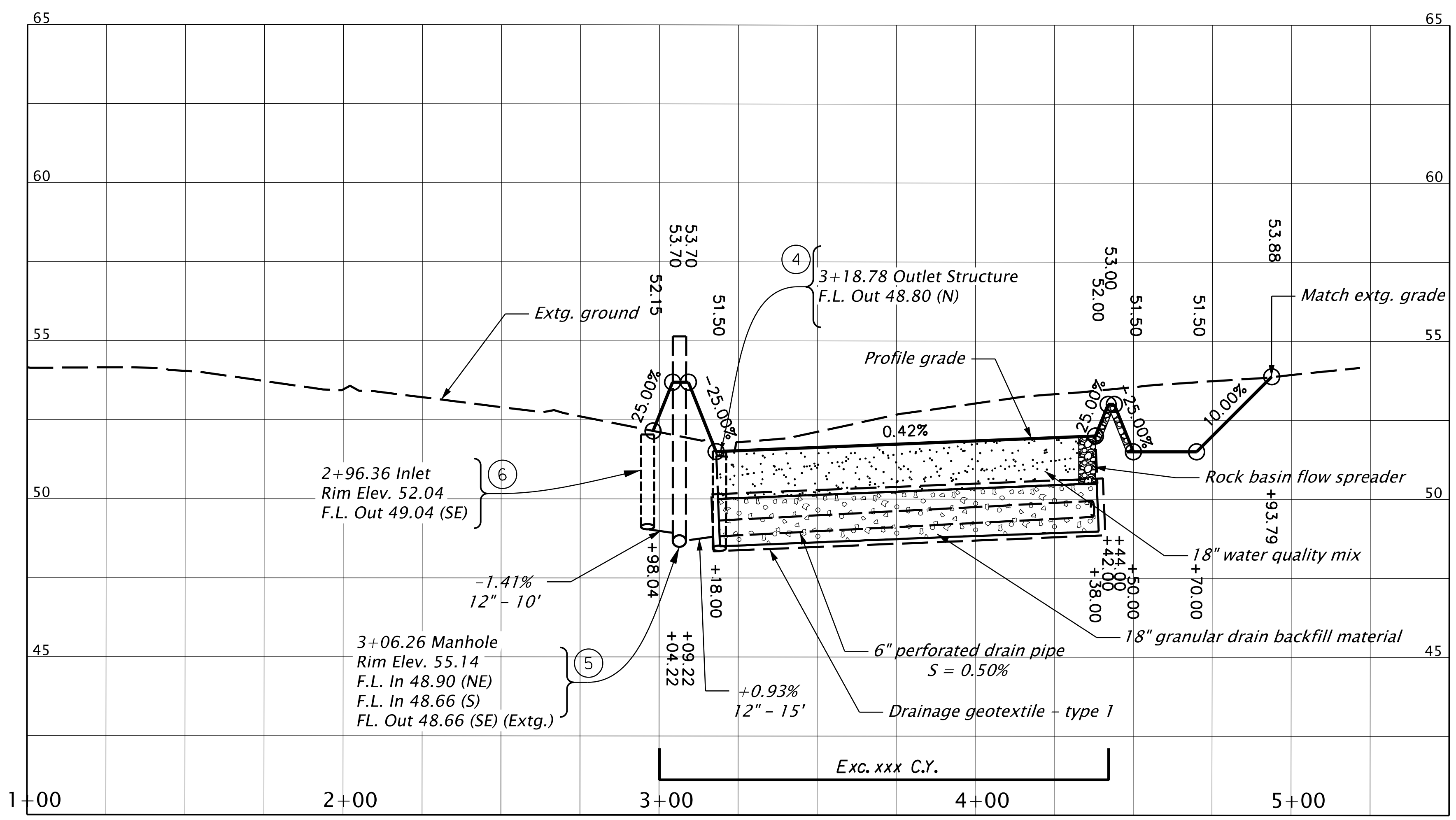
Designer: Cory Gieseke	Reviewer: Karen Tatman
Drafter: Morgan Tholl	Checker: Christine Higgins

DRAINAGE PROFILE

SHEET NO. C18E



1. Sta. 5+02.44 to Sta. 3+06.48 = Sta. "L" 665+46.16, 77.84' Lt. to Sta. "L" 663+50.02, 77.02' Lt.
   Const. bioretention pond
   Inst. field facility marker (Type S2) - 2
   (For details, see sht. HA17)
2. Sta. 4+50.00
   Const. bioretention pond berm
   (For details, see sht. HA16)
3. Sta. 4+39.51
   Const. rock basin flow spreader
   (For details, see sht. HA16)
4. Sta. 3+18.78, 0.61' Rt.
   Const. water quality facility outlet structure
   (For details, see sht. HA19)
5. Sta. 3+06.26, 8.77' Rt.
   Const. storm sew. manhole over existing sewer
   Inst. 12" storm sew. pipe - 10'
   5' Depth
   Inst. 12" storm sew. pipe - 15'
   5' Depth
6. Sta. 2+96.36, 8.44' Rt.
   Const. type "D" inlet



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OREGON DEPARTMENT OF TRANSPORTATION

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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

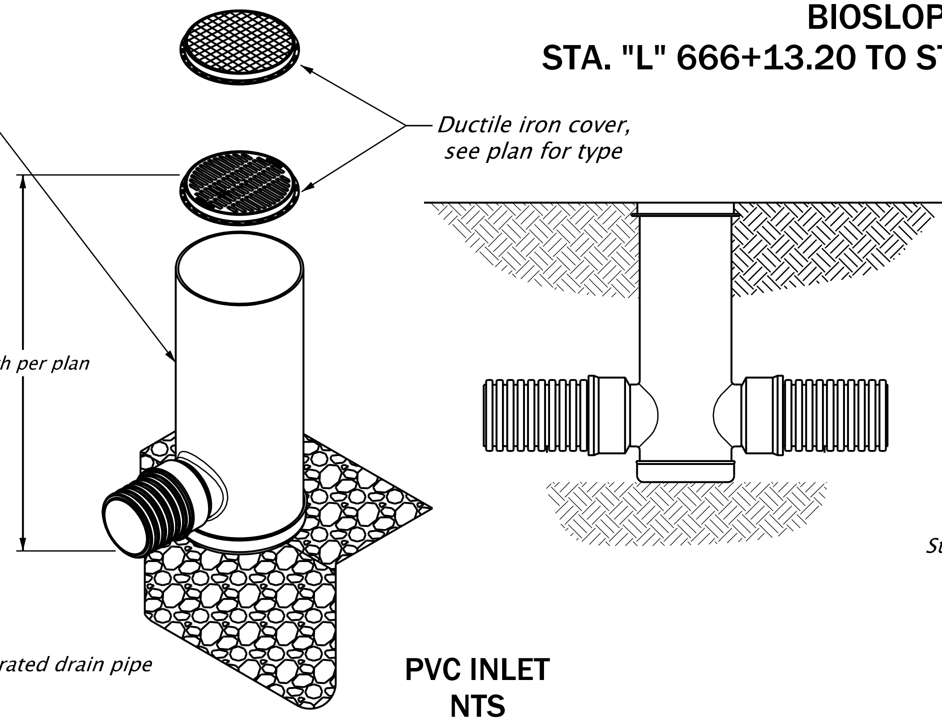
Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

WATER QUALITY PLAN & PROFILE

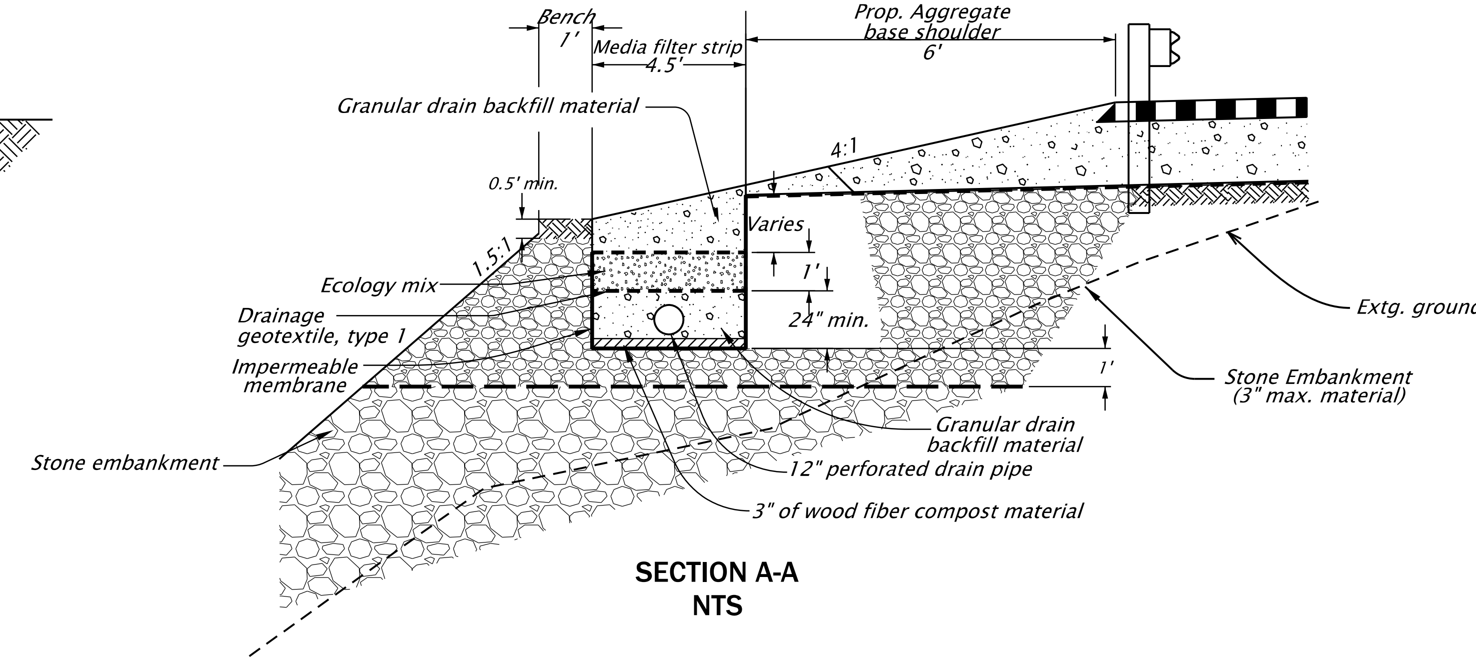
SHEET NO.
HA01

Rotation: 223.5514° Scale: 1"=50'
Vertical Scale: 1:10

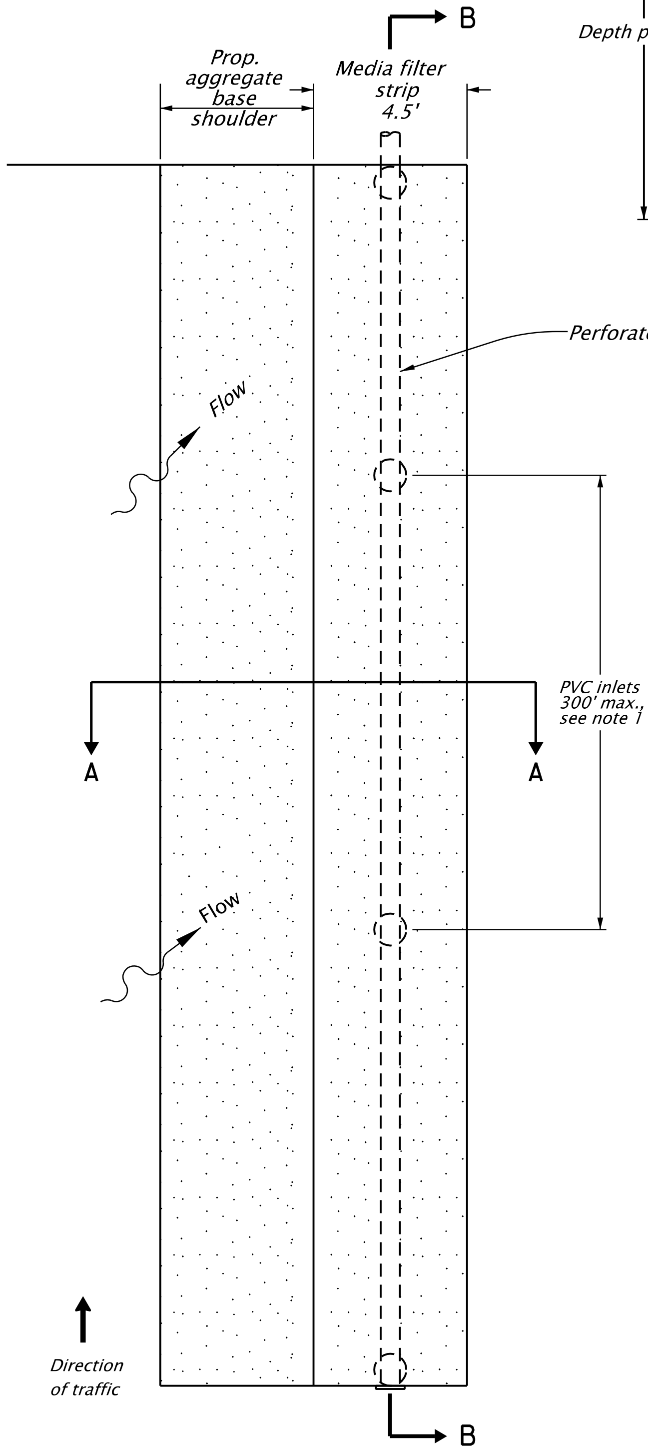
BIOSLOPE
STA. "L" 666+13.20 TO STA. "L" 684+63.80



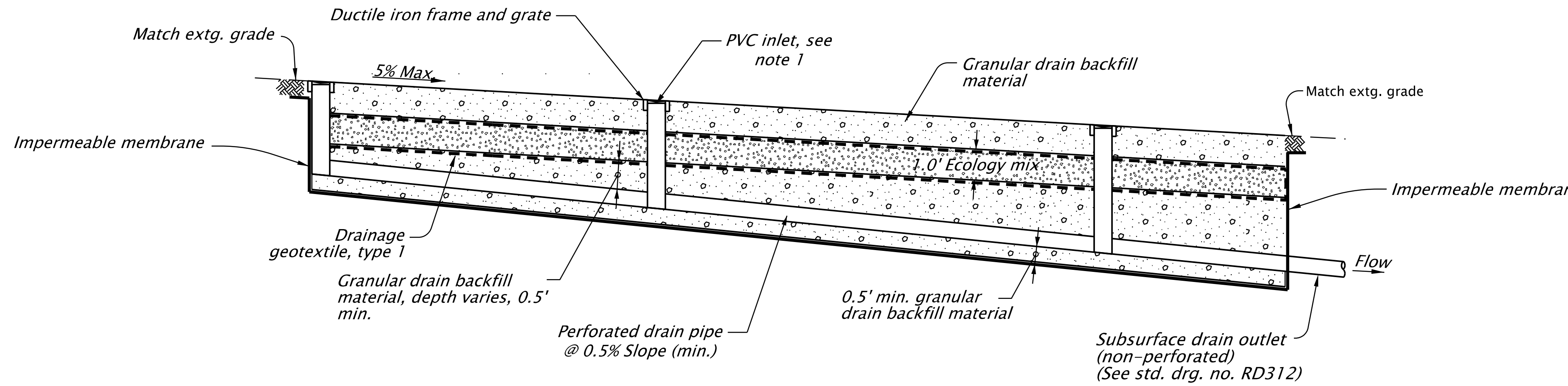
PVC INLET
NTS



SECTION A-A
NTS



PLAN
NTS



SECTION B-B
NTS

Notes:

1. Install PVC inlets as shown along perforated drain pipe. PVC inlet should be flush to ground surface.

Bioslope I.D.	Basin Area (acres)	2-Year Peak Flow (cfs)	Length (ft)	Assumed Long Term * Infiltration Capacity (cfs)	Rdwy Slope	Pipe Slope	Pipe ** Capacity (cfs)
Bioslope #1	0.253	0.14	333	0.35	1.9%	1.9%	2.37
Bioslope #2	0.840	0.47	459	0.48	0.2%	0.5%	1.22
Bioslope #3	0.517	0.29	307	0.32	0.2%	0.5%	1.22
Bioslope #4	0.496	0.28	301	0.31	0.3%	0.5%	1.22
Bioslope #5	0.871	0.49	565	0.52	0.8%	0.8%	1.54

* assumes 4.5 feet wide infilration trench as shown in detail
** assumes 12 inch pipe and 0.027 mannings coefficient

DFI#XXXXXX

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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

WATER QUALITY DETAILS

SHEET NO.
HA02

265

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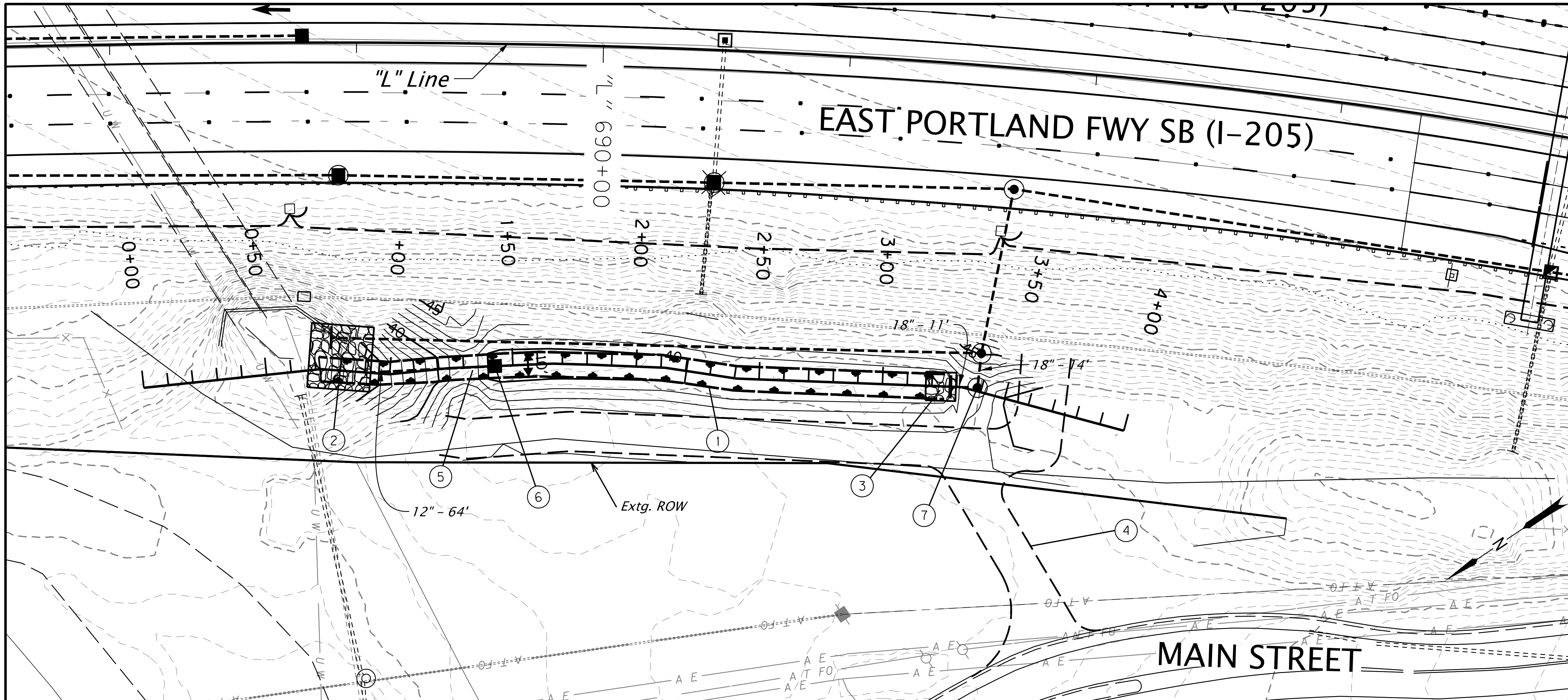
Rotation: 0° Scale: 1"=60'



1 Sta. 3+24.89 to Sta. 0+71.34 =
Sta. "L" 691+52.67, 130.80' Rt. to
Sta. "L" 688+85.28, 133.45' Rt.
Const. bioretention pond
Inst. field facility marker (Type S2) - 2
(For details, see sht. HA17)

2 Sta. 0+81.52, 9.75' Lt.
Const. riprap pad
Loose riprap (class 50) - 5.0 tons
Inst. 12" storm sew. pipe - 64'
5' Depth

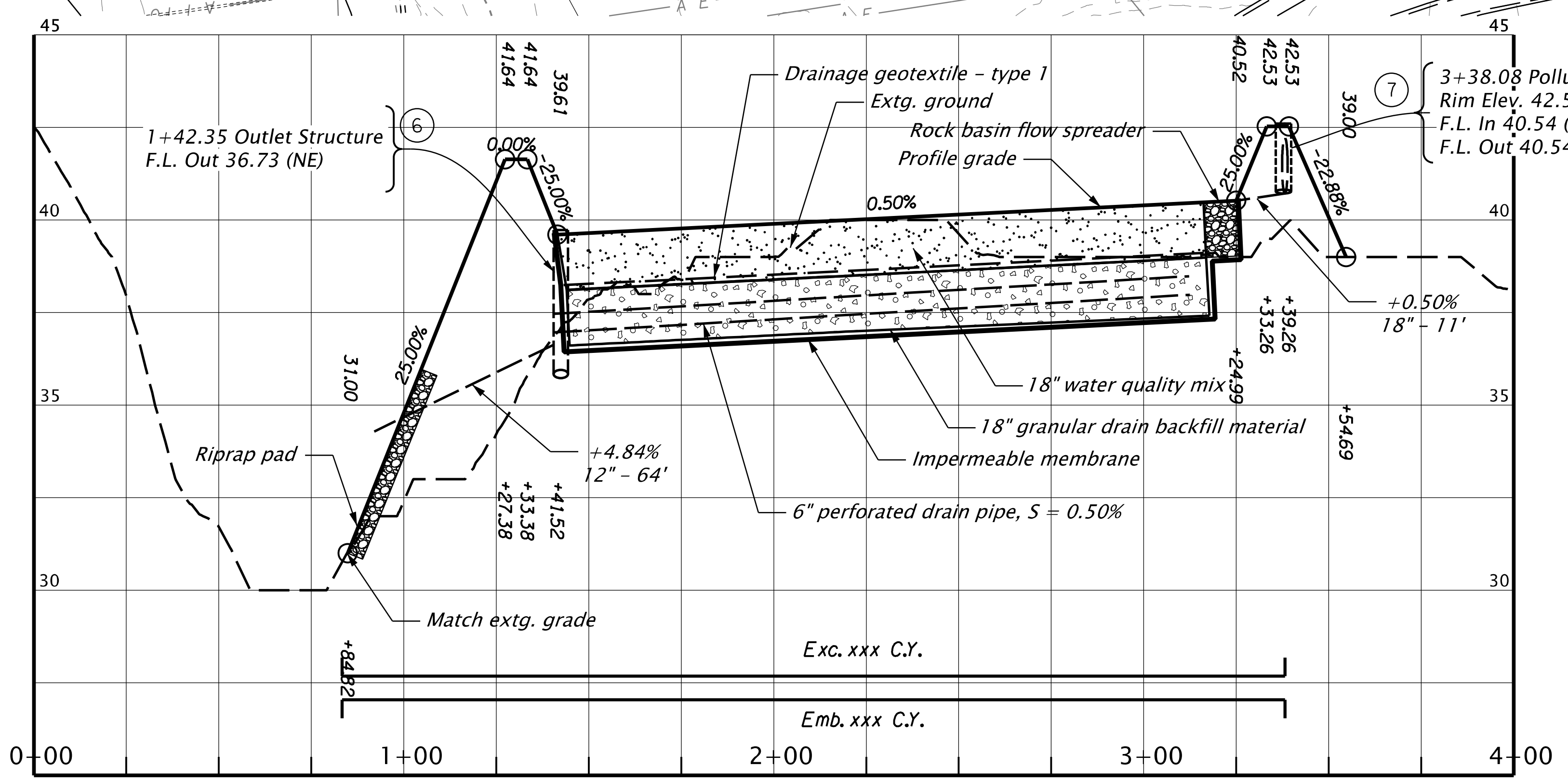
3 Sta. 3+23.60
Const. rock basin flow spreader
(For details, see sht. HA16)
Inst. 18" storm sew. pipe - 11'
5' Depth

4 Const. maintenance access road
Exc. - xx cu. yd.
Agg. base - xx ton
Subgrade geotextile - sq. yd.
(For details, see sht. HA17)

5 Sta. 1+30.37
Const. bioretention pond berm
(For details, see sht. HA16)

6 Sta. 1+42.35
Const. water quality facility outlet structure
(For details, see sht. HA19)

7 Sta. 3+38.08, 1.50' Rt.
Const. pollution control manhole
Inst. 18" storm sew. pipe - 14'
5' Depth



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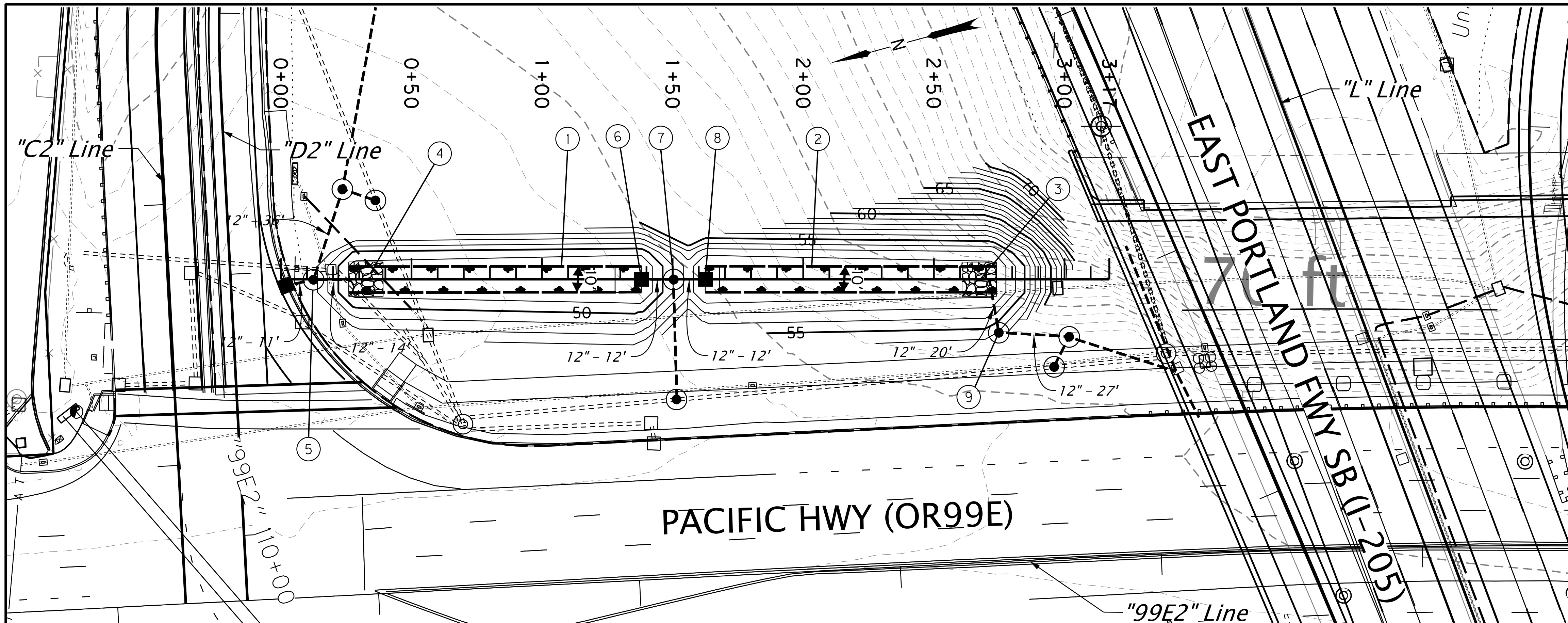
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

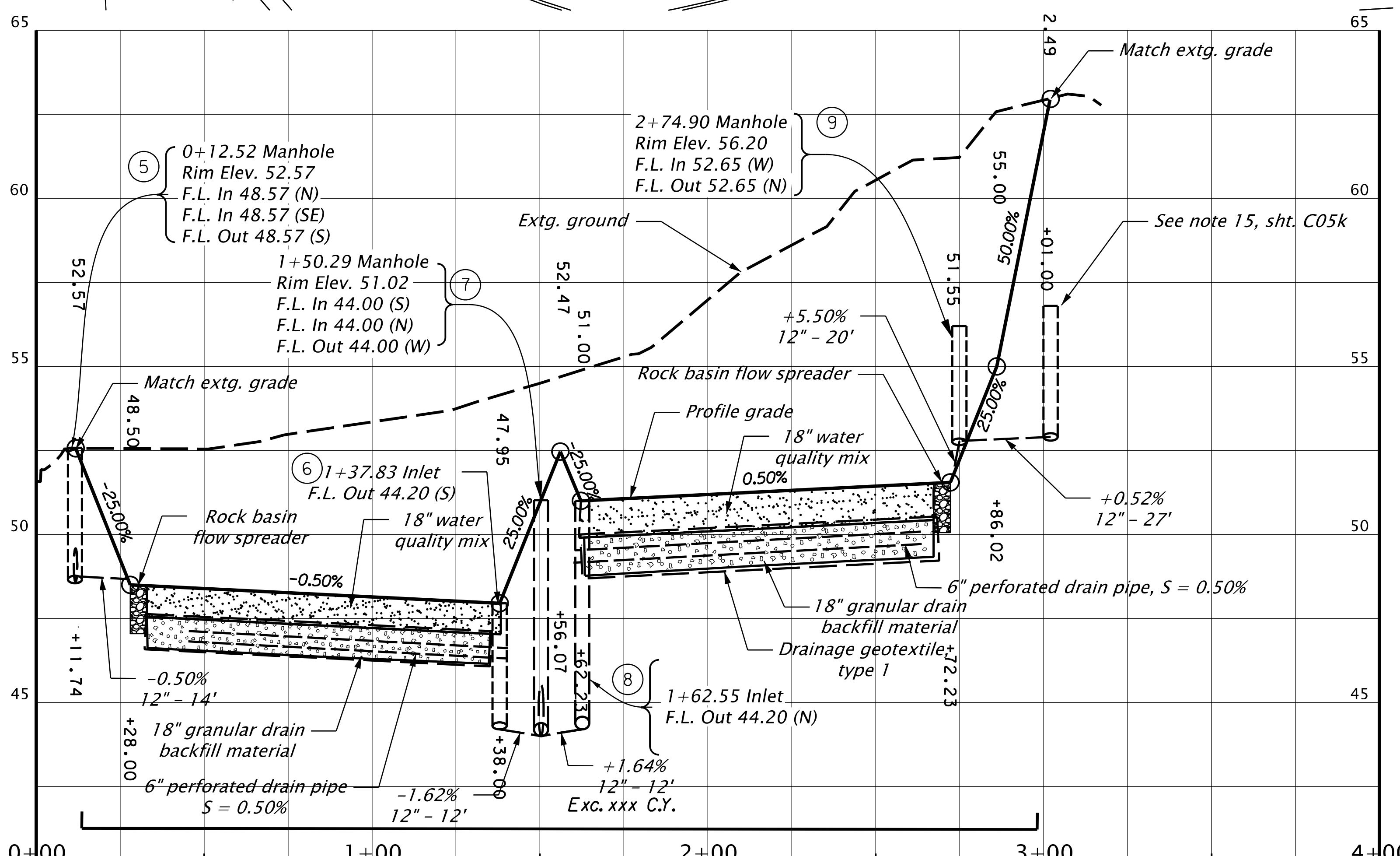
Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

WATER QUALITY PLAN & PROFILE

SHEET NO. HA03

Rotation: 236.1297° Scale: 1"=50'
Vertical Scale: 1:10





(1) Sta. 0+25.96 to Sta. 1+37.92 = Sta. "99E2" 108+94.90, 120.45' Lt. to Sta. "99E2" 110+06.66, 114.88' Lt.
Const. biofiltration swale
Inst. field facility marker (Type S2) - 2
(For details, see sht. HA16)

(2) Sta. 2+73.76 to Sta. 1+62.80 = Sta. "99E2" 111+42.10, 107.75' Lt. to Sta. "99E2" 110+31.13, 113.76' Lt.
Const. biofiltration swale
(For details, see sht. HA16)

(3) Sta. 2+67.30
Construct rock basin flow spreader
Inst. 12" storm sew. pipe - 20'
5' Depth
(For details, see sht. HA16)

(4) Sta. 0+32.40
Construct rock basin flow spreader
Inst. 12" storm sew. pipe - 14'
5' Depth
(For details, see sht. HA16)

(5) Sta. 0+12.52, 0.00'
Const. pollution control manhole
Inst. 12" storm sew. pipe - 11'
5' Depth
Inst. 12" storm sew. pipe - 36'
5' Depth

(6) Sta. 1+37.83, 0.00'
Const. type "D" inlet

(7) Sta. 1+50.29, 0.00'
Const. storm sew. manhole
Inst. 12" storm sew. pipe - 12'
5' Depth
Inst. 12" storm sew. pipe - 12'
5' Depth

(8) Sta. 1+62.55, 0.00'
Const. type "D" inlet

(9) Sta. 2+74.90, 20.40' Lt.
Const. pollution control manhole
Inst. 12" storm sew. pipe - 27'
5 Depth

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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

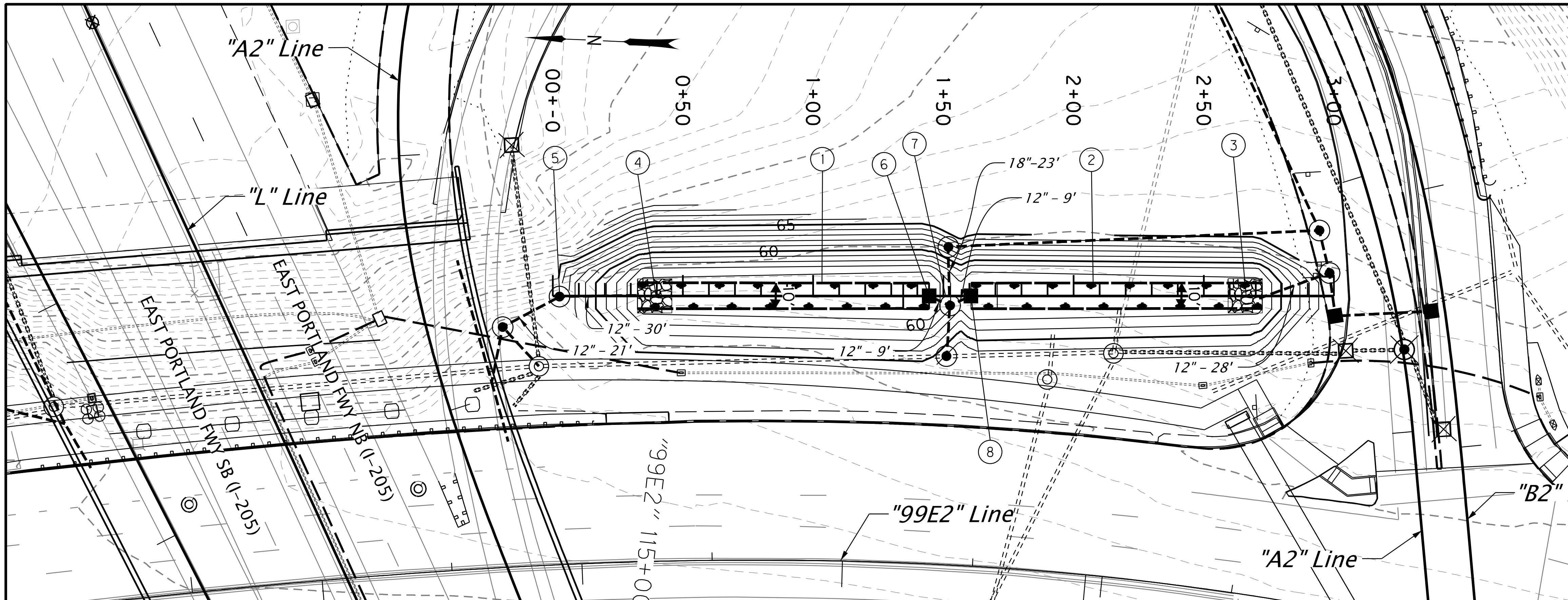
Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

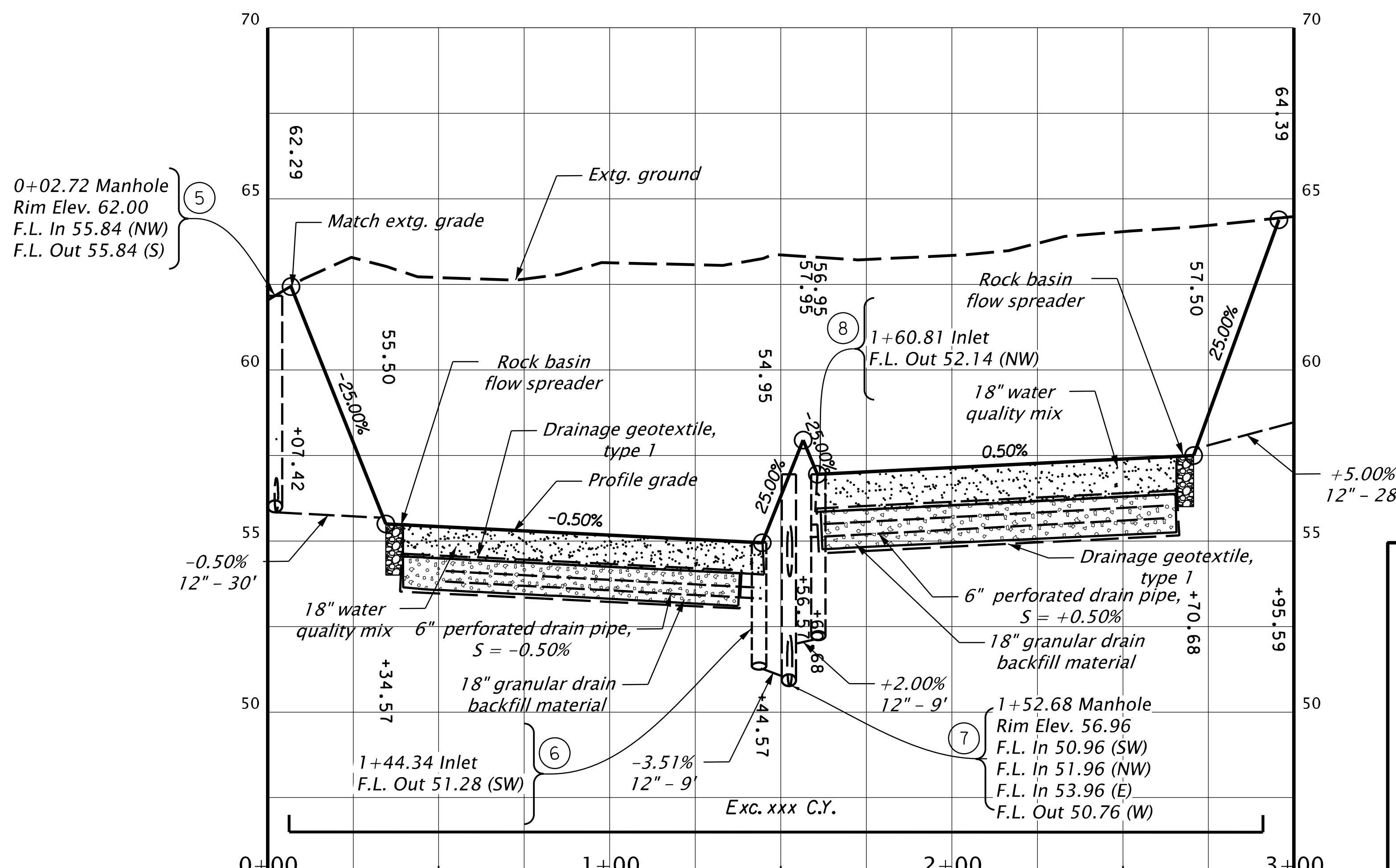
WATER QUALITY PLAN & PROFILE

SHEET NO.
HA04

267

Rotation: 271.1643° Scale: 1"=50'
Vertical Scale: 1:10





1. Sta. 0+32.52 to Sta. 1+44.44 = Sta. "99E2" 114+24.15, 102.38' Lt. to Sta. "99E2" 115+28.87, 102.40' Lt.
Construct biofiltration swale
Inst. field facility marker (Type S2) - 2
(For details, see sht. HA16)

2. Sta. 2+72.49 to Sta. 1+60.81 = Sta. "99E2" 116+45.63, 114.32' Lt. to Sta. "99E2" 115+43.75, 103.51' Lt.
Construct biofiltration swale
(For details, see sht. HA16)

3. Sta. 2+65.35
Construct rock basin flow spreader
Inst. 12" storm sew. pipe - 30'
10' Depth
(For details, see sht. HA16)

4. Sta. 0+39.05
Construct rock basin flow spreader
Inst. 12" storm sew. pipe - 35'
10' Depth
(For details, see sht. HA16)

5. Sta. 0+02.72, 0.30' Rt.
Const. pollution control manhole
Inst. 12" storm sew. pipe - 21'
10' Depth

6. Sta. 1+44.34
Const. type "D" inlet

7. Sta. 1+52.68, 3.95' Rt.
Const. storm sew. manhole
Inst. 12" storm sew. pipe - 9'
5' Depth
Inst. 12" storm sew. pipe - 9'
5' Depth
Inst. 18" storm sew. pipe - 23', S = 5.00%
5' Depth

8. Sta. 1+60.81
Const. type "D" inlet

DFI no. ######

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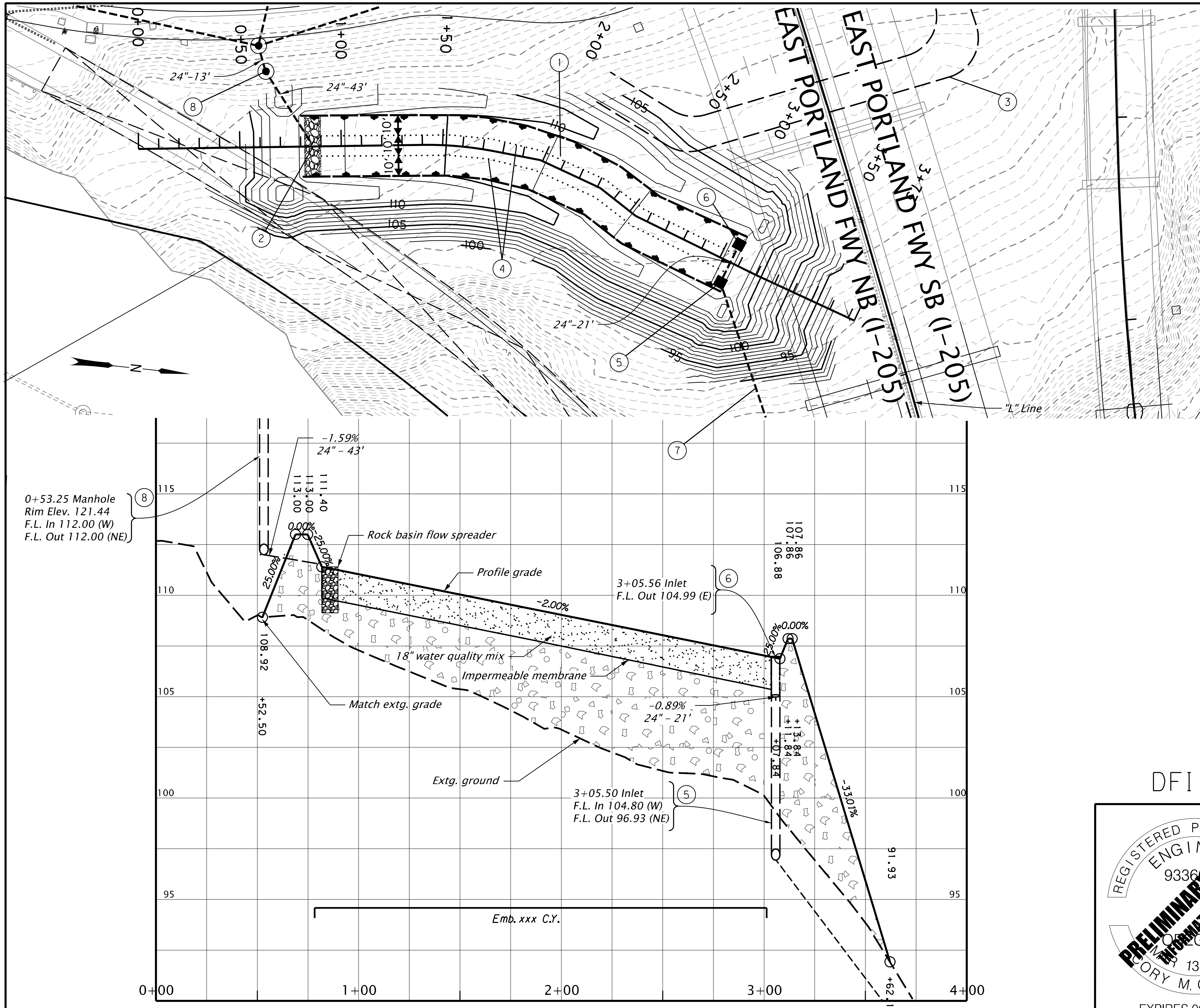
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

WATER QUALITY PLAN & PROFILE

SHEET NO. HA05

Rotation: 267.1179° Scale: 1"=50'
Vertical Scale: 1:10



1. Sta. 0+80.76 to Sta. 3+07.72 = Sta. "OR43" 10+12.40, 104.31' Lt. to Sta. "OR43" 8+77.47, 208.62' Lt.
   Construct biofiltration swale
   Inst. field facility marker (Type S2) - 2
   (For details, see sht. HA16)

2. Sta. 0+86.13
   Construct rock basin flow spreader
   Inst. 24" storm sew. pipe - 43'
   5' Depth
   (For details, see sht. HA16)

3. Const. maintenance access road
   Exc. - xx cu. yd.
   Agg. base - xx ton
   Subgrade geotextile - sq. yd.
   (For details, see sht. HA17)

4. Construct biofiltration swale divider
   (For details, see sht. HAxx)

5. Sta. 3+05.56, 10.11' Lt.
   Const. type "D" inlet
   Inst. 24" storm sew. pipe - 21'
   5' Depth

6. Sta. 3+05.50, 10.87' Rt.
   Const. type "D" inlet

7. See sht. HA07 for outfall details

8. Sta. 0+53.25, 37.24' Rt.
   Const. pollution control manhole
   Inst. 24" storm sew. pipe - 13'
   10' Depth

DFI no. ######

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I-205: I-5 - OR213, PHASE 1 SEC.

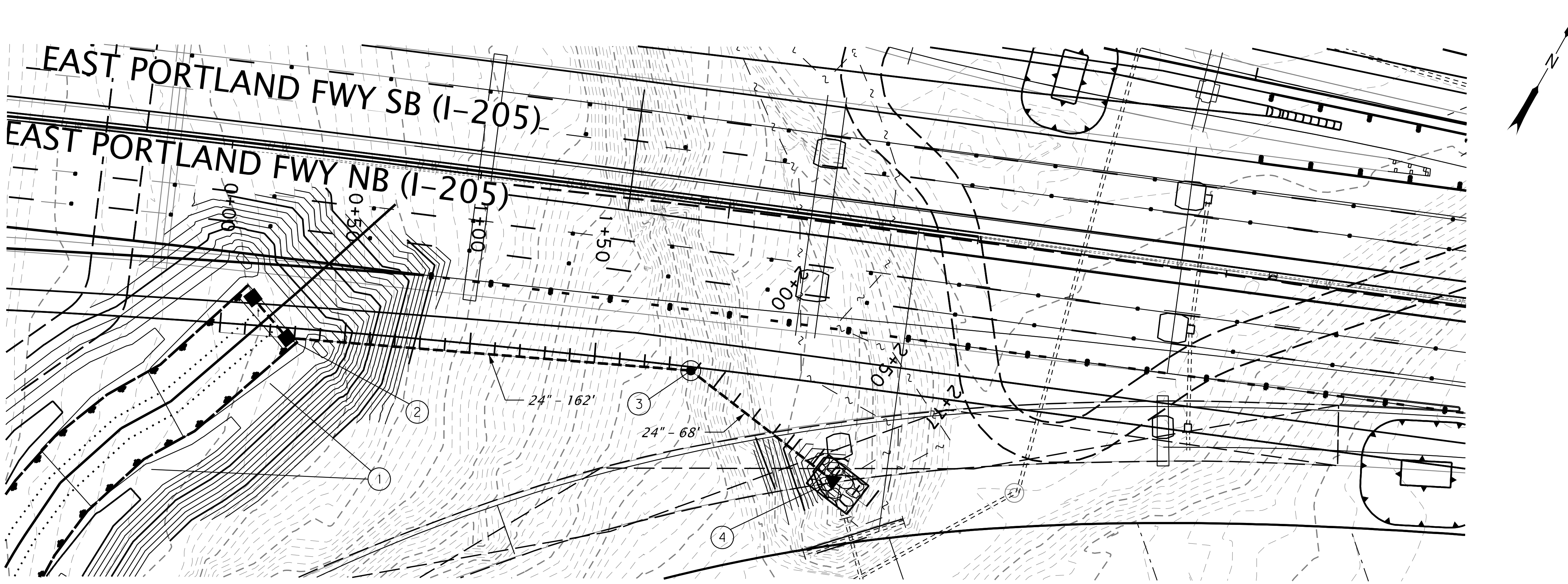
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke	Reviewer: Karen Tatman
Drafter: Morgan Tholl	Checker: Christine Higgins

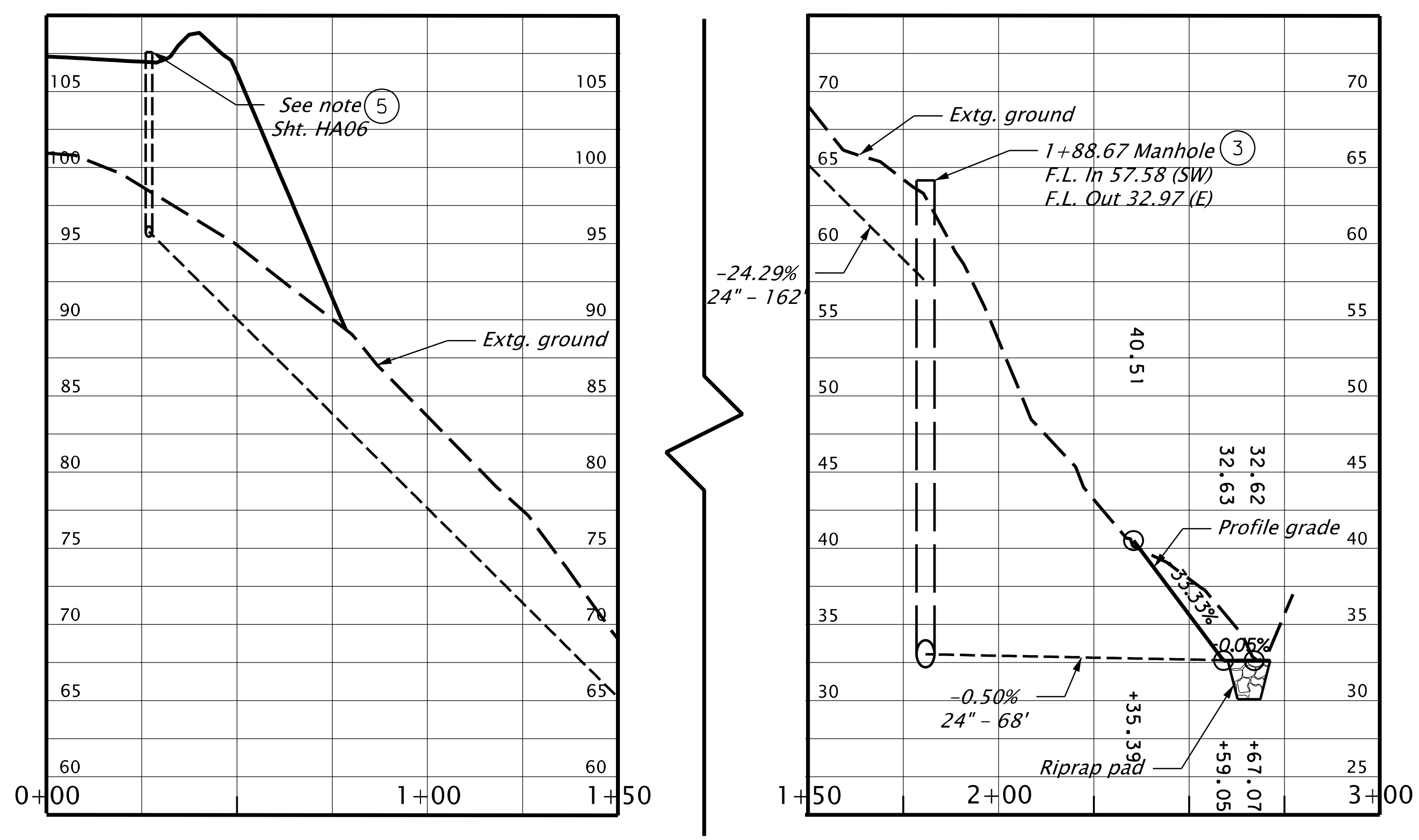
WATER QUALITY PLAN & PROFILE

SHEET NO. HA06

Rotation: 96.0998° Scale: 1"=50'
Vertical Scale: 1:10



1. See sht. HA06, note 1
2. See sht. HA06, note 5
3. Sta. 1+88.67
Const. outside drop manhole
Inst. 24" storm sew. pipe - 162'
20' Depth
4. Sta. 2+50.00
Construct riprap pad
Loose riprap (class 50) - 5.0 tons
Inst. 24" storm sew. pipe w/ sloped end section- 68'
5' Depth



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MAY 13, 2018
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CLACKAMAS COUNTY

Designer: Reviewer:
Drafter: Checker:

WATER QUALITY PLAN & PROFILE

SHEET NO. HA07

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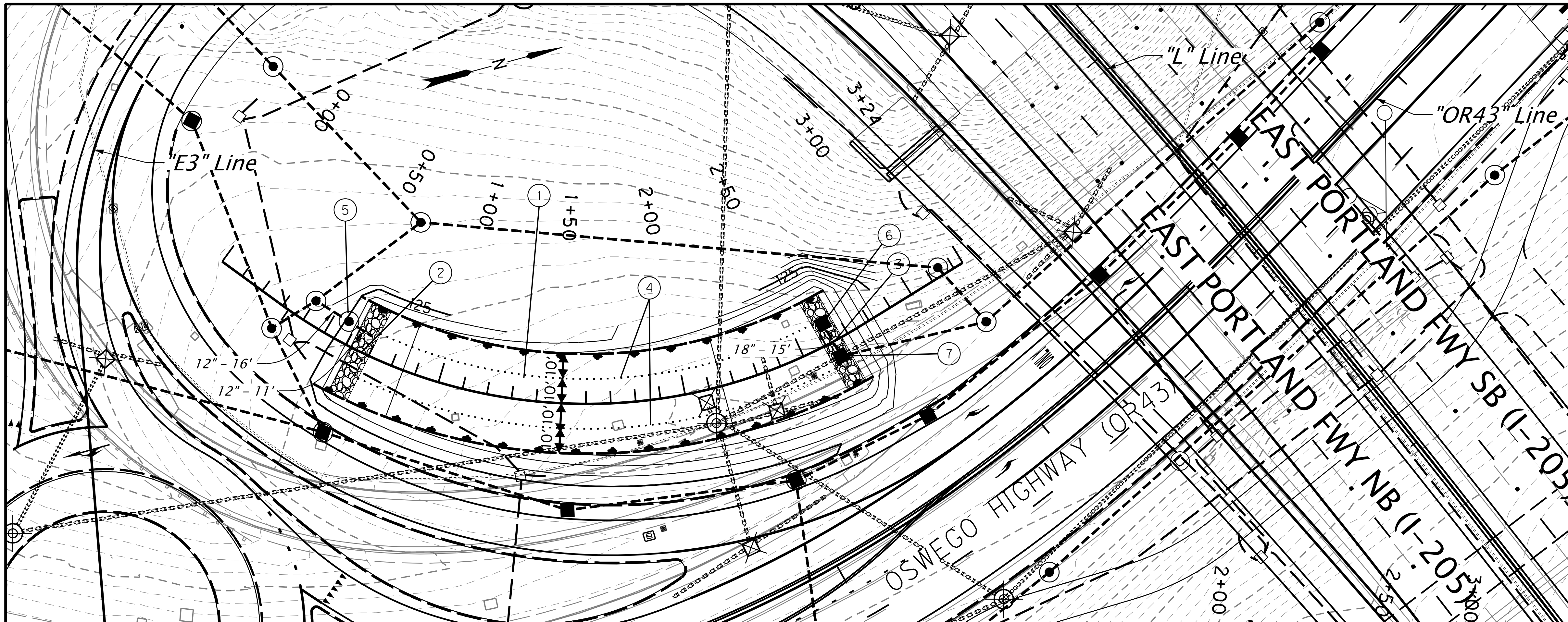
Rotation: 29.332° Scale: 1"=50' Vertical Scale: 1:4



1. Sta. 0+59.27 to 2+69.56 = Sta. "E3" 740+37.28, 107.23' Lt. to Sta. "OR43" 9+52.79, 60.58' Rt.
Construct biofiltration swale
Inst. field facility marker (Type S2) - 2
(For details, see sht. HA16)

2. Sta. 0+66.37
Construct rock basin flow spreader
Install 12" storm sew. pipe - 11'
5' Depth
(For details, see sht. HA16)

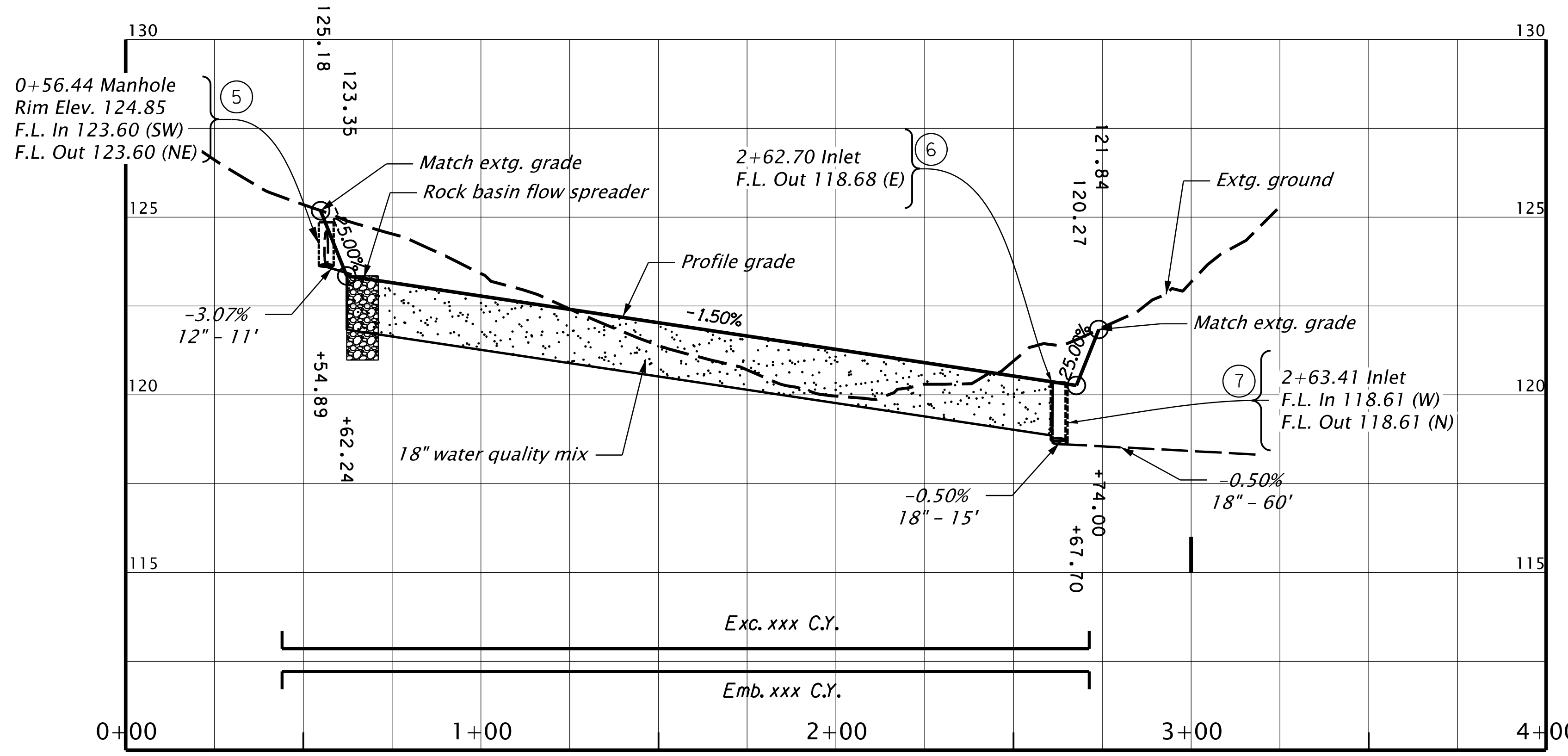
3. Sta. 2+62.73
Construct rock basin flow spreader
(For details, see sht. HA16)

4. Construct biofiltration swale divider
(For details, see sht. HAxx)

5. Sta. 0+56.44, 8.79' Lt.
Const. pollution control manhole
Inst. 12" storm sew. pipe - 16'
5' Depth

6. Sta. 2+62.70, 8.64' Lt.
Const. type "D" inlet

7. Sta. 2+63.41, 6.55' Rt.
Const. type "D" inlet
Inst. 18" storm sew. pipe - 15'
5' Depth



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CLACKAMAS COUNTY

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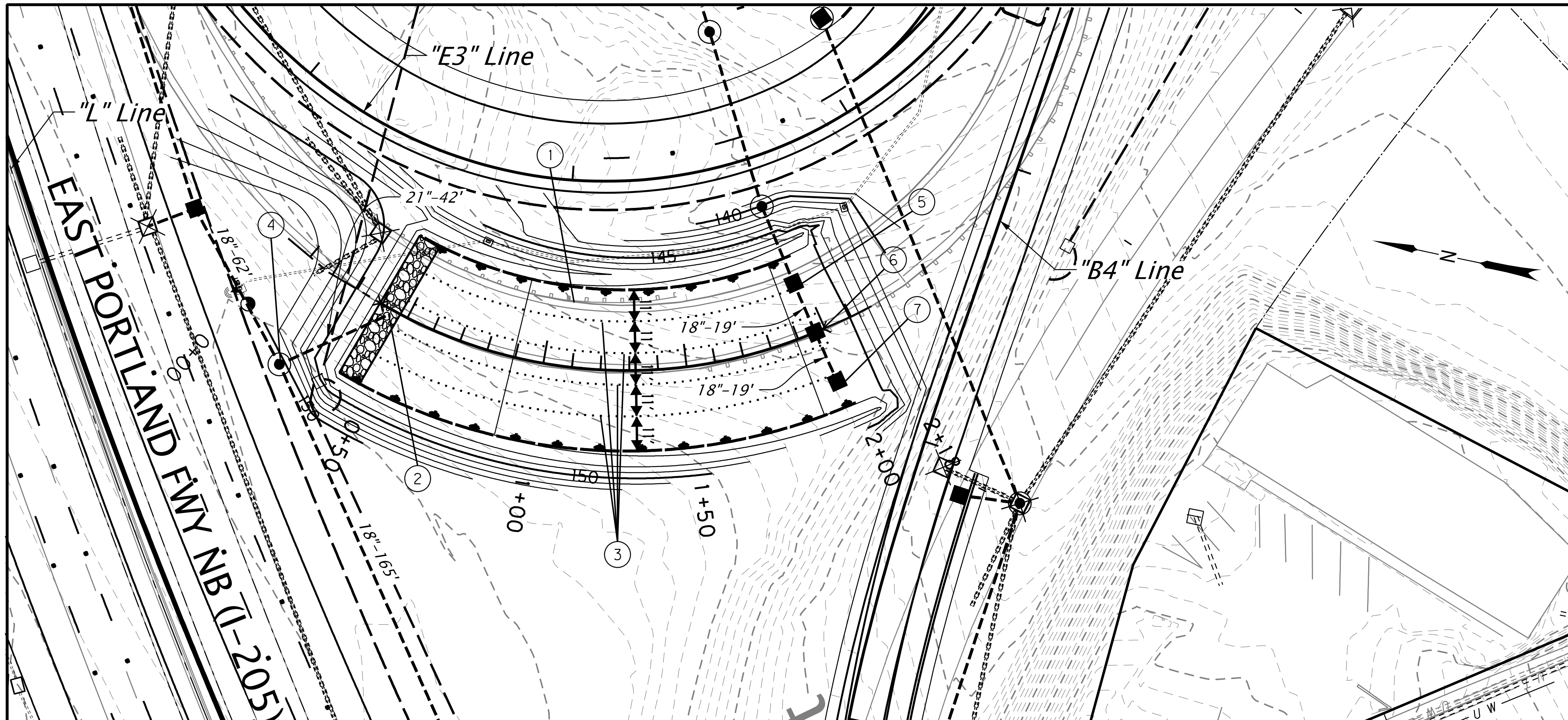
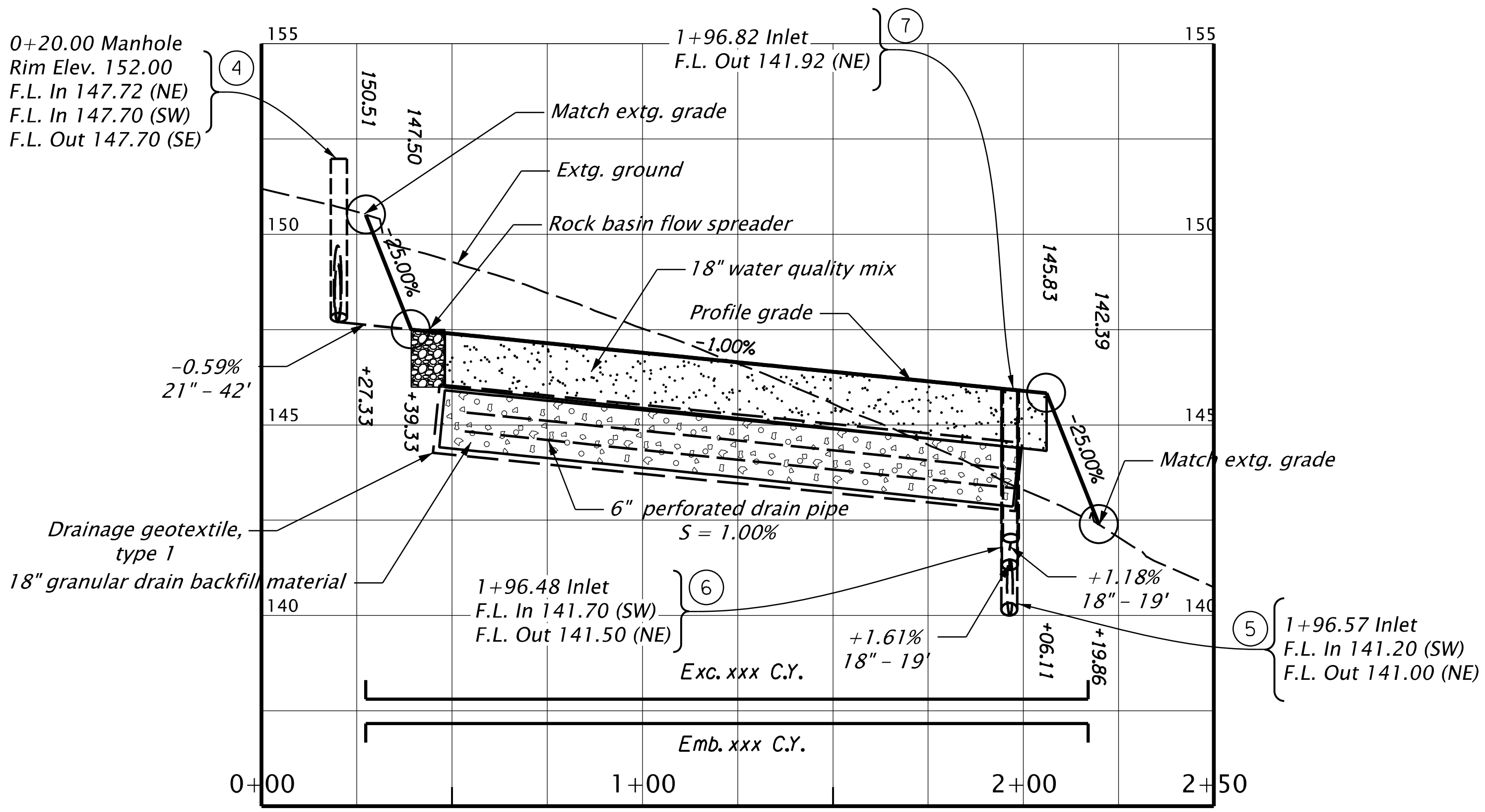
WATER QUALITY PLAN & PROFILE

SHEET NO. HA08

Rotation: 75.0253° Scale: 1"=50'
Vertical Scale: 1:10



1. Sta. 0+39.24 to Sta. 1+98.79 = Sta. "E3" 737+52.57, 56.87' Rt. to Sta. "E3" 738+66.37, 64.42' Rt.
   Construct biofiltration swale
   Inst. field facility marker (Type S2) - 2
   (For details, see sht. HA16)
2. Sta. 0+44.18, 0.00'
   Construct rock basin flow spreader
   Inst. 21" storm sew. pipe - 42'
   5' Depth
   (For details, see sht. HA16)
3. Construct biofiltration swale divider
   (For details, see sht. HAxx)
4. Sta. 0+20.00, 36.16' Rt.
   Const. pollution control manhole
   Inst. 18" storm sew. pipe - 62'
   5' Depth
   Inst. 18" storm sew. pipe - 165'
   5' Depth
5. Sta. 1+96.57, 18.41' Lt.
   Const. type "D" inlet
   Inst. 18" storm sew. pipe - 19'
   5' Depth
6. Sta. 1+96.48, 0.21' Rt.
   Const. type "D" inlet
   Inst. 18" storm sew. pipe - 19'
   5' Depth
7. Sta. 1+96.82, 18.86' Rt.
   Const. type "D" inlet



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CLACKAMAS COUNTY

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Drafter: Morgan Tholl	Checker: Christine Higgins

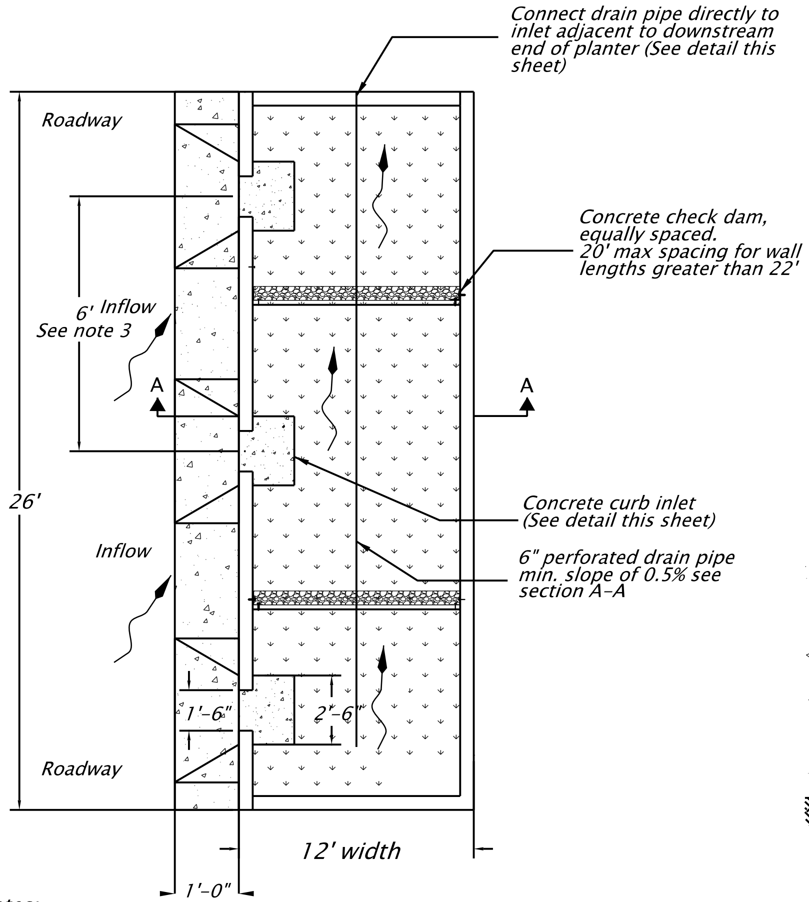
WATER QUALITY PLAN & PROFILE

SHEET NO.
HA09

272

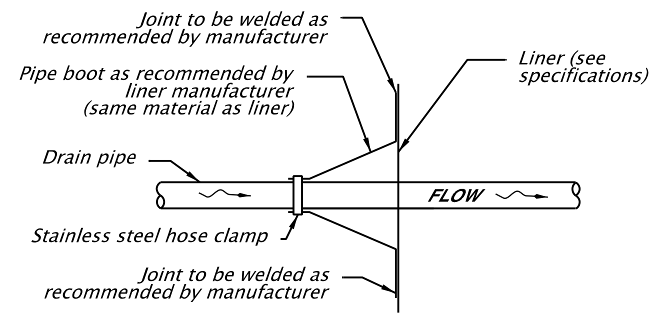
Rotation: 281.7947° Scale: 1"=50'
Vertical Scale: 1"=5'

S T O R M W A T E R   P L A N T E R

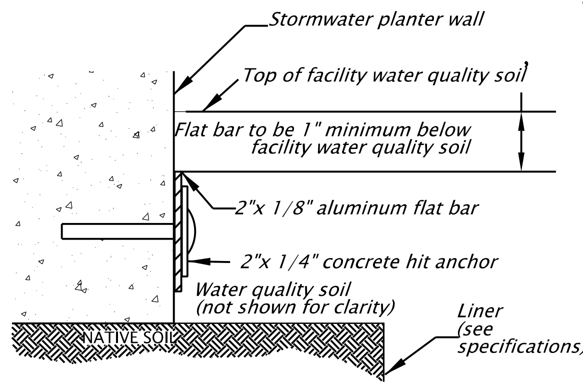


Notes:
1. Match longitudinal slope of planter to slope of the road.
2. If less than 18" is between splash pad and planter end wall, extend pad to wall.
3. Install inlets (6' on center) on all sides of facility that are adjacent to parking lot.

PLAN VIEW

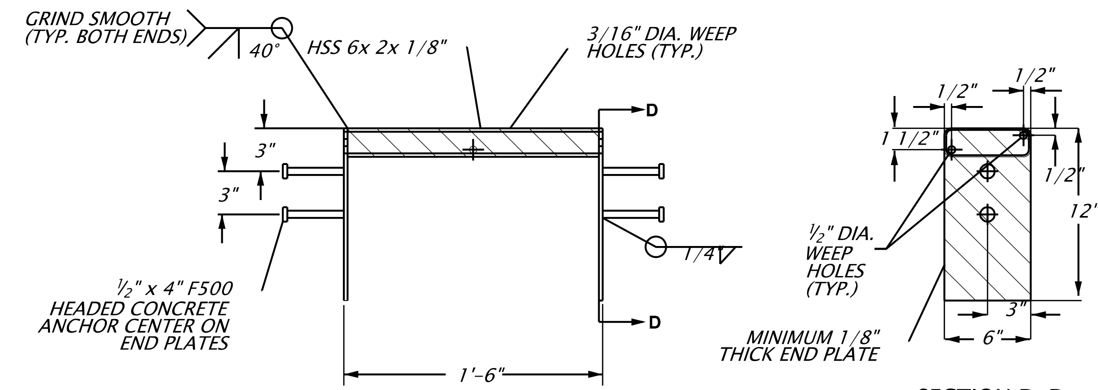


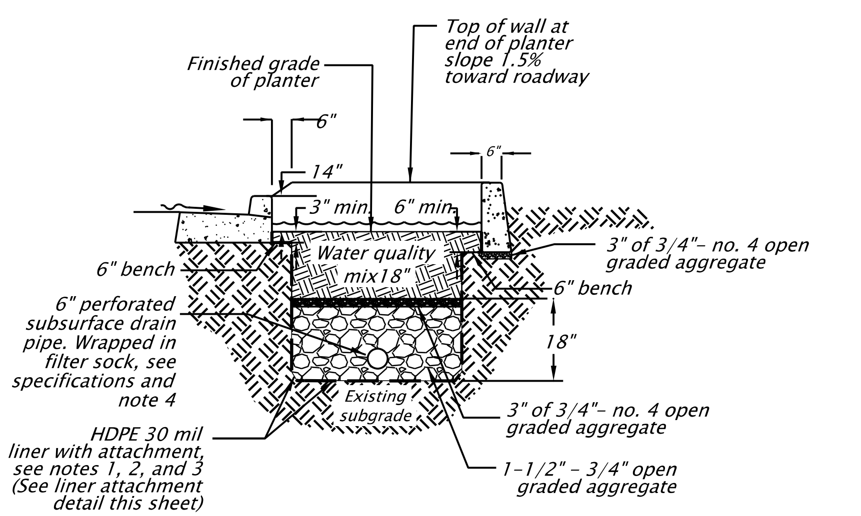
PIPE BOOT
NOT TO SCALE



Notes:
1. Adhere liner to concrete with top coat tc moldable sealant, or approved equal.
2. Liner to extend from top of water quality soil to the bottom of excavation.
3. 3" of concrete is required on all sides of attachment. Adjust sidewalk depth as necessary.
4. Secure liner to concrete with 2" aluminum flat bar, placed as directed (around entire facility).
5. Attach flat bar with concrete hit anchors, 24" o.c.
6. Trim excess liner to the top of the flat bar.

LINER ATTACHMENT DETAIL
NOT TO SCALE

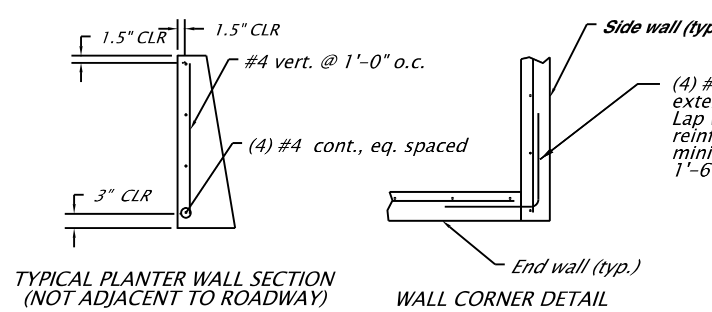




Notes:
1. Partial or full liner required. See stormwater planter table (this sheet) for requirement.
2. Partial liner located along side of planter adjacent to roadway.
3. Full liner located along all sides of planter.
4. Drain pipe only required for fully lined planters.
5. Scarify the native soil 12" following the initial excavation and before installing water quality soil and rock.

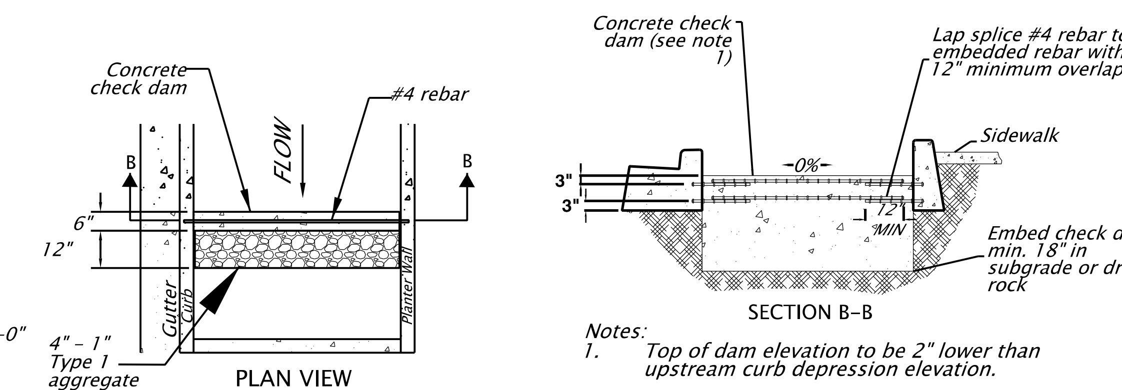
SECTION A-A

STORMWATER PLANTER DETAIL
NOT TO SCALE



Notes:
1. Top of planter walls to be 4" higher than adjacent sidewalk.
2. Bottom of planter walls to be 6" below top of water quality soil.

PLANTER WALL
NOT TO SCALE



Notes:
1. Top of dam elevation to be 2" lower than upstream curb depression elevation.
2. Concrete to be 3,000 psi.
3. Embed #4 rebar 3" into curb and planter wall.

CONCRETE CHECK DAM
NOT TO SCALE

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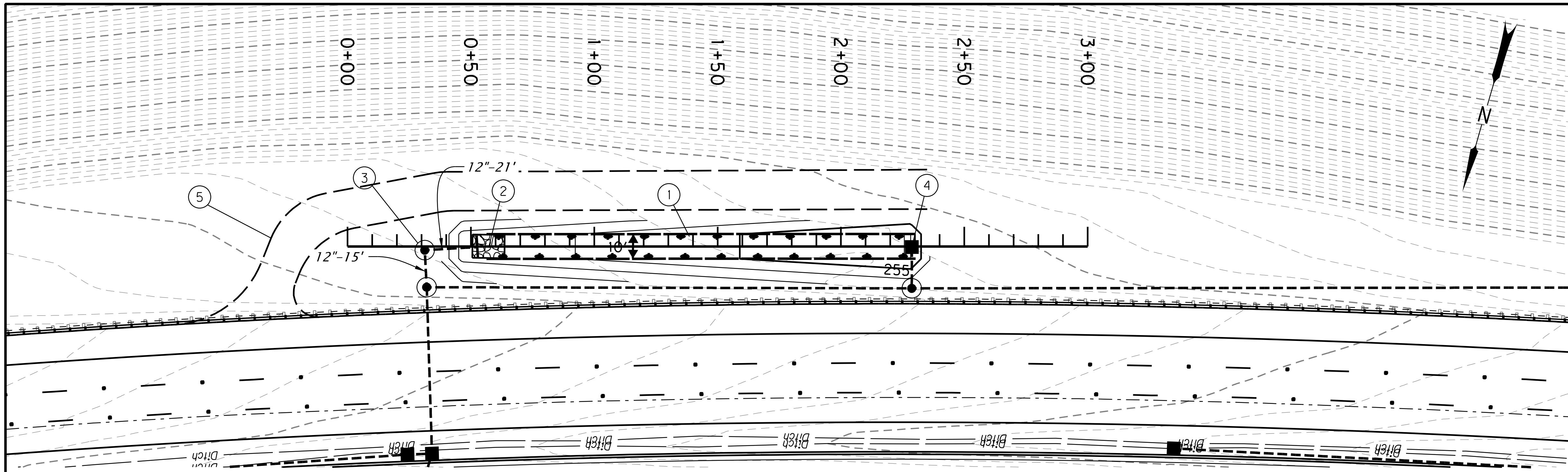
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

WATER QUALITY DETAILS
SHEET NO. HA10

Rotation: 0°   Scale: 1"=60'



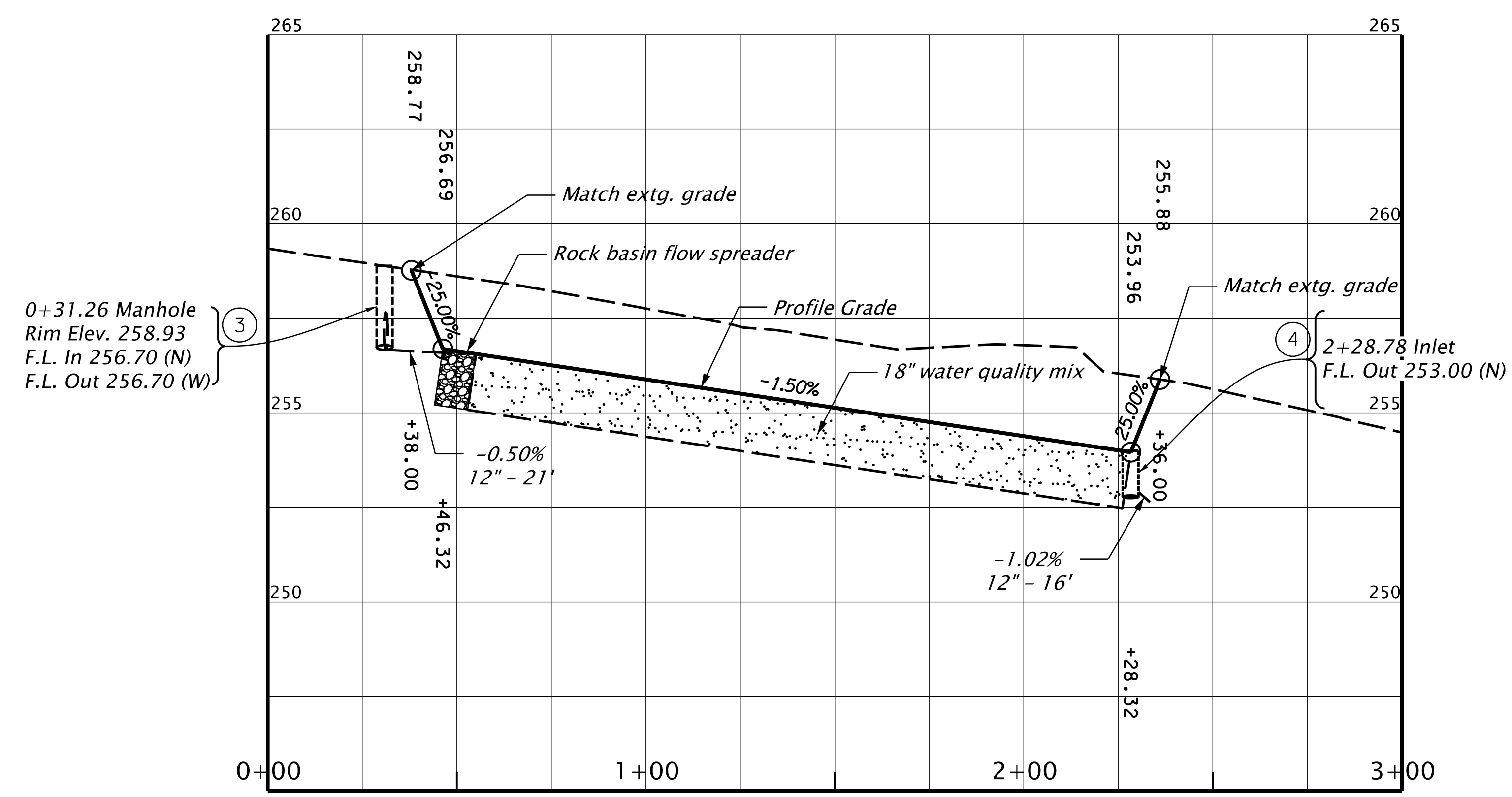
1. Sta. 0+56.01 to Sta. 2+30.32 =
Sta. "Ln" 812+11.63, 49.46' Lt. to
Sta. "Ln" 813+82.31, 47.34' Lt.
Construct bioretention swale
Inst. field facility marker (Type S2) - 2
(For details, see sht. HA16)

2. Sta. 0+57.34
Construct rock basin flow spreader
Inst. 12" storm sew. pipe - 21'
5' Depth
(For details, see sht. HA16)

3. Sta. 0+31.26, 1.40' Rt.
Const. pollution control manhole
Inst. 12" storm sew. pipe - 15'
5' Depth

4. Sta. 2+28.78, 0.00'
Const. type "D" inlet

5. Const. maintenance access road
Exc. - xx cu. yd.
Agg. base - xx ton
Subgrade geotextile - sq. yd.
(For details, see sht. HA17)



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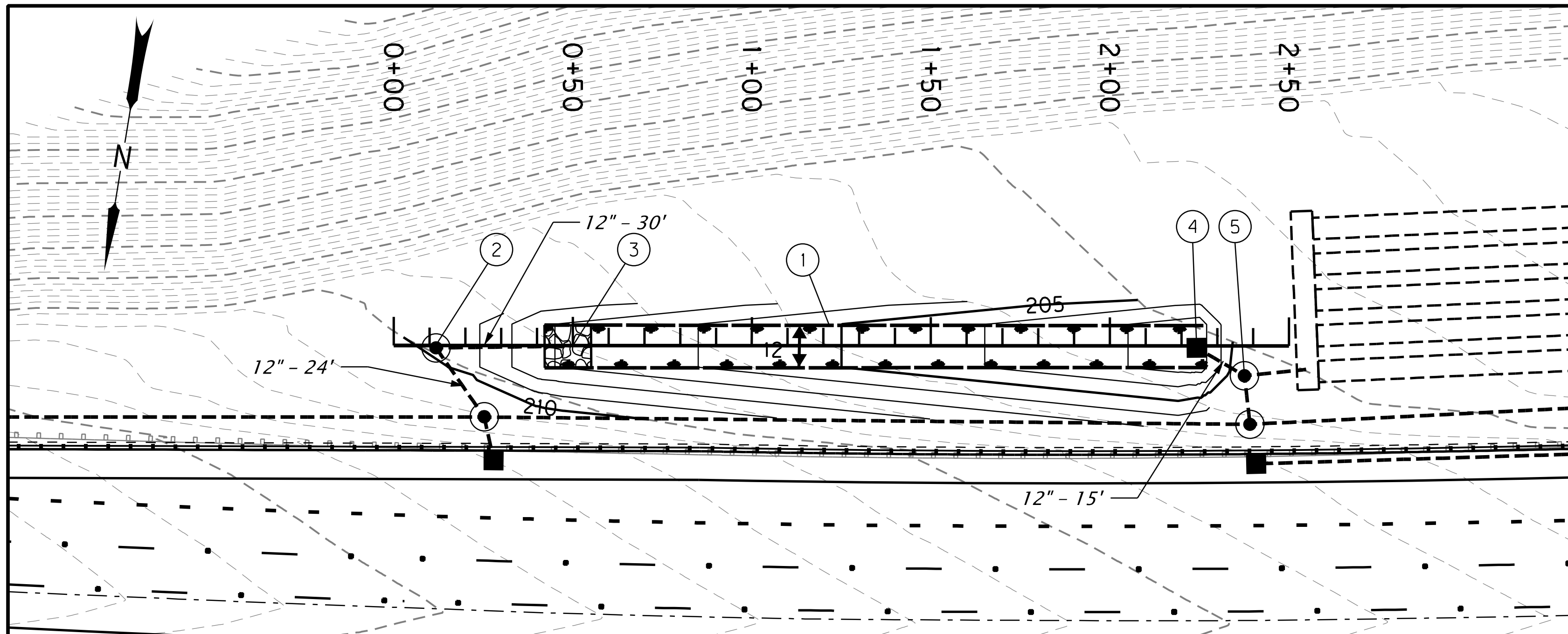
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

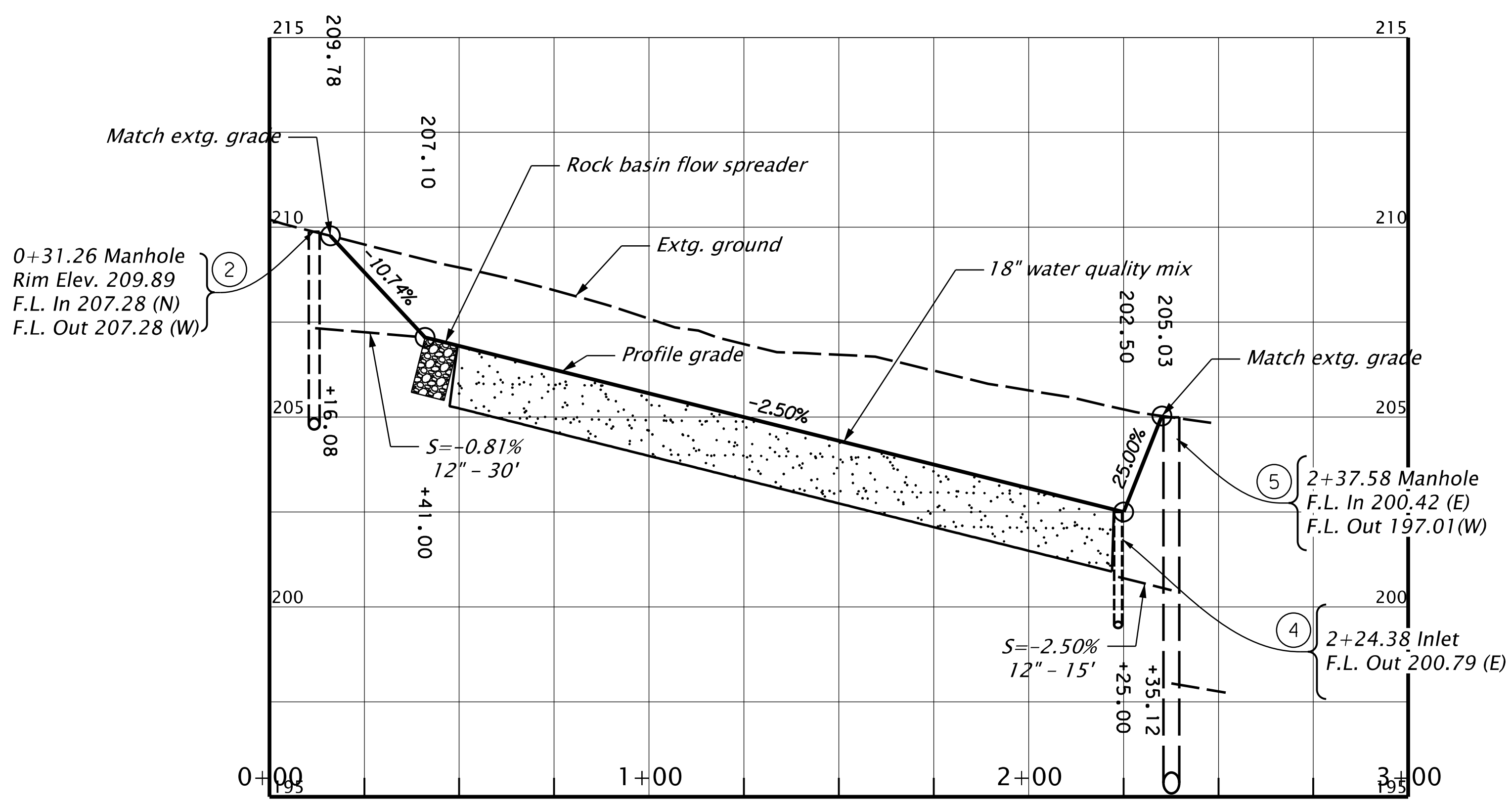
Designer: Cory Gieseke	Reviewer: Karen Tatman
Drafter: Morgan Tholl	Checker: Christine Higgins

WATER QUALITY PLAN & PROFILE

SHEET NO.
HA11

Rotation: 223.5514° Scale: 1"=50'
Vertical Scale: 1:10





1. *Sta. 0+41.77 to Sta 2+24.40 = Sta. "Ln2" 836+82.56, 60.48' Lt. to Sta. "Ln2" 838+59.54, 61. 72' Lt.*
   Construct biofiltration swale
   Inst. 12" storm sew. pipe - 30'
   5' Depth
   Inst. field facility marker (Type S2) - 2
   (For details, see sht. HA16)

2. *Sta. 0+31.26, 1.40' Rt.*
   Const. pollution control manhole
   Inst. 12" storm sew. pipe - 24'
   5' Depth

3. *Sta. 0+48.66*
   Construct rock basin flow spreader
   (For details, see sht. HA16)

4. *Sta. 2+24.38, 0.38' Rt.*
   Const. type "D" inlet

5. *Sta. 2+37.58, 8.32' Rt.*
   Const. diversion manhole
   Inst. 12" storm sew. pipe - 15'
   5' Depth

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CLACKAMAS COUNTY

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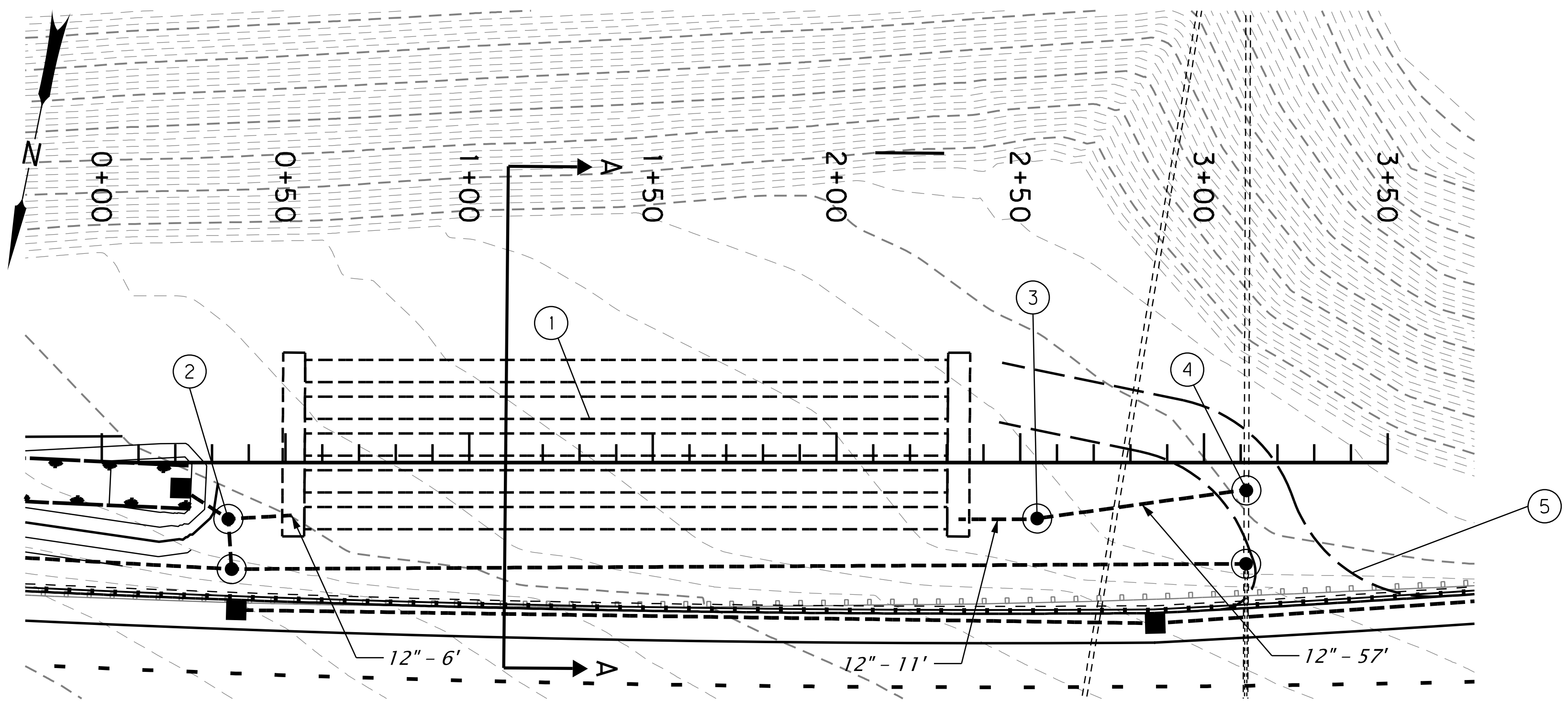
WATER QUALITY PLAN & PROFILE

SHEET NO. HA12

Rotation: 223.5514° Scale: 1"=50'
Vertical Scale: 1:10



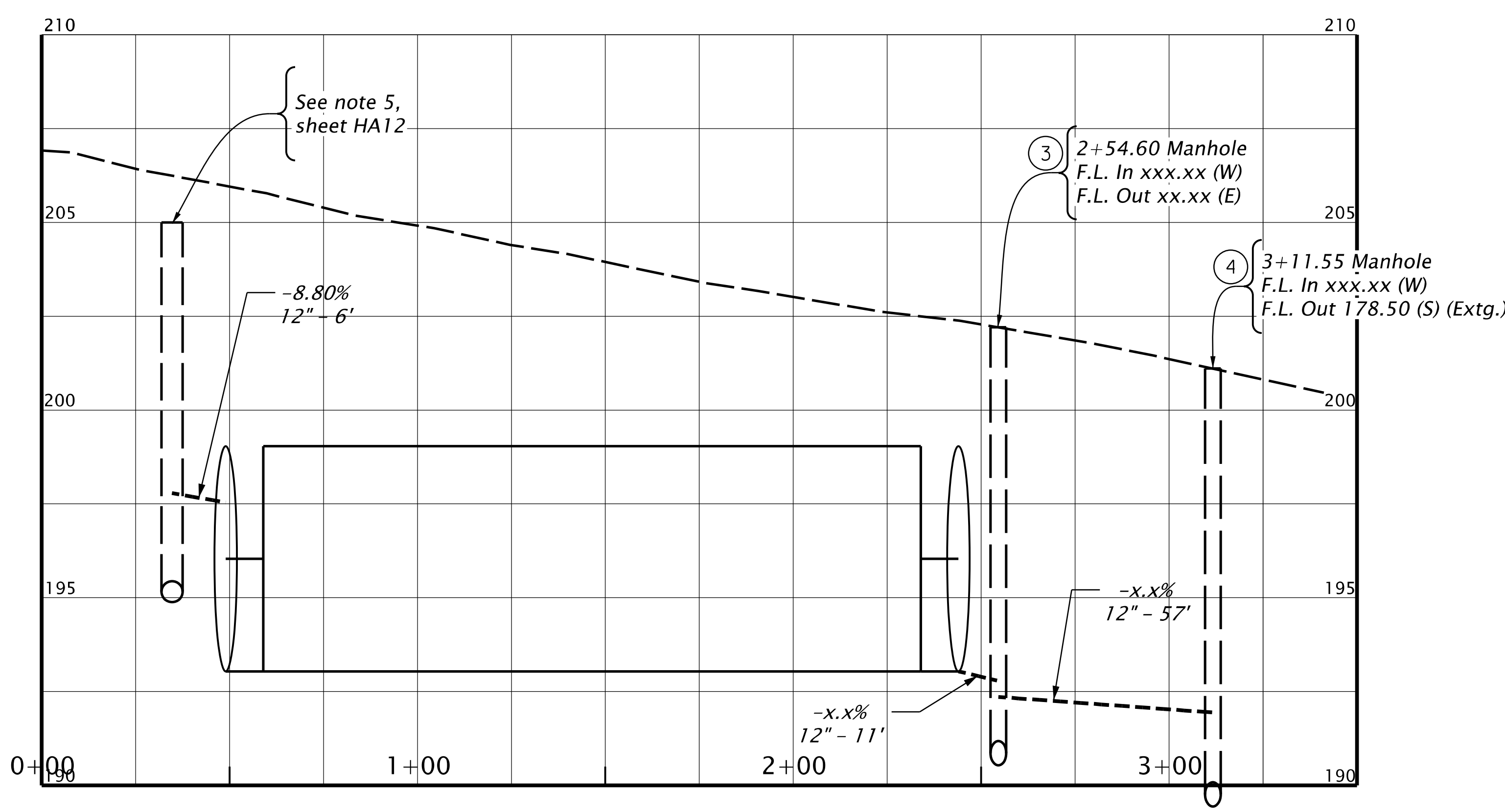
(1) Sta. 0+42.14 to Sta. 2+42.32 =
Sta. "Ln2" 838+80.48, 70.62' Lt. to
Sta "Ln2" 840+81.69, 75.39' Lt.
Const. underground detention system
Inst. 72" storm sew. pipe - 875'
20' Depth
Inst. field facility marker (Type S2) - 2

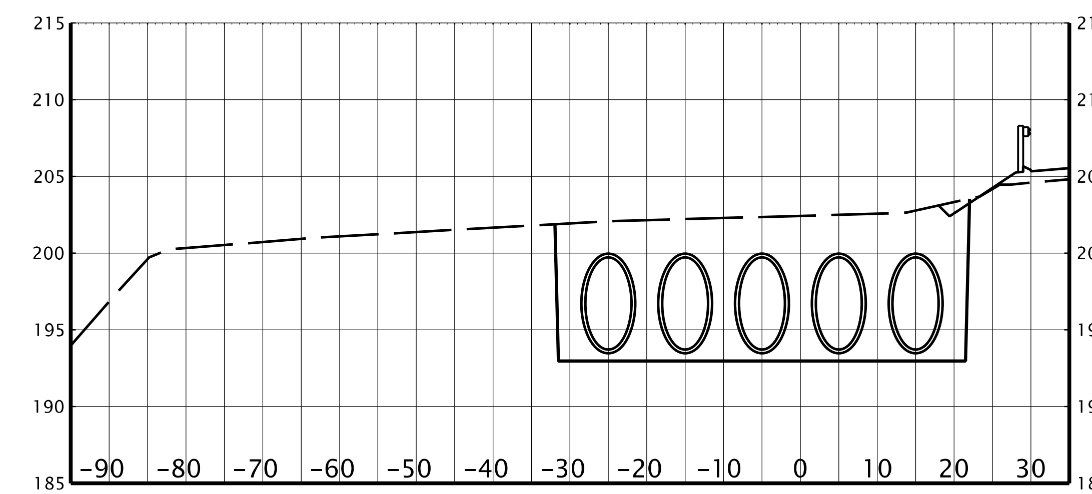
(2) See note 5, sht. HA12

(3) Sta. 2+54.60, 15.20' Rt.
Const. storm sew. manhole
Inst. 12" storm sew. pipe - 11'
10' Depth

(4) Sta. 3+11.55, 7.37' Rt.
Const. storm sew. manhole over existing pipe
Inst. 12" storm sew. pipe - 57'
20' Depth

(5) Const. maintenance access road
Exc. - xx cu. yd.
Agg. base - xx ton
Subgrade geotextile - sq. yd.
(For details, see sht. HA17)





SECTION A-A

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CLACKAMAS COUNTY

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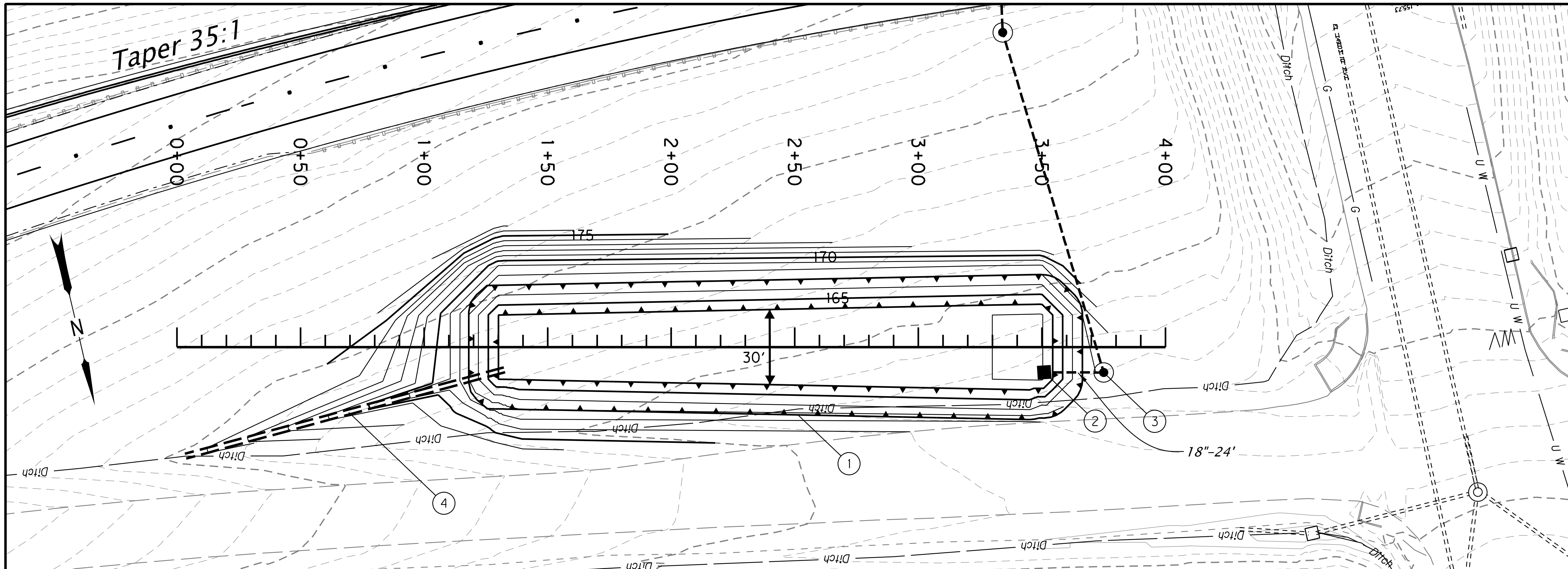
Drafter: Morgan Tholl | Checker: Christine Higgins

WATER QUALITY PLAN & PROFILE

SHEET NO. HA13

Rotation: 223.5514° Scale: 1"=50'
Vertical Scale: 1:10

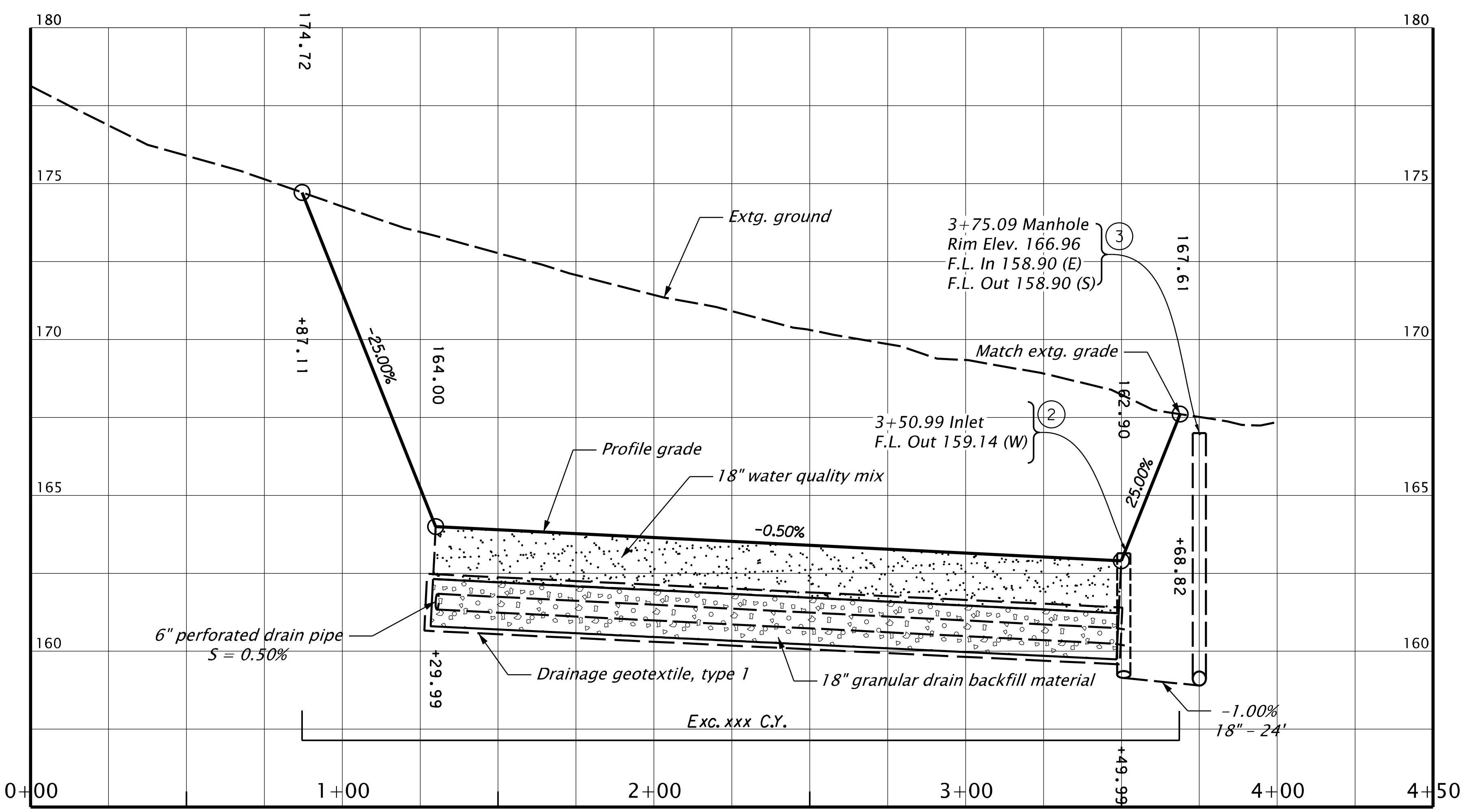


1. Sta. 1+18.08 to Sta. 3+66.37 =
Sta. "D2" 856+66.70, 60.41' Lt. to
Sta. "D2" 859+14.63, 48.14' Lt.
Construct bioretention pond
Inst. filed facility marker (Type S2) - 2
(For details, see sht. HA17)

2. Sta. 3+50.99, 10.15' Rt.
Const. water quality facility outlet structure
(For details, see sht. HA19)

3. Sta. 3+75.09, 9.97' Rt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 24'
10' Depth

Const. ditch



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EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

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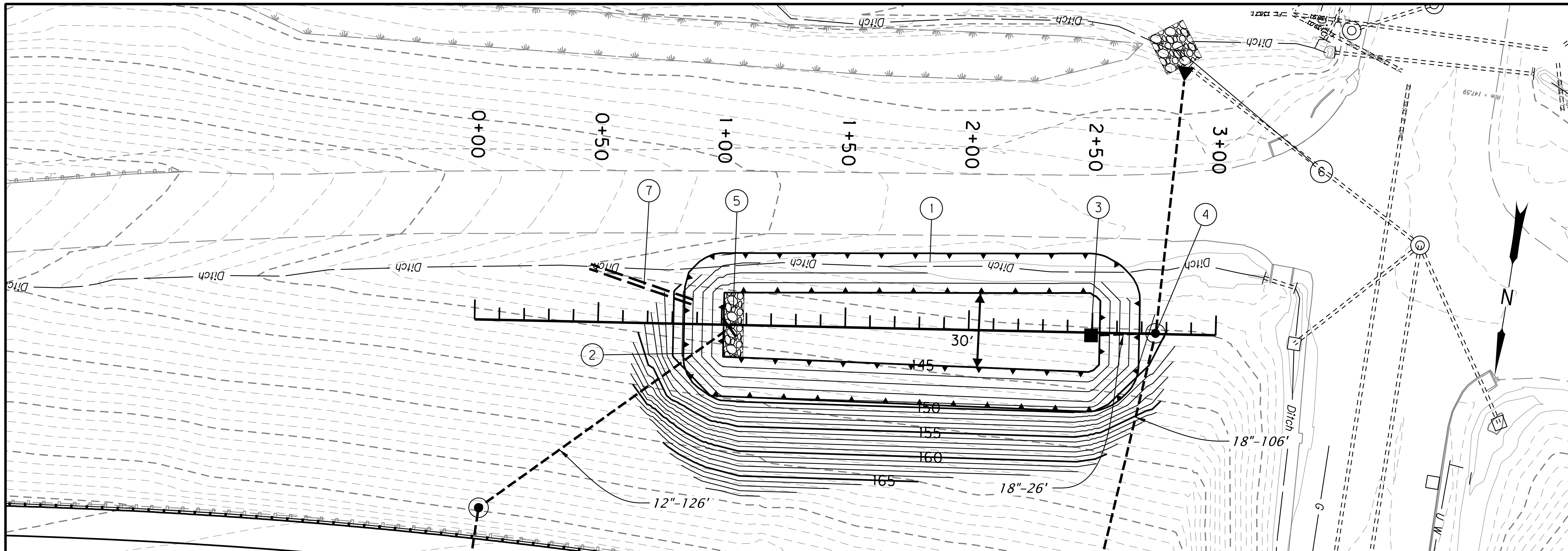
WATER QUALITY PLAN & PROFILE

SHEET NO. HA14

Rotation: 223.5514° Scale: 1"=50'
Vertical Scale: 1:10



1. Sta. 0+84.80 to Sta. 2+69.05 =
Sta. "A2" 859+06.98, 45.55' Rt. to
Sta. "A2" 860+91.75, 46.62' Rt.
Construct bioretention pond
Inst. field facility marker (Type S2) - 2
(For details, see sht. HA17)

2. Sta. 0+89.08, 11.96' Rt.
Inst. 12" storm sew. pipe - 126'
20' Depth

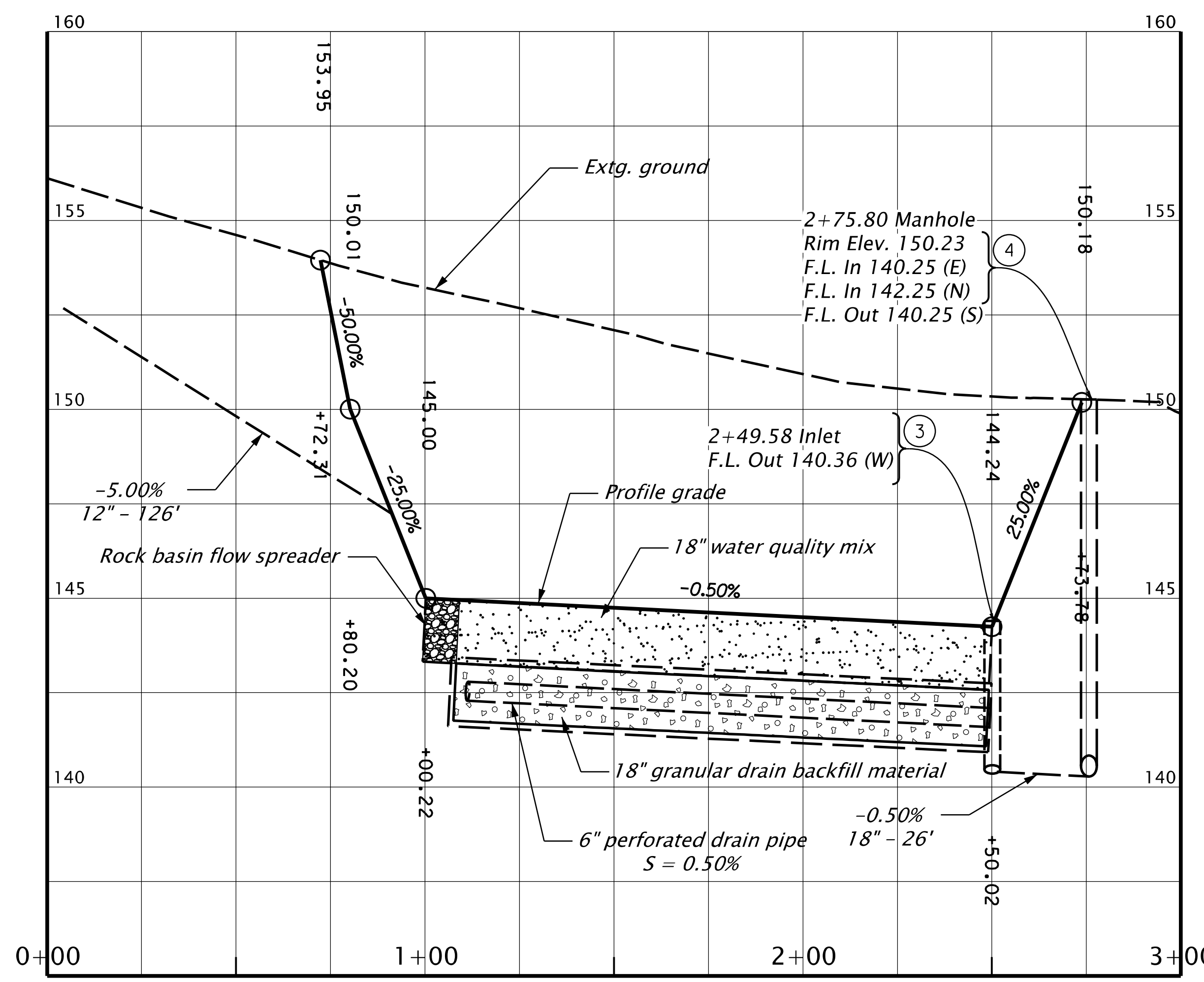
3. Sta. 2+49.58, 1.05' Rt.
Const. water quality facility outlet structure
(For details, see sht. HA19)

4. Sta. 2+75.80, 0.29' Lt.
Const. storm sew. manhole
Inst. 18" storm sew. pipe - 26'
5' Depth
Inst. 18" storm sew. pipe - 106'
10' Depth

5. Sta. 1+02.00
Const. rock basin flow spreader
(For details see sht. HA16)

6. Sta. 2+81.68, 115.50' Lt.
Const. rock basin flow spreader
(For details see sht. HA16)

7. Const. ditch



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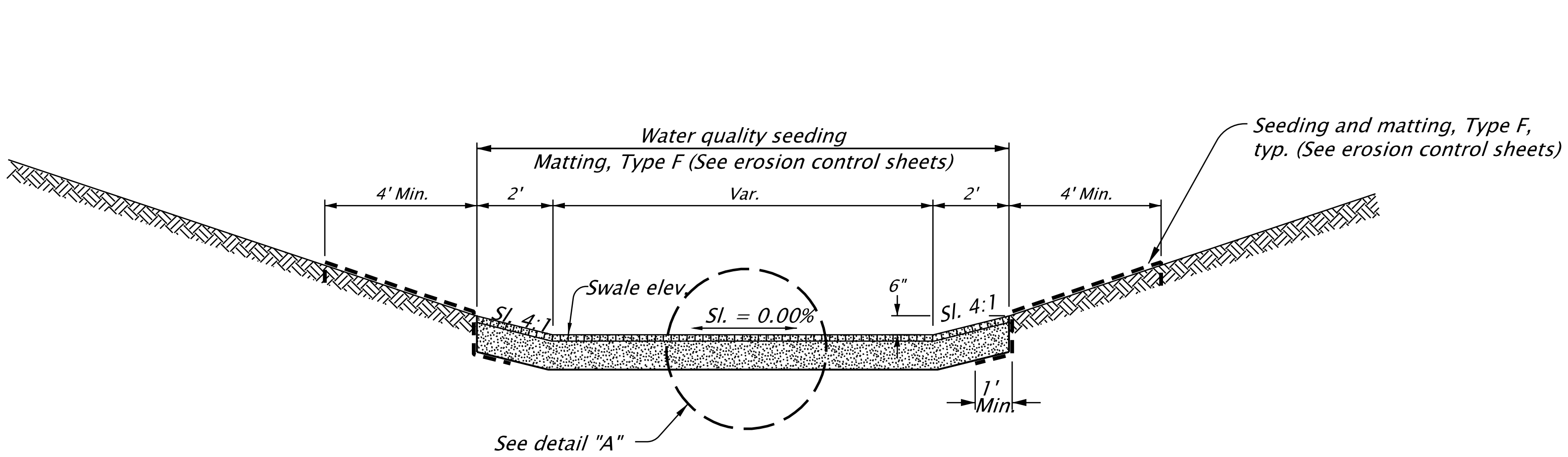
EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

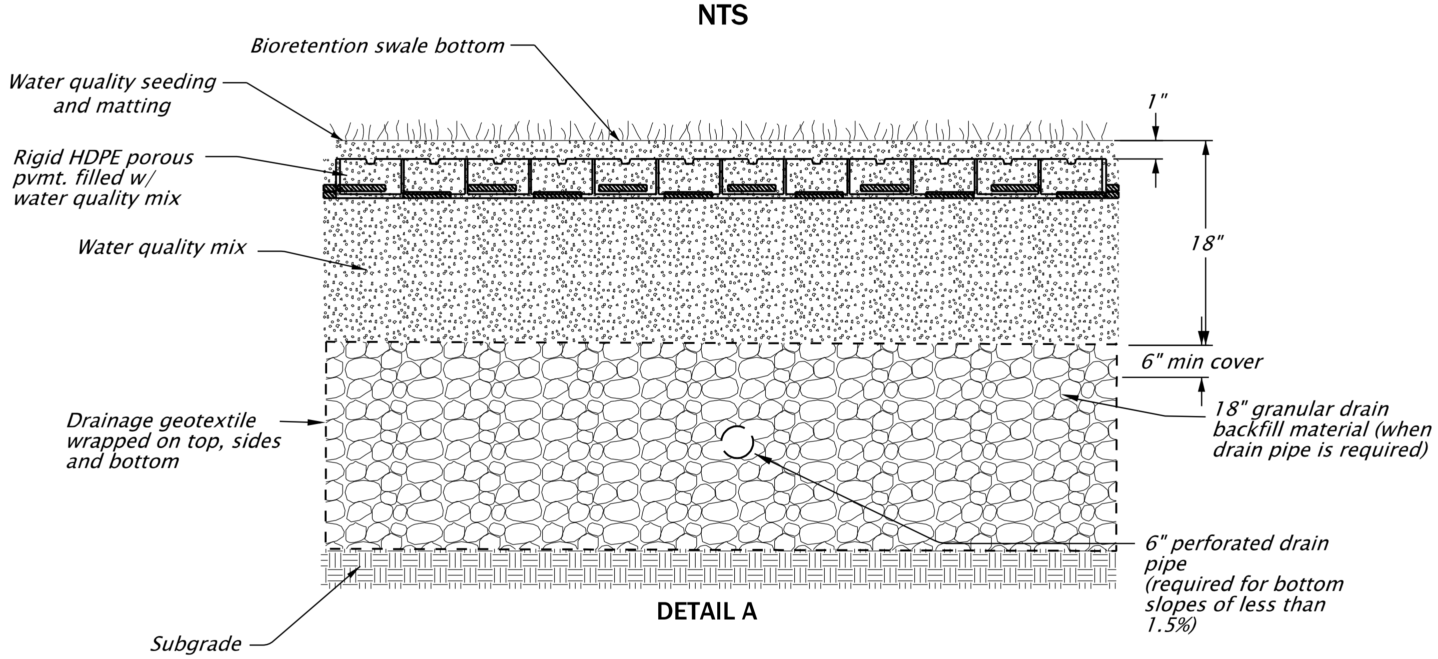
WATER QUALITY PLAN & PROFILE

SHEET NO. HA15

Rotation: 223.5514° Scale: 1"=50'
Vertical Scale: 1:10



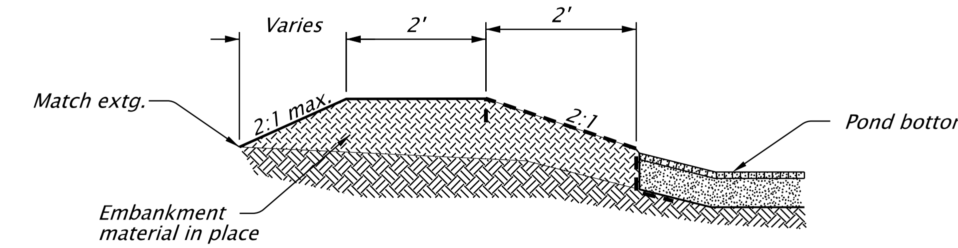
BIOFILTRATION SWALE
NTS



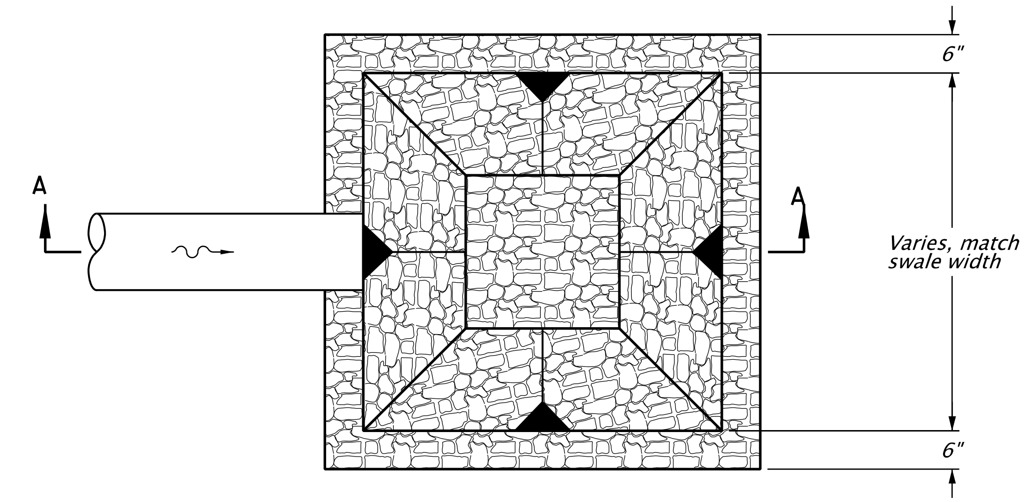
DETAIL A

BIOFILTRATION SWALE TABLE

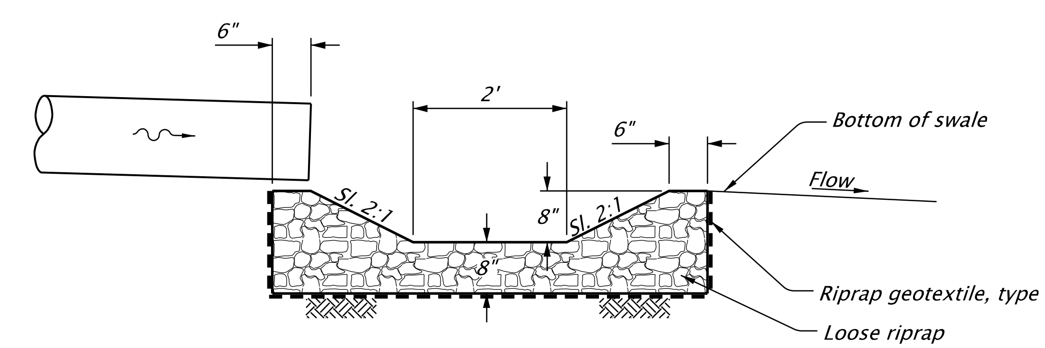
Station	Facility DFI	Biofiltration Swale Bottom Width (feet)	Biofiltration Swale Bottom Length (feet)
"99E2" 108+94.90 to "99E2" 110+06.66	#	10	220
"99E2" 114+24.15 to "99E2" 115+28.87	#	10	220
"OR43" 10+12.40 to "OR43" 8+77.47	#	30	226
"A2" 859+06.98 to "A2" 860+91.75	#	40	205
"L" 691+52.97 to "L" 688+85.28	#	10	183
"D2" 856+66.70 to "D2" 859+14.63	#	30	220
"A2" 859+06.98 to "A2" 860+91.75	#	30	150



BIORETENTION POND BERM
NTS



ROCK BASIN FLOW SPREADER
NTS



SECTION A-A

REGISTERED PROFESSIONAL ENGINEER
93360PE
OREGON
MAY 13, 2018
CORY M. GIESEKE
PRELIMINARY COPY
INFORMATION ONLY
EXPIRES 06/30/2021

HDR ENGINEERING, INC
1050 SW 6TH AVENUE, SUITE 1800
PORTLAND, OR 97204-1134
503.423.3700

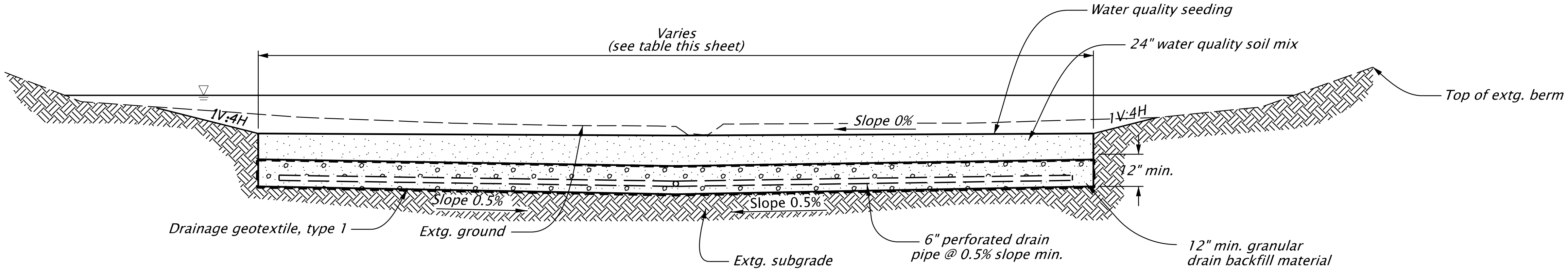
I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer:
Reviewer:
Drafter:
Checker:

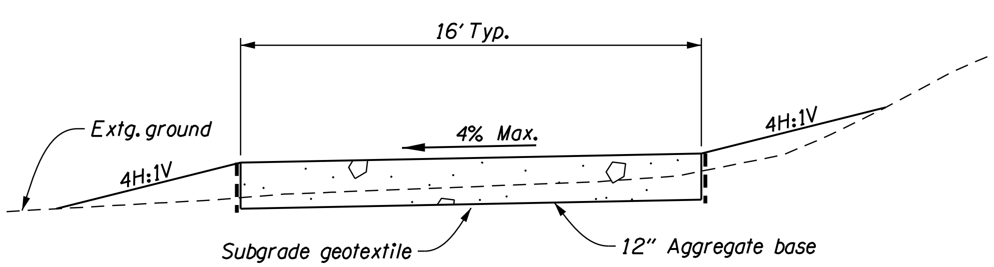
WATER QUALITY DETAILS

SHEET NO.
HA16



BIORETENTION POND SECTION
Scale: NTS

BIORETENTION POND TABLE			
Station	*Facility DFI*	*Bioretention Pond Bottom Width (feet)*	*Bioretention Pond Length (feet)*
"L" 665+46.16 to "L" 663+50.02	*#*	*10*	*120*
"L" 691+52.97 to "L" 688+85.28	*#*	*10*	*183*
"D2" 856+66.70 to "D2" 859+14.63	*#*	*30*	*220*
"A2" 859+06.98 to "A2" 860+91.75	*#*	*30*	*150*



MAINTENANCE ACCESS ROAD SECTION
NTS

REGISTERED PROFESSIONAL ENGINEER
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OREGON DEPARTMENT OF TRANSPORTATION

I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke
Reviewer: Karen Tatman
Drafter: Morgan Tholl
Checker: Christine Higgins

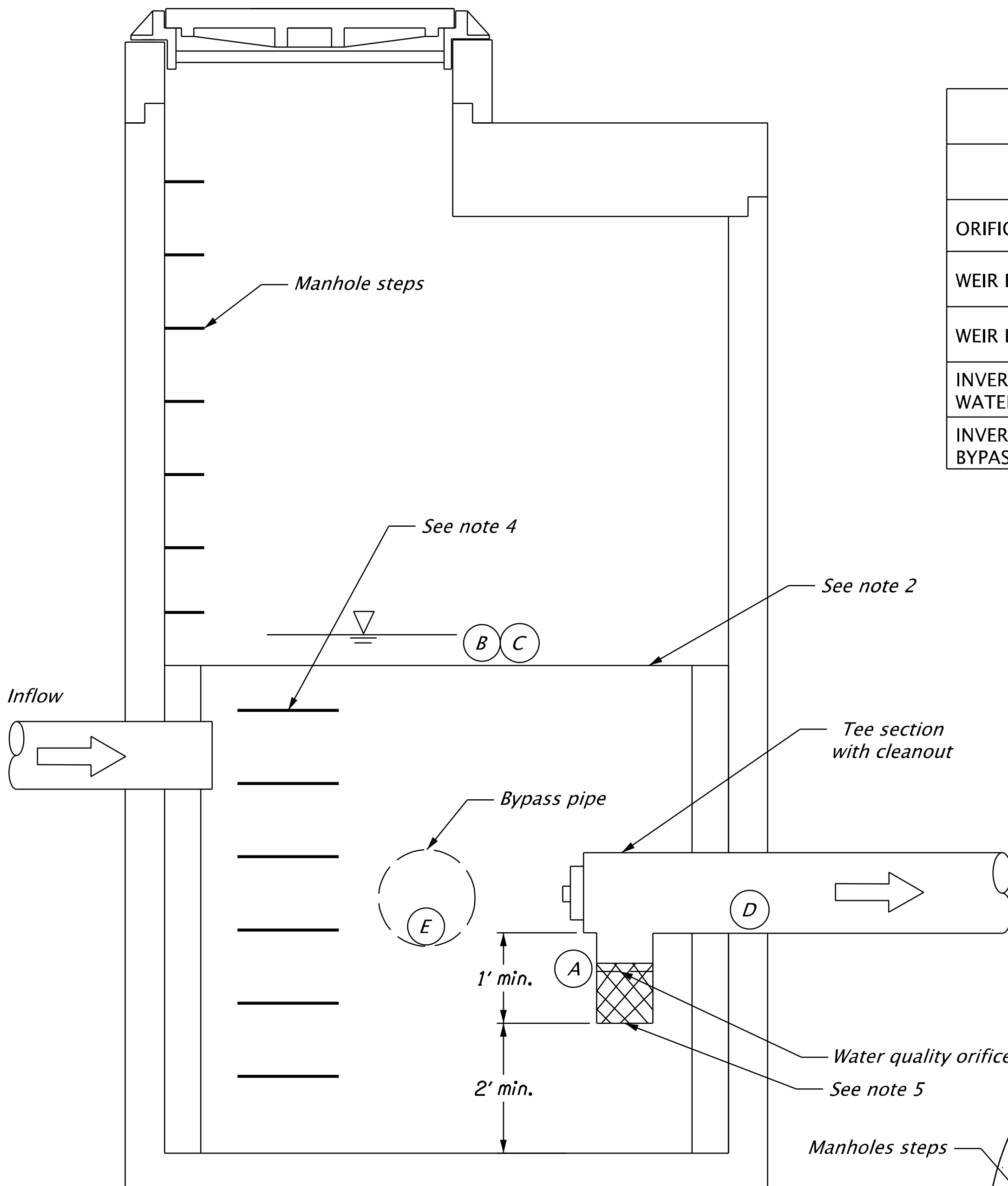
WATER QUALITY DETAILS

SHEET NO.
HA17

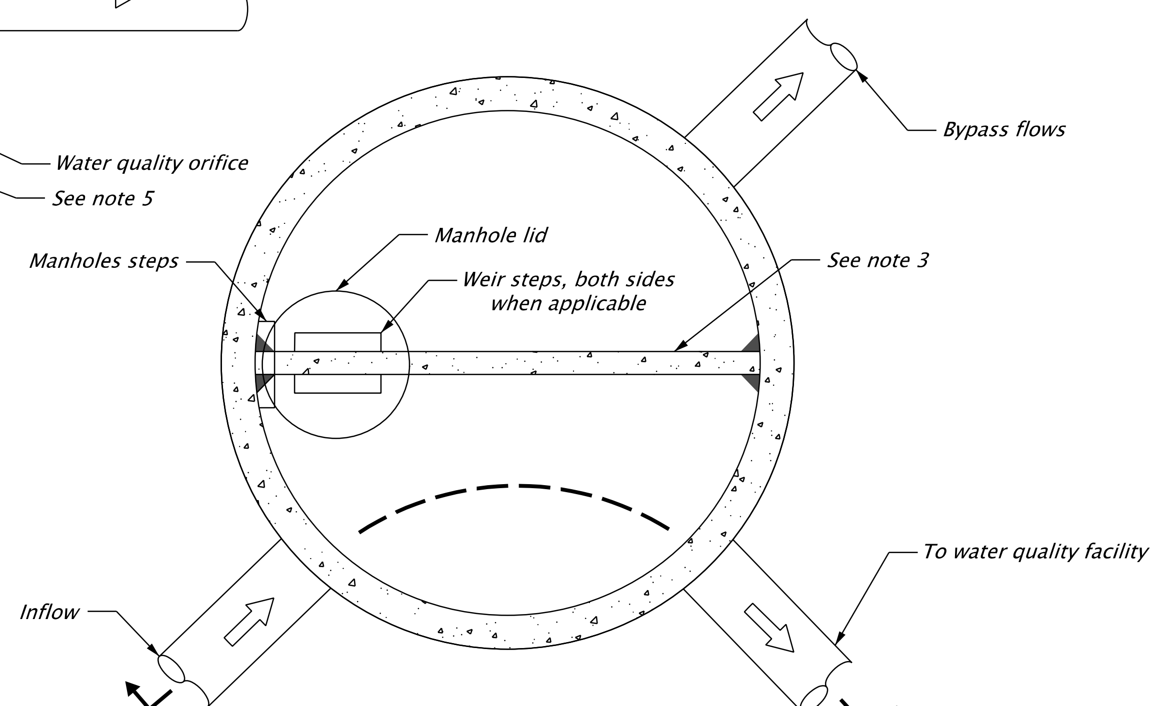
Rotation: 0° Scale: Full Size 1=1

DIVERSION MANHOLE

DESCRIPTION	LETTER	WQF#3 VALUE	WQF#4 VALUE	WQF#5 VALUE	WQF#6 VALUE	WQF#7 VALUE	WQF#8 VALUE	WQF#11 VALUE	WQF#12 VALUE
ORIFICE DIAMETER	A	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed
WEIR ELEVATION	B	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed
WEIR LENGTH	C	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed
INVERT OF OUTLET PIPE TO WATER QUALITY FACILITY	D	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed
INVERT OF HIGH FLOW BYPASS OUTLET PIPE	E	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed	To Be Developed



SECTION A-A
N.T.S.



PLAN
N.T.S.

GENERAL NOTES:

1. *Manhole structure 72 in. min. dia.*
2. *4 in . min. thickness reinforced concrete weir.*
3. *Weir shall be grouted to manhole stucture (both ends)*
4. *Provide weir steps when height of weir is greater than 36 inches, both sides*
5. *Water quality orifice screening. The wire cloth strainer assembly should be secured to pipe with a stainless steel hose clamp. Orifice screening must contain mulitple openings that are equal to or less than the orifice diameter.*
6. *Include tracer wire as shown in Standard Drawing RD336.*

REGISTERED PROFESSIONAL ENGINEER
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OREGON
MAY 13, 2018
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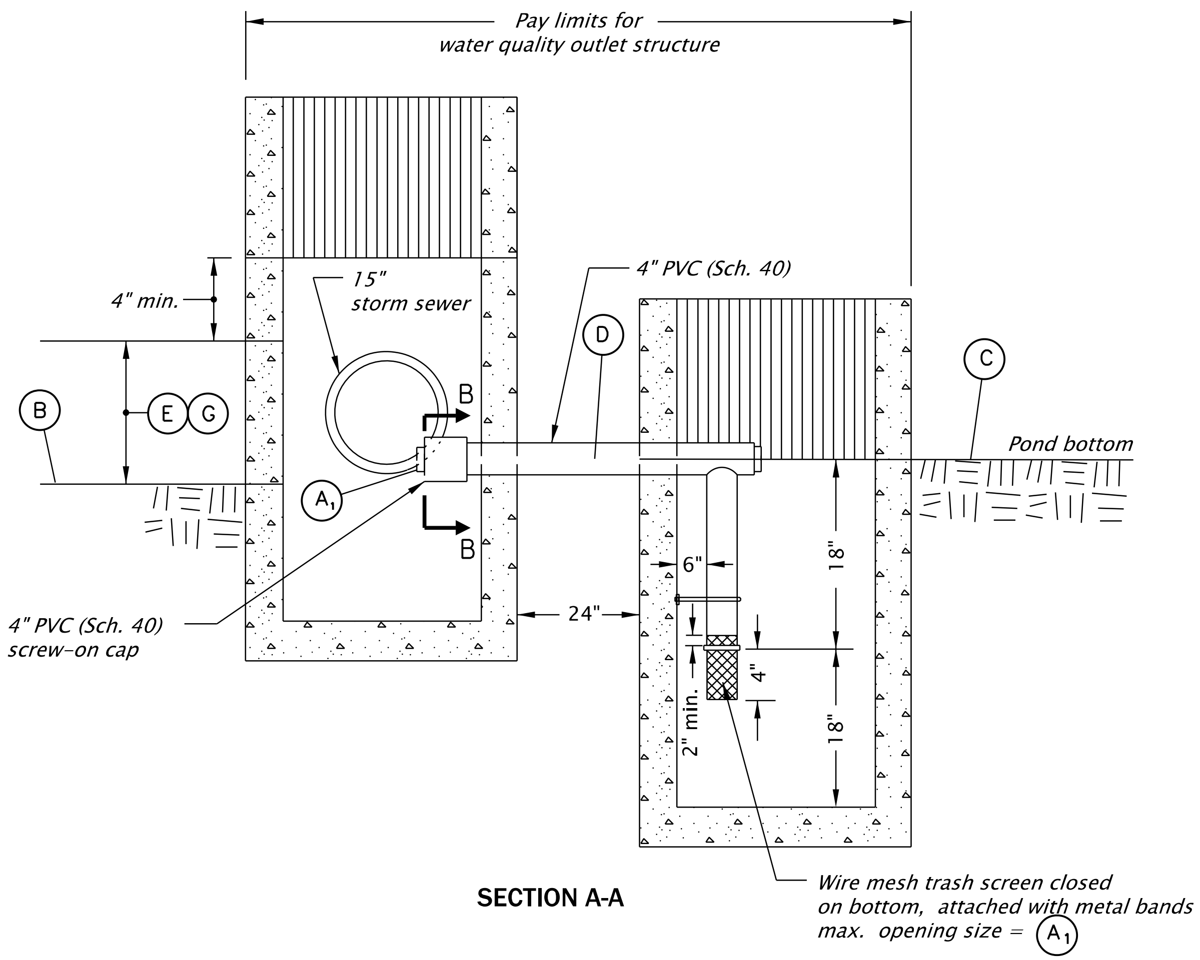
I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

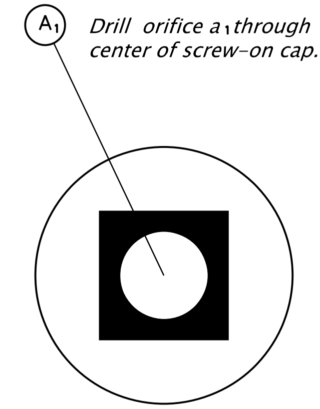
Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

WATER QUALITY DETAILS | SHEET NO. HA18

WATER QUALITY OUTLET STRUCTURE

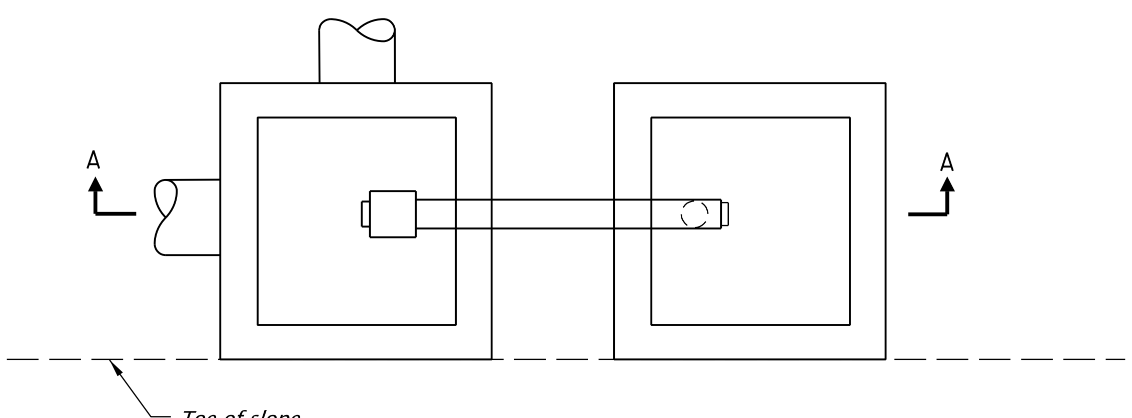


SECTION A-A



SECTION B-B

Letter	Value (inch)	Description
A_1	*To Be Developed*	*Orifice diameter*
A_2	*To Be Developed*	*Elev. of center of orifice*
B	*To Be Developed*	*Elev. of pond bottom*
C	*To Be Developed*	*Elev. of lip of inlet*
D	*To Be Developed*	*F.L. elev. of 4" PVC*
E	*To Be Developed*	*Pond design depth*
F	*To Be Developed*	*F.L. elev. of outfall pipe*
G	*To Be Developed*	*Pond design volume*
H	*To Be Developed*	*Elev. of lip of inlet*



PLAN

POND BOTTOM

REGISTERED PROFESSIONAL ENGINEER
93360PE
OREGON
MAY 13, 2018
CORY M. GIESEKE
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I-205: I-5 - OR213, PHASE 1 SEC.

EAST PORTLAND FREEWAY
CLACKAMAS COUNTY

Designer: Cory Gieseke | Reviewer: Karen Tatman
Drafter: Morgan Tholl | Checker: Christine Higgins

WATER QUALITY DETAILS

SHEET NO. HA19

Rotation: 0° Scale: Full Size 1=1

Appendix D. NRCS Soil Survey Report and Draft Infiltration Testing Memo

United States Department of Agriculture

NRCS

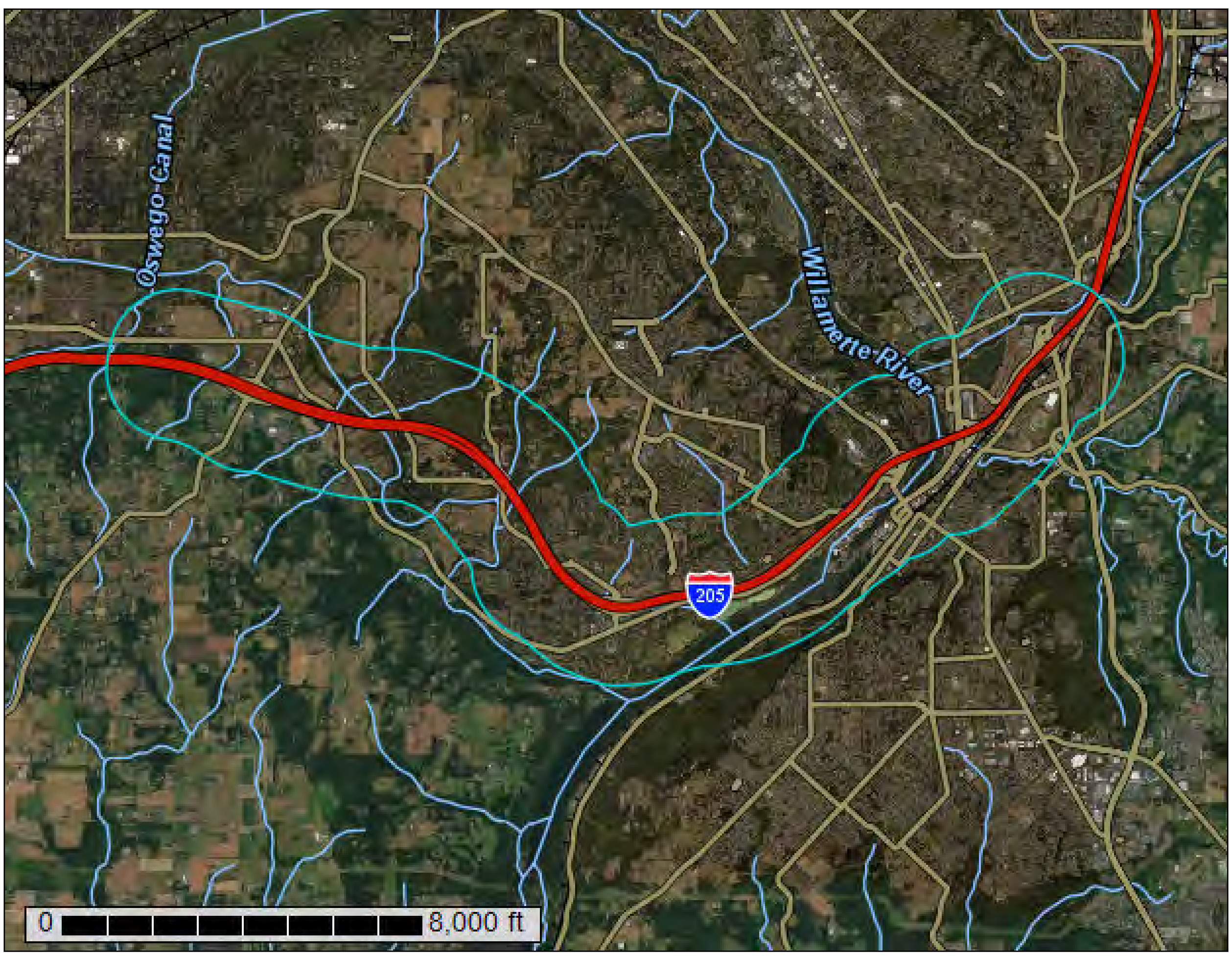
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Clackamas County Area, Oregon

I-205 Abernethy to Stafford Widening



August 8, 2017

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

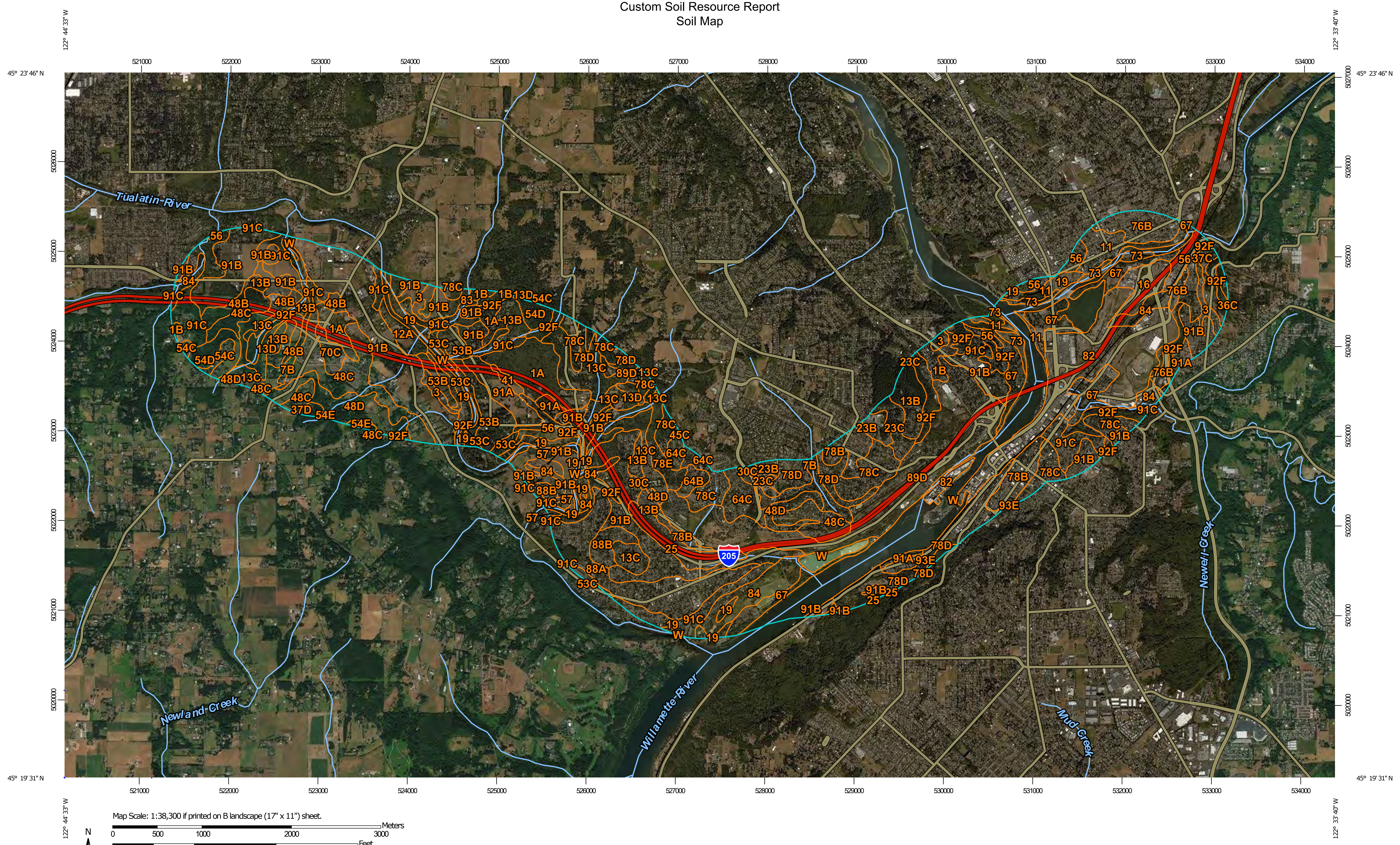
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:38,300 if printed on B landscape (17" x 11") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 1500, 3000, 6000, 9000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clackamas County Area, Oregon
Survey Area Data: Version 11, Sep 16, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 8, 2010—Sep 13, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Clackamas County Area, Oregon (OR610)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
1A	Aloha silt loam, 0 to 3 percent slopes	161.9	2.7%
1B	Aloha silt loam, 3 to 6 percent slopes	34.9	0.6%
3	Amity silt loam	51.2	0.8%
7B	Borges silty clay loam, 0 to 8 percent slopes	47.0	0.8%
11	Camas gravelly sandy loam	78.0	1.3%
12A	Canderly sandy loam, 0 to 3 percent slopes	29.1	0.5%
13B	Cascade silt loam, 3 to 8 percent slopes	130.4	2.2%
13C	Cascade silt loam, 8 to 15 percent slopes	134.6	2.2%
13D	Cascade silt loam, 15 to 30 percent slopes	53.4	0.9%
16	Chehalis silt loam	50.7	0.8%
19	Cloquato silt loam	113.2	1.9%
23B	Cornelius silt loam, 3 to 8 percent slopes	30.8	0.5%
23C	Cornelius silt loam, 8 to 15 percent slopes	48.2	0.8%
25	Cove silty clay loam	63.3	1.0%
30C	Delena silt loam, 3 to 12 percent slopes	9.9	0.2%
36C	Hardscrabble silt loam, 7 to 20 percent slopes	0.0	0.0%
37C	Helvetia silt loam, 8 to 15 percent slopes	51.0	0.8%
37D	Helvetia silt loam, 15 to 30 percent slopes	7.9	0.1%
41	Huberly silt loam	8.3	0.1%
45C	Jory silty clay loam, 8 to 15 percent slopes	0.7	0.0%
48B	Kinton silt loam, 3 to 8 percent slopes	67.3	1.1%
48C	Kinton silt loam, 8 to 15 percent slopes	247.5	4.1%
48D	Kinton silt loam, 15 to 30 percent slopes	125.4	2.1%
53B	Latourell loam, 3 to 8 percent slopes	94.8	1.6%

Clackamas County Area, Oregon (OR610)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
53C	Latourell loam, 8 to 15 percent slopes	37.2	0.6%
54C	Laurelwood silt loam, 8 to 15 percent slopes	16.3	0.3%
54D	Laurelwood silt loam, 15 to 30 percent slopes	62.1	1.0%
54E	Laurelwood silt loam, 30 to 60 percent slopes	6.5	0.1%
56	McBee silty clay loam	74.6	1.2%
57	McBee variant loam	35.5	0.6%
64B	Nekia silty clay loam, 2 to 8 percent slopes	17.7	0.3%
64C	Nekia silty clay loam, 8 to 15 percent slopes	61.0	1.0%
67	Newberg fine sandy loam	189.0	3.1%
70C	Powell silt loam, 8 to 15 percent slopes	23.5	0.4%
73	Riverwash	39.8	0.7%
76B	Salem silt loam, 0 to 7 percent slopes	89.8	1.5%
78B	Saum silt loam, 3 to 8 percent slopes	110.0	1.8%
78C	Saum silt loam, 8 to 15 percent slopes	229.2	3.8%
78D	Saum silt loam, 15 to 30 percent slopes	157.1	2.6%
78E	Saum silt loam, 30 to 60 percent slopes	39.9	0.7%
82	Urban land	363.1	6.0%
83	Wapato silt loam	6.5	0.1%
84	Wapato silty clay loam	146.1	2.4%
88A	Willamette silt loam, wet, 0 to 3 percent slopes	192.6	3.2%
88B	Willamette silt loam, wet, 3 to 7 percent slopes	42.8	0.7%
89D	Witzel very stony silt loam, 3 to 40 percent slopes	439.2	7.3%
91A	Woodburn silt loam, 0 to 3 percent slopes	88.6	1.5%
91B	Woodburn silt loam, 3 to 8 percent slopes	779.4	12.9%
91C	Woodburn silt loam, 8 to 15 percent slopes	283.3	4.7%
92F	Xerochrepts and Haploxerolls, very steep	287.0	4.7%
93E	Xerochrepts-Rock outcrop complex, moderately steep	115.8	1.9%

Clackamas County Area, Oregon (OR610)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
W	Water	477.5	7.9%
Totals for Area of Interest		**6,050.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Clackamas County Area, Oregon

1A—Aloha silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 223l
Elevation: 150 to 400 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Aloha and similar soils: 85 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Aloha

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 51 inches: silt loam
H3 - 51 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Other vegetative classification: Somewhat Poorly Drained (G002XY005OR)
Hydric soil rating: No

Minor Components

Huberly

Percent of map unit: 3 percent
Landform: Swales on terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear

Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Dayton

Percent of map unit: 2 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

1B—Aloha silt loam, 3 to 6 percent slopes

Map Unit Setting

National map unit symbol: 223m
Elevation: 150 to 400 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Aloha and similar soils: 85 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Aloha

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 51 inches: silt loam
H3 - 51 to 80 inches: silt loam

Properties and qualities

Slope: 3 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Other vegetative classification: Somewhat Poorly Drained (G002XY005OR)
Hydric soil rating: No

Minor Components

Huberly

Percent of map unit: 3 percent
Landform: Swales on terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Dayton

Percent of map unit: 2 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

3—Amity silt loam

Map Unit Setting

National map unit symbol: 2247
Elevation: 150 to 400 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Amity and similar soils: 85 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Amity

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 22 inches: silt loam
H2 - 22 to 62 inches: silty clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Other vegetative classification: Somewhat Poorly Drained (G002XY005OR)
Hydric soil rating: No

Minor Components

Dayton

Percent of map unit: 3 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Huberly

Percent of map unit: 2 percent
Landform: Swales on terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

7B—Borges silty clay loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2277
Elevation: 250 to 1,400 feet
Mean annual precipitation: 48 to 65 inches
Mean annual air temperature: 50 to 54 degrees F

Frost-free period: 140 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Borges and similar soils: 80 percent
Minor components: 6 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Borges

Setting

Landform: Depressions on terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium

Typical profile

H1 - 0 to 18 inches: silty clay loam
H2 - 18 to 45 inches: silty clay
H3 - 45 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Minor Components

Delena

Percent of map unit: 6 percent
Landform: Terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, riser
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

11—Camas gravelly sandy loam

Map Unit Setting

National map unit symbol: 2231
Elevation: 100 to 1,500 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Camas and similar soils: 80 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Camas

Setting

Landform: Flood plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 10 inches: gravelly sandy loam
H2 - 10 to 17 inches: gravelly sandy loam
H3 - 17 to 60 inches: stratified extremely gravelly coarse sand to very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 9 to 17 inches to strongly contrasting textural stratification
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Wapato

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

12A—Canderly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2232
Elevation: 120 to 250 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Canderly and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canderly

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 7 inches: sandy loam
H2 - 7 to 46 inches: sandy loam
H3 - 46 to 60 inches: stratified gravelly sand to coarse sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Hydric soil rating: No

13B—Cascade silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2234
Elevation: 250 to 1,400 feet
Mean annual precipitation: 50 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Cascade and similar soils: 80 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cascade

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Interfluve, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty material

Typical profile

H1 - 0 to 11 inches: silt loam
H2 - 11 to 21 inches: silt loam
H3 - 21 to 60 inches: silty clay loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 30 inches to fragipan
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Other vegetative classification: Somewhat Poorly Drained (G002XY005OR)

Hydric soil rating: No

Minor Components

Delena

Percent of map unit: 3 percent
Landform: Terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, riser
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

13C—Cascade silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2235
Elevation: 250 to 1,400 feet
Mean annual precipitation: 50 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cascade and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cascade

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Crest, interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty material

Typical profile

H1 - 0 to 11 inches: silt loam
H2 - 11 to 21 inches: silt loam
H3 - 21 to 60 inches: silty clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 30 inches to fragipan
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None

Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Other vegetative classification: Somewhat Poorly Drained (G002XY005OR)
Hydric soil rating: No

13D—Cascade silt loam, 15 to 30 percent slopes

Map Unit Setting
National map unit symbol: 2236
Elevation: 250 to 1,400 feet
Mean annual precipitation: 50 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Cascade and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cascade

Setting
Landform: Hillslopes
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Crest, interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty material

Typical profile
H1 - 0 to 11 inches: silt loam
H2 - 11 to 21 inches: silt loam
H3 - 21 to 60 inches: silty clay loam

Properties and qualities
Slope: 15 to 30 percent
Depth to restrictive feature: 20 to 30 inches to fragipan
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C
Other vegetative classification: Somewhat Poorly Drained (G002XY005OR)
Hydric soil rating: No

16—Chehalis silt loam

Map Unit Setting

National map unit symbol: 223g
Elevation: 50 to 1,200 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Chehalis and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chehalis

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 44 inches: silty clay loam
H3 - 44 to 60 inches: stratified fine sandy loam to silty clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)
Hydric soil rating: No

Minor Components

Wapato

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

19—Cloquato silt loam

Map Unit Setting

National map unit symbol: 223k
Elevation: 50 to 1,200 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Cloquato and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cloquato

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 15 inches: silt loam
H2 - 15 to 42 inches: silt loam
H3 - 42 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: High (about 11.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)
Hydric soil rating: No

Minor Components

Wapato

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Aquolls

Percent of map unit: 1 percent
Landform: Flood plains
Hydric soil rating: Yes

23B—Cornelius silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 223r
Elevation: 250 to 1,400 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Cornelius and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cornelius

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty material

Typical profile

H1 - 0 to 16 inches: silt loam

H2 - 16 to 34 inches: silty clay loam
H3 - 34 to 60 inches: silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 30 to 40 inches to fragipan
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 27 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Other vegetative classification: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

Minor Components

Delena

Percent of map unit: 3 percent
Landform: Terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, riser
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

23C—Cornelius silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 223s
Elevation: 250 to 1,400 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cornelius and similar soils: 80 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cornelius

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty material

Typical profile

H1 - 0 to 16 inches: silt loam
H2 - 16 to 34 inches: silty clay loam
H3 - 34 to 60 inches: silt loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 30 to 40 inches to fragipan
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 27 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Other vegetative classification: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

Minor Components

Delena

Percent of map unit: 4 percent
Landform: Terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, riser
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

25—Cove silty clay loam

Map Unit Setting

National map unit symbol: 223y

Elevation: 100 to 1,500 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cove and similar soils: 85 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cove

Setting

Landform: Flood plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium

Typical profile

H1 - 0 to 7 inches: silty clay loam
H2 - 7 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Hydric soil rating: Yes

Minor Components

Wapato

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Conser

Percent of map unit: 4 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear

Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Concord

Percent of map unit: 2 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Dayton

Percent of map unit: 1 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

30C—Delena silt loam, 3 to 12 percent slopes

Map Unit Setting

National map unit symbol: 2248
Elevation: 250 to 1,400 feet
Mean annual precipitation: 48 to 65 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 140 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Delena and similar soils: 80 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Delena

Setting

Landform: Terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 25 inches: silty clay loam
H3 - 25 to 60 inches: silty clay loam

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: 20 to 30 inches to fragipan
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Minor Components

Borges

Percent of map unit: 8 percent
Landform: Depressions on terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

36C—Hardscrabble silt loam, 7 to 20 percent slopes

Map Unit Setting

National map unit symbol: 224k
Elevation: 150 to 600 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hardscrabble and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hardscrabble

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, interfluve

Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Clayey alluvium

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 14 inches: silty clay loam
H3 - 14 to 60 inches: clay

Properties and qualities

Slope: 7 to 20 percent
Depth to restrictive feature: 12 to 24 inches to abrupt textural change
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Other vegetative classification: Somewhat Poorly Drained (G002XY005OR)
Hydric soil rating: No

37C—Helvetia silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 224m
Elevation: 250 to 1,400 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Helvetia and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Helvetia

Setting

Landform: Terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed old alluvium

Typical profile

H1 - 0 to 14 inches: silt loam

H2 - 14 to 21 inches: silty clay loam
H3 - 21 to 40 inches: silty clay
H4 - 40 to 60 inches: silty clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 36 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Other vegetative classification: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

Minor Components

Delena

Percent of map unit: 2 percent
Landform: Terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, riser
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

37D—Helvetia silt loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 224n
Elevation: 250 to 500 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Helvetia and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Helvetia

Setting

Landform: Terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed old alluvium

Typical profile

H1 - 0 to 14 inches: silt loam
H2 - 14 to 21 inches: silty clay loam
H3 - 21 to 40 inches: silty clay
H4 - 40 to 60 inches: silty clay loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 36 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Other vegetative classification: Moderately Well Drained >15% Slopes (G002XY003OR)
Hydric soil rating: No

41—Huberly silt loam

Map Unit Setting

National map unit symbol: 224s
Elevation: 150 to 1,400 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Huberly and similar soils: 85 percent
Minor components: 7 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Huberly

Setting

Landform: Swales on terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 15 inches: silt loam
H2 - 15 to 24 inches: silt loam
H3 - 24 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 20 to 30 inches to fragipan
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Minor Components

Dayton

Percent of map unit: 5 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Delena

Percent of map unit: 2 percent
Landform: Terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, riser
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

45C—Jory silty clay loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 224y
Elevation: 250 to 1,200 feet
Mean annual precipitation: 50 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Jory and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Jory

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Base slope, interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium

Typical profile

H1 - 0 to 13 inches: silty clay loam
H2 - 13 to 60 inches: silty clay

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)
Hydric soil rating: No

48B—Kinton silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2256
Elevation: 250 to 1,400 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Kinton and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kinton

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Base slope, interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 15 inches: silt loam
H2 - 15 to 35 inches: silt loam
H3 - 35 to 60 inches: silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 30 to 40 inches to fragipan
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 27 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Other vegetative classification: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

Minor Components

Delena

Percent of map unit: 3 percent
Landform: Terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, riser
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

48C—Kinton silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2257
Elevation: 250 to 1,400 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kinton and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kinton

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Base slope, interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 15 inches: silt loam
H2 - 15 to 35 inches: silt loam
H3 - 35 to 60 inches: silt loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 30 to 40 inches to fragipan
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 27 to 37 inches
Frequency of flooding: None

Frequency of ponding: None
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Other vegetative classification: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

Minor Components

Delena

Percent of map unit: 3 percent
Landform: Terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, riser
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

48D—Kinton silt loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2258
Elevation: 250 to 1,400 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kinton and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kinton

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Base slope, interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 15 inches: silt loam
H2 - 15 to 35 inches: silt loam

H3 - 35 to 60 inches: silt loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 30 to 40 inches to fragipan
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 27 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Other vegetative classification: Moderately Well Drained >15% Slopes (G002XY003OR)
Hydric soil rating: No

Minor Components

Delena

Percent of map unit: 2 percent
Landform: Terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, riser
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

53B—Latourell loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 225k
Elevation: 50 to 400 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Latourell and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Latourell

Setting

Landform: Terraces

Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 15 inches: loam
H2 - 15 to 48 inches: loam
H3 - 48 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

53C—Latourell loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 225l
Elevation: 50 to 400 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Latourell and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Latourell

Setting

Landform: Terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 15 inches: loam
H2 - 15 to 48 inches: loam

H3 - 48 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

54C—Laurelwood silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 225p
Elevation: 200 to 1,500 feet
Mean annual precipitation: 45 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Laurelwood and similar soils: 85 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Laurelwood

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty material over older clayey material

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 18 inches: silty clay loam
H3 - 18 to 46 inches: silty clay loam
H4 - 46 to 60 inches: silty clay

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)
Hydric soil rating: No

Minor Components

Aqualfs

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

54D—Laurelwood silt loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 225q
Elevation: 200 to 1,500 feet
Mean annual precipitation: 45 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Laurelwood and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Laurelwood

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty material over older clayey material

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 18 inches: silty clay loam
H3 - 18 to 46 inches: silty clay loam
H4 - 46 to 60 inches: silty clay

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Other vegetative classification: Well Drained > 15% Slopes (G002XY001OR)
Hydric soil rating: No

54E—Laurelwood silt loam, 30 to 60 percent slopes

Map Unit Setting

National map unit symbol: 225r
Elevation: 200 to 1,500 feet
Mean annual precipitation: 45 to 60 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Laurelwood and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Laurelwood

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Silty material over older clayey material

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 18 inches: silty clay loam
H3 - 18 to 46 inches: silty clay loam
H4 - 46 to 60 inches: silty clay

Properties and qualities

Slope: 30 to 60 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

56—McBee silty clay loam

Map Unit Setting

National map unit symbol: 225t
Elevation: 50 to 1,200 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Mcbee and similar soils: 85 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mcbee

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 15 inches: silty clay loam
H2 - 15 to 48 inches: silty clay loam
H3 - 48 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: High (about 11.6 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Other vegetative classification: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

Minor Components

Wapato

Percent of map unit: 3 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Aquolls

Percent of map unit: 1 percent
Landform: Flood plains
Hydric soil rating: Yes

57—McBee variant loam

Map Unit Setting

National map unit symbol: 225v
Elevation: 50 to 1,200 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Mcbee, variant, and similar soils: 90 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mcbee, Variant

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 28 inches: loam

H2 - 28 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Other vegetative classification: Somewhat Poorly Drained (G002XY005OR)
Hydric soil rating: No

Minor Components

Wapato

Percent of map unit: 3 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

64B—Nekia silty clay loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2268
Elevation: 250 to 1,200 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Nekia and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nekia

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Nose slope, crest, interfluve

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from basalt

Typical profile

H1 - 0 to 19 inches: silty clay loam
H2 - 19 to 39 inches: clay
H3 - 39 to 43 inches: unweathered bedrock

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)
Hydric soil rating: No

64C—Nekia silty clay loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2269
Elevation: 250 to 1,200 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Nekia and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nekia

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Nose slope, crest, interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from basalt

Typical profile

H1 - 0 to 19 inches: silty clay loam

H2 - 19 to 39 inches: clay
H3 - 39 to 43 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)
Hydric soil rating: No

67—Newberg fine sandy loam

Map Unit Setting

National map unit symbol: 226g
Elevation: 30 to 1,200 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Newberg and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Newberg

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 14 inches: fine sandy loam
H2 - 14 to 23 inches: fine sandy loam
H3 - 23 to 42 inches: fine sand
H4 - 42 to 60 inches: extremely gravelly sand

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Wapato

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Aquolls

Percent of map unit: 1 percent
Landform: Flood plains
Hydric soil rating: Yes

70C—Powell silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 226m
Elevation: 250 to 1,400 feet
Mean annual precipitation: 50 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Powell and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Powell

Setting

Landform: Terraces
Landform position (three-dimensional): Riser

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty material over old silty alluvium

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 15 inches: silt loam
H3 - 15 to 60 inches: silt loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 15 to 23 inches to fragipan
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 15 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Other vegetative classification: Somewhat Poorly Drained (G002XY005OR)
Hydric soil rating: No

Minor Components

Delena

Percent of map unit: 3 percent
Landform: Terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, riser
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

73—Riverwash

Map Unit Composition

Riverwash: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Riverwash

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear

Across-slope shape: Linear

Typical profile

H1 - 0 to 60 inches: stratified sand to gravel

Properties and qualities

Slope: 0 to 3 percent
Natural drainage class: Well drained
Depth to water table: About 0 to 24 inches
Frequency of flooding: Frequent

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Yes

76B—Salem silt loam, 0 to 7 percent slopes

Map Unit Setting

National map unit symbol: 226y
Elevation: 200 to 650 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Salem and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Salem

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 24 inches: gravelly clay loam
H3 - 24 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 7 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)
Hydric soil rating: No

78B—Saum silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2271
Elevation: 250 to 800 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Saum and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saum

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Material silty and colluvium

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 26 inches: silty clay loam
H3 - 26 to 50 inches: gravelly silty clay loam
H4 - 50 to 54 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C

Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)
Hydric soil rating: No

78C—Saum silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2272
Elevation: 250 to 800 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Saum and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saum

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Material silty and colluvium

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 26 inches: silty clay loam
H3 - 26 to 50 inches: gravelly silty clay loam
H4 - 50 to 54 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)
Hydric soil rating: No

78D—Saum silt loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2273
Elevation: 250 to 800 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Saum and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saum

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Material silty and colluvium

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 26 inches: silty clay loam
H3 - 26 to 50 inches: gravelly silty clay loam
H4 - 50 to 54 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Other vegetative classification: Well Drained > 15% Slopes (G002XY001OR)
Hydric soil rating: No

78E—Saum silt loam, 30 to 60 percent slopes

Map Unit Setting

National map unit symbol: 2274
Elevation: 250 to 800 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Saum and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saum

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Material silty and colluvium

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 26 inches: silty clay loam
H3 - 26 to 50 inches: gravelly silty clay loam
H4 - 50 to 54 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 60 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Hydric soil rating: No

82—Urban land

Map Unit Setting

National map unit symbol: 227g
Elevation: 50 to 400 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

83—Wapato silt loam

Map Unit Setting

National map unit symbol: 227h
Elevation: 100 to 1,500 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Wapato and similar soils: 90 percent
Minor components: 6 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wapato

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 16 inches: silt loam
H2 - 16 to 41 inches: silty clay loam
H3 - 41 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Minor Components

Cove

Percent of map unit: 6 percent
Landform: Flood plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

84—Wapato silty clay loam

Map Unit Setting

National map unit symbol: 227j
Elevation: 100 to 1,500 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Wapato and similar soils: 85 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wapato

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 18 inches: silty clay loam
H2 - 18 to 45 inches: silty clay loam
H3 - 45 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Available water storage in profile: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Minor Components

Cove

Percent of map unit: 6 percent
Landform: Flood plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Humaquepts

Percent of map unit: 4 percent
Landform: Flood plains
Hydric soil rating: Yes

88A—Willamette silt loam, wet, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 227q

Elevation: 150 to 350 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Willamette, wet, and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Willamette, Wet

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 14 inches: silt loam
H2 - 14 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 30 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Other vegetative classification: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

88B—Willamette silt loam, wet, 3 to 7 percent slopes

Map Unit Setting

National map unit symbol: 227r
Elevation: 150 to 350 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Willamette, wet, and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Willamette, Wet

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 14 inches: silt loam
H2 - 14 to 60 inches: silty clay loam

Properties and qualities

Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 30 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Other vegetative classification: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

89D—Witzel very stony silt loam, 3 to 40 percent slopes

Map Unit Setting

National map unit symbol: 227s
Elevation: 300 to 1,000 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Witzel and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Witzel

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, nose slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from basalt

Typical profile

H1 - 0 to 4 inches: very stony silt loam
H2 - 4 to 16 inches: very stony silty clay loam
H3 - 16 to 20 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 40 percent
Depth to restrictive feature: 12 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Other vegetative classification: Well Drained > 15% Slopes (G002XY001OR)
Hydric soil rating: No

91A—Woodburn silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 227y
Elevation: 150 to 400 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Woodburn and similar soils: 85 percent
Minor components: 6 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodburn

Setting

Landform: Terraces

Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile
H1 - 0 to 16 inches: silt loam
H2 - 16 to 38 inches: silty clay loam
H3 - 38 to 60 inches: silt loam

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 25 to 32 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 12.0 inches)

Interpretive groups
Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Other vegetative classification: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

Minor Components

Huberly
Percent of map unit: 3 percent
Landform: Swales on terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Dayton
Percent of map unit: 2 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Aquolls
Percent of map unit: 1 percent
Landform: Flood plains
Hydric soil rating: Yes

91B—Woodburn silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 227z
Elevation: 150 to 400 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Woodburn and similar soils: 90 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodburn

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 16 inches: silt loam
H2 - 16 to 38 inches: silty clay loam
H3 - 38 to 60 inches: silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 25 to 32 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Other vegetative classification: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

Minor Components

Huberly

Percent of map unit: 2 percent
Landform: Swales on terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Aquolls

Percent of map unit: 1 percent
Landform: Flood plains
Hydric soil rating: Yes

Dayton

Percent of map unit: 1 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

91C—Woodburn silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2280
Elevation: 150 to 400 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Woodburn and similar soils: 90 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodburn

Setting

Landform: Terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 16 inches: silt loam
H2 - 16 to 38 inches: silty clay loam
H3 - 38 to 60 inches: silt loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 25 to 32 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Other vegetative classification: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

Minor Components

Dayton

Percent of map unit: 2 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Aquolls

Percent of map unit: 1 percent
Landform: Flood plains
Hydric soil rating: Yes

92F—Xerochrepts and Haploxerolls, very steep

Map Unit Setting

National map unit symbol: 2281
Elevation: 50 to 1,000 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Xerochrepts and similar soils: 50 percent
Haploxerolls and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Xerochrepts

Setting

Landform: Terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from igneous rock

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 48 inches: gravelly clay loam
H3 - 48 to 60 inches: very cobbly clay loam

Properties and qualities

Slope: 20 to 60 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 36 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Haploxerolls

Setting

Landform: Terraces
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Colluvium derived from igneous rock

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 60 inches: very gravelly loam

Properties and qualities

Slope: 20 to 60 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 36 to 48 inches
Frequency of flooding: None

Frequency of ponding: None
Available water storage in profile: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

93E—Xerochrepts-Rock outcrop complex, moderately steep

Map Unit Setting

National map unit symbol: 2282
Elevation: 100 to 500 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Xerochrepts and similar soils: 60 percent
Rock outcrop: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Xerochrepts

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from andesite and/or basalt

Typical profile

H1 - 0 to 26 inches: gravelly loam
H2 - 26 to 30 inches: unweathered bedrock

Properties and qualities

Slope: 0 to 30 percent
Depth to restrictive feature: 10 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C
Hydric soil rating: No

Description of Rock Outcrop

Typical profile
R - 0 to 60 inches: unweathered bedrock

Properties and qualities
Slope: 0 to 30 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

W—Water

Map Unit Composition
Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Yes

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Building Site Development

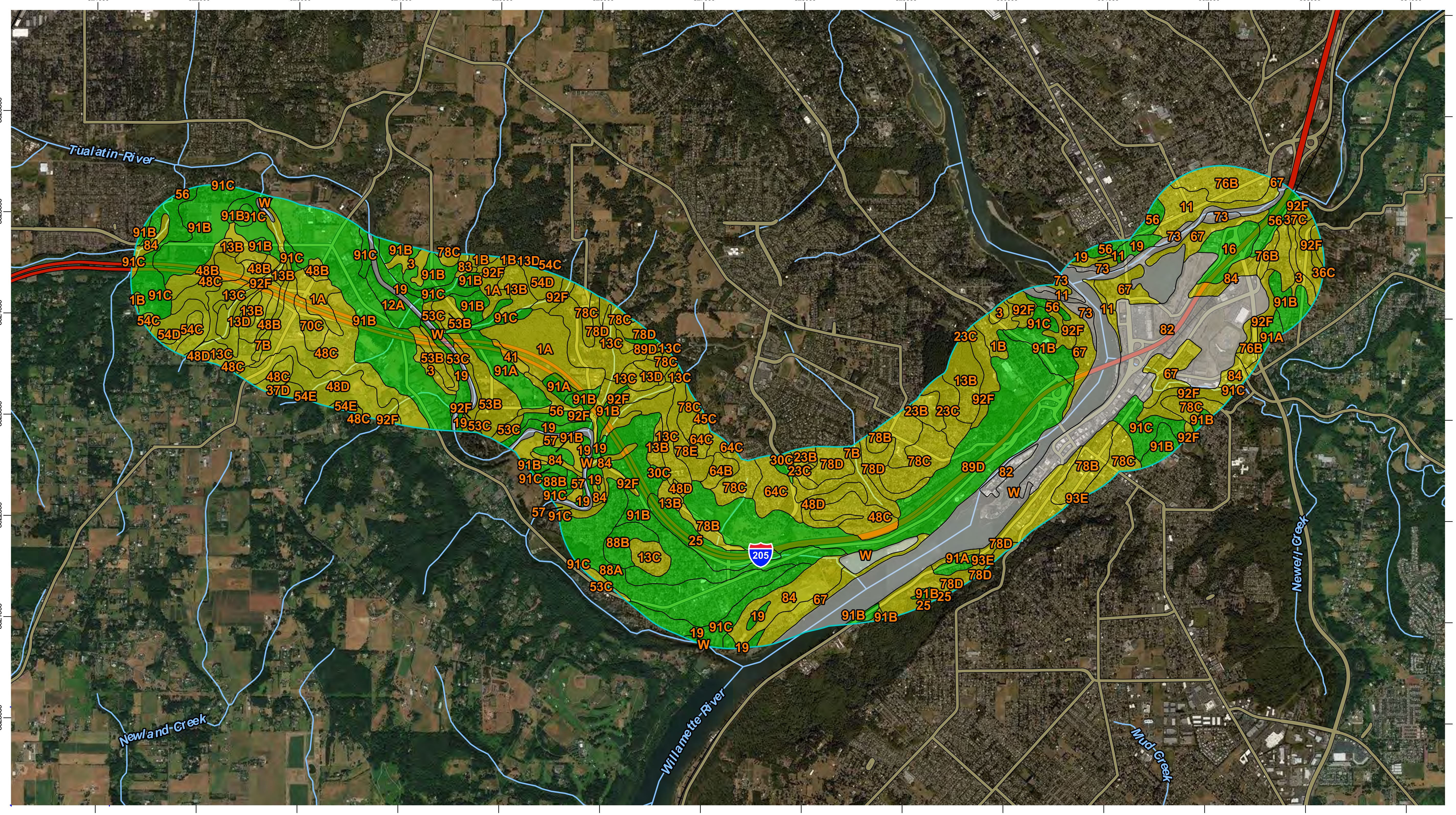
Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

Corrosion of Concrete

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens concrete. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the concrete in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."

Custom Soil Resource Report
Map—Corrosion of Concrete



Map Scale: 1:38,300 if printed on B landscape (17" x 11") sheet.

Meters: 0 500 1000 2000 3000

Feet: 0 1500 3000 6000 9000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

High

Moderate

Low

Not rated or not available

Soil Rating Lines

High

Moderate

Low

Not rated or not available

Soil Rating Points

High

Moderate

Low

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clackamas County Area, Oregon
Survey Area Data: Version 11, Sep 16, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 8, 2010—Sep 13, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Corrosion of Concrete

Corrosion of Concrete— Summary by Map Unit — Clackamas County Area, Oregon (OR610)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1A	Aloha silt loam, 0 to 3 percent slopes	Moderate	161.9	2.7%
1B	Aloha silt loam, 3 to 6 percent slopes	Moderate	34.9	0.6%
3	Amity silt loam	Moderate	51.2	0.8%
7B	Borges silty clay loam, 0 to 8 percent slopes	Moderate	47.0	0.8%
11	Camas gravelly sandy loam	Moderate	78.0	1.3%
12A	Canderly sandy loam, 0 to 3 percent slopes	Low	29.1	0.5%
13B	Cascade silt loam, 3 to 8 percent slopes	Moderate	130.4	2.2%
13C	Cascade silt loam, 8 to 15 percent slopes	Moderate	134.6	2.2%
13D	Cascade silt loam, 15 to 30 percent slopes	Moderate	53.4	0.9%
16	Chehalis silt loam	Low	50.7	0.8%
19	Cloquato silt loam	Low	113.2	1.9%
23B	Cornelius silt loam, 3 to 8 percent slopes	Moderate	30.8	0.5%
23C	Cornelius silt loam, 8 to 15 percent slopes	Moderate	48.2	0.8%
25	Cove silty clay loam	Low	63.3	1.0%
30C	Delena silt loam, 3 to 12 percent slopes	Low	9.9	0.2%
36C	Hardscrabble silt loam, 7 to 20 percent slopes	High	0.0	0.0%
37C	Helvetia silt loam, 8 to 15 percent slopes	Moderate	51.0	0.8%
37D	Helvetia silt loam, 15 to 30 percent slopes	Moderate	7.9	0.1%
41	Huberly silt loam	Moderate	8.3	0.1%
45C	Jory silty clay loam, 8 to 15 percent slopes	Moderate	0.7	0.0%
48B	Kinton silt loam, 3 to 8 percent slopes	Moderate	67.3	1.1%
48C	Kinton silt loam, 8 to 15 percent slopes	Moderate	247.5	4.1%
48D	Kinton silt loam, 15 to 30 percent slopes	Moderate	125.4	2.1%
53B	Latourell loam, 3 to 8 percent slopes	Moderate	94.8	1.6%

Corrosion of Concrete— Summary by Map Unit — Clackamas County Area, Oregon (OR610)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
53C	Latourell loam, 8 to 15 percent slopes	Moderate	37.2	0.6%
54C	Laurelwood silt loam, 8 to 15 percent slopes	Moderate	16.3	0.3%
54D	Laurelwood silt loam, 15 to 30 percent slopes	Moderate	62.1	1.0%
54E	Laurelwood silt loam, 30 to 60 percent slopes	Moderate	6.5	0.1%
56	McBee silty clay loam	Low	74.6	1.2%
57	McBee variant loam	Moderate	35.5	0.6%
64B	Nekia silty clay loam, 2 to 8 percent slopes	Moderate	17.7	0.3%
64C	Nekia silty clay loam, 8 to 15 percent slopes	Moderate	61.0	1.0%
67	Newberg fine sandy loam	Moderate	189.0	3.1%
70C	Powell silt loam, 8 to 15 percent slopes	Moderate	23.5	0.4%
73	Riverwash		39.8	0.7%
76B	Salem silt loam, 0 to 7 percent slopes	Moderate	89.8	1.5%
78B	Saum silt loam, 3 to 8 percent slopes	Moderate	110.0	1.8%
78C	Saum silt loam, 8 to 15 percent slopes	Moderate	229.2	3.8%
78D	Saum silt loam, 15 to 30 percent slopes	Moderate	157.1	2.6%
78E	Saum silt loam, 30 to 60 percent slopes	Moderate	39.9	0.7%
82	Urban land		363.1	6.0%
83	Wapato silt loam	Moderate	6.5	0.1%
84	Wapato silty clay loam	Moderate	146.1	2.4%
88A	Willamette silt loam, wet, 0 to 3 percent slopes	Low	192.6	3.2%
88B	Willamette silt loam, wet, 3 to 7 percent slopes	Low	42.8	0.7%
89D	Witzel very stony silt loam, 3 to 40 percent slopes	Low	439.2	7.3%
91A	Woodburn silt loam, 0 to 3 percent slopes	Low	88.6	1.5%
91B	Woodburn silt loam, 3 to 8 percent slopes	Low	779.4	12.9%
91C	Woodburn silt loam, 8 to 15 percent slopes	Low	283.3	4.7%
92F	Xerochrepts and Haploxerolls, very steep	Moderate	287.0	4.7%

Corrosion of Concrete— Summary by Map Unit — Clackamas County Area, Oregon (OR610)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
93E	Xerochrepts-Rock outcrop complex, moderately steep	Moderate	115.8	1.9%
W	Water		477.5	7.9%
Totals for Area of Interest			**6,050.5**	**100.0%**

Rating Options—Corrosion of Concrete

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

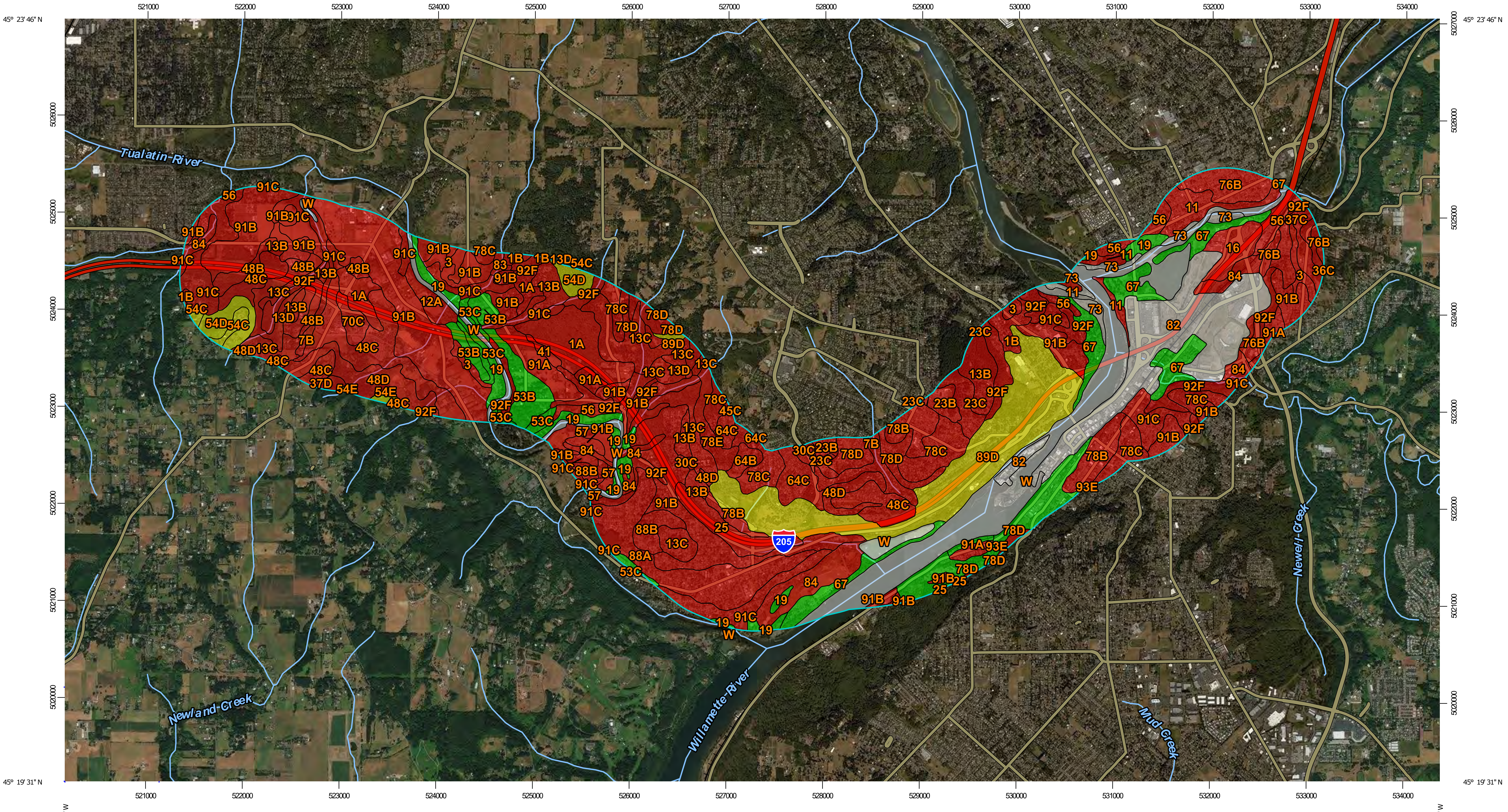
Tie-break Rule: Higher

Corrosion of Steel

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."

Custom Soil Resource Report
Map—Corrosion of Steel



Map Scale: 1:38,300 if printed on B landscape (17" x 11") sheet.

Meters: 0 500 1000 2000 3000

Feet: 0 1500 3000 6000 9000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

High

Moderate

Low

Not rated or not available

Soil Rating Lines

High

Moderate

Low

Not rated or not available

Soil Rating Points

High

Moderate

Low

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Soil Survey Area: Clackamas County Area, Oregon
Survey Area Data: Version 11, Sep 16, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 8, 2010—Sep 13, 2016

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Table—Corrosion of Steel

Corrosion of Steel— Summary by Map Unit — Clackamas County Area, Oregon (OR610)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1A	Aloha silt loam, 0 to 3 percent slopes	High	161.9	2.7%
1B	Aloha silt loam, 3 to 6 percent slopes	High	34.9	0.6%
3	Amity silt loam	High	51.2	0.8%
7B	Borges silty clay loam, 0 to 8 percent slopes	High	47.0	0.8%
11	Camas gravelly sandy loam	High	78.0	1.3%
12A	Canderly sandy loam, 0 to 3 percent slopes	High	29.1	0.5%
13B	Cascade silt loam, 3 to 8 percent slopes	High	130.4	2.2%
13C	Cascade silt loam, 8 to 15 percent slopes	High	134.6	2.2%
13D	Cascade silt loam, 15 to 30 percent slopes	High	53.4	0.9%
16	Chehalis silt loam	High	50.7	0.8%
19	Cloquato silt loam	Low	113.2	1.9%
23B	Cornelius silt loam, 3 to 8 percent slopes	High	30.8	0.5%
23C	Cornelius silt loam, 8 to 15 percent slopes	High	48.2	0.8%
25	Cove silty clay loam	High	63.3	1.0%
30C	Delena silt loam, 3 to 12 percent slopes	High	9.9	0.2%
36C	Hardscrabble silt loam, 7 to 20 percent slopes	High	0.0	0.0%
37C	Helvetia silt loam, 8 to 15 percent slopes	High	51.0	0.8%
37D	Helvetia silt loam, 15 to 30 percent slopes	High	7.9	0.1%
41	Huberly silt loam	High	8.3	0.1%
45C	Jory silty clay loam, 8 to 15 percent slopes	High	0.7	0.0%
48B	Kinton silt loam, 3 to 8 percent slopes	High	67.3	1.1%
48C	Kinton silt loam, 8 to 15 percent slopes	High	247.5	4.1%
48D	Kinton silt loam, 15 to 30 percent slopes	High	125.4	2.1%
53B	Latourell loam, 3 to 8 percent slopes	Low	94.8	1.6%

Corrosion of Steel— Summary by Map Unit — Clackamas County Area, Oregon (OR610)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
53C	Latourell loam, 8 to 15 percent slopes	Low	37.2	0.6%
54C	Laurelwood silt loam, 8 to 15 percent slopes	Moderate	16.3	0.3%
54D	Laurelwood silt loam, 15 to 30 percent slopes	Moderate	62.1	1.0%
54E	Laurelwood silt loam, 30 to 60 percent slopes	Moderate	6.5	0.1%
56	McBee silty clay loam	High	74.6	1.2%
57	McBee variant loam	High	35.5	0.6%
64B	Nekia silty clay loam, 2 to 8 percent slopes	High	17.7	0.3%
64C	Nekia silty clay loam, 8 to 15 percent slopes	High	61.0	1.0%
67	Newberg fine sandy loam	Low	189.0	3.1%
70C	Powell silt loam, 8 to 15 percent slopes	High	23.5	0.4%
73	Riverwash		39.8	0.7%
76B	Salem silt loam, 0 to 7 percent slopes	High	89.8	1.5%
78B	Saum silt loam, 3 to 8 percent slopes	High	110.0	1.8%
78C	Saum silt loam, 8 to 15 percent slopes	High	229.2	3.8%
78D	Saum silt loam, 15 to 30 percent slopes	High	157.1	2.6%
78E	Saum silt loam, 30 to 60 percent slopes	High	39.9	0.7%
82	Urban land		363.1	6.0%
83	Wapato silt loam	High	6.5	0.1%
84	Wapato silty clay loam	High	146.1	2.4%
88A	Willamette silt loam, wet, 0 to 3 percent slopes	High	192.6	3.2%
88B	Willamette silt loam, wet, 3 to 7 percent slopes	High	42.8	0.7%
89D	Witzel very stony silt loam, 3 to 40 percent slopes	Moderate	439.2	7.3%
91A	Woodburn silt loam, 0 to 3 percent slopes	High	88.6	1.5%
91B	Woodburn silt loam, 3 to 8 percent slopes	High	779.4	12.9%
91C	Woodburn silt loam, 8 to 15 percent slopes	High	283.3	4.7%
92F	Xerochrepts and Haploxerolls, very steep	High	287.0	4.7%

Corrosion of Steel— Summary by Map Unit — Clackamas County Area, Oregon (OR610)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
93E	Xerochrepts-Rock outcrop complex, moderately steep	Low	115.8	1.9%
W	Water		477.5	7.9%
Totals for Area of Interest			**6,050.5**	**100.0%**

Rating Options—Corrosion of Steel

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Water Management

Water Management interpretations are tools for evaluating the potential of the soil in the application of various water management practices. Example interpretations include pond reservoir area, embankments, dikes, levees, and excavated ponds.

Subsurface Water Management, Outflow Quality

The ratings for Subsurface Water Management, Outflow Quality are based on the soil properties that affect the capacity of the soil to convey surface and subsurface water and on the properties that affect water quality. The properties that affect the conveyance and water quality include salinity, sodicity, soil reaction, soil taxonomic great group placement, gypsum content, shrink-swell potential, soil saturation, and surface erosion.

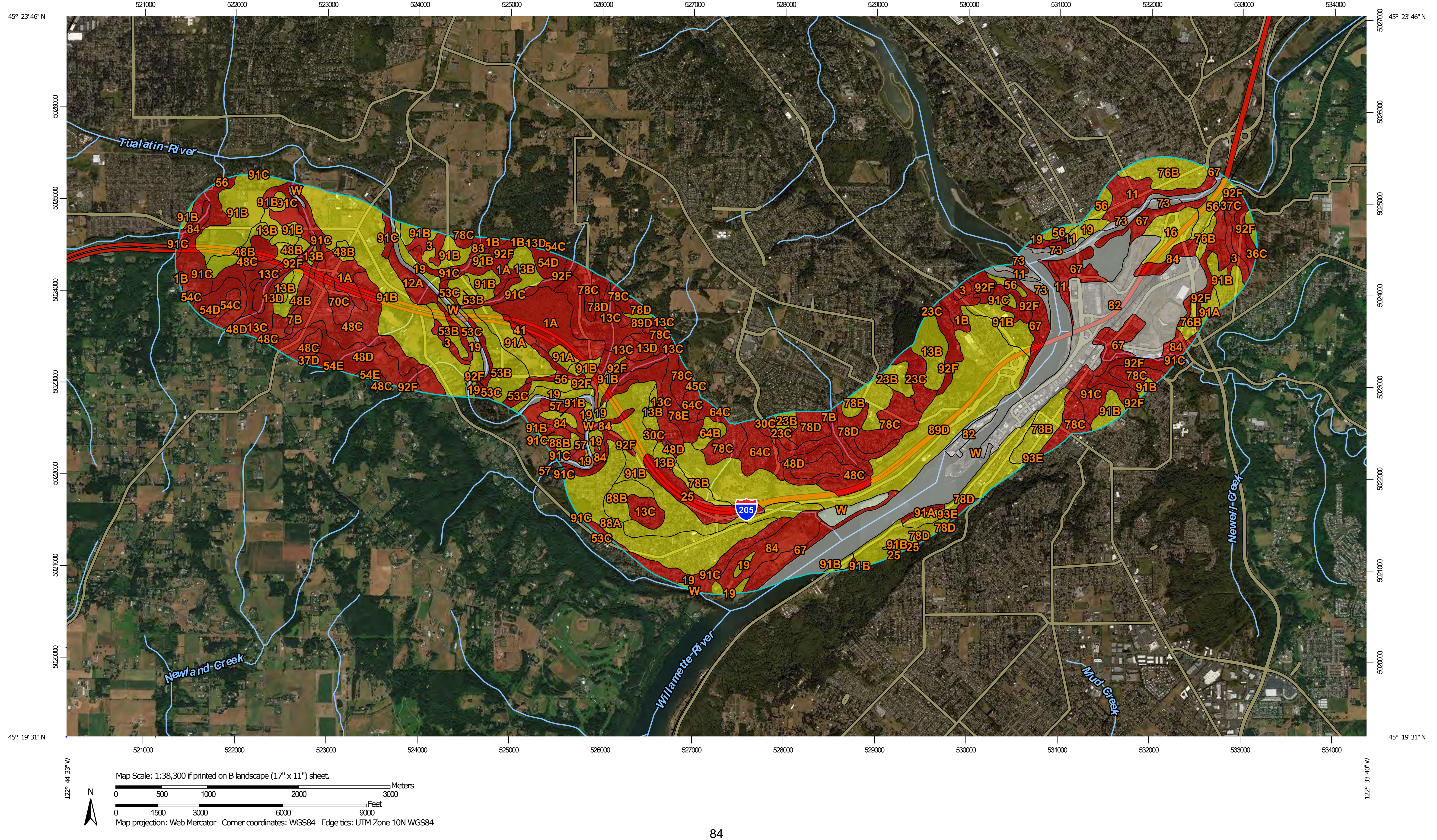
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor water quality can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as that listed for the map unit. The percent composition of each component in a particular map unit is given so that the user will realize the percentage of each map unit that has the specified rating.

A map unit may have other components with different ratings. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Map—Subsurface Water Management, Outflow Quality



Map Scale: 1:38,300 if printed on B landscape (17" x 11") sheet.

Meters: 0 500 1000 2000 3000

Feet: 0 1500 3000 6000 9000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Lines

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Points

Very limited

Somewhat limited

Not limited

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 11, Sep 16, 2016

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Date(s) aerial images were photographed: Jul 8, 2010—Sep 13, 2016

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Tables—Subsurface Water Management, Outflow Quality

Subsurface Water Management, Outflow Quality— Summary by Map Unit — Clackamas County Area, Oregon (OR610)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
1A	Aloha silt loam, 0 to 3 percent slopes	Very limited	Aloha (85%)	Pesticide and nutrient movement (1.00)	161.9	2.7%
			Huberly (3%)	Pesticide and nutrient movement (1.00)		
			Dayton (2%)	Pesticide and nutrient movement (1.00)		
1B	Aloha silt loam, 3 to 6 percent slopes	Very limited	Aloha (85%)	Pesticide and nutrient movement (1.00)	34.9	0.6%
				Water Erosion (0.46)		
			Huberly (3%)	Pesticide and nutrient movement (1.00)		
			Dayton (2%)	Pesticide and nutrient movement (1.00)		
3	Amity silt loam	Very limited	Amity (85%)	Pesticide and nutrient movement (1.00)	51.2	0.8%
			Dayton (3%)	Pesticide and nutrient movement (1.00)		
			Huberly (2%)	Pesticide and nutrient movement (1.00)		
7B	Borges silty clay loam, 0 to 8 percent slopes	Very limited	Borges (80%)	Pesticide and nutrient movement (1.00)	47.0	0.8%
				Water Erosion (0.12)		
			Delena (6%)	Pesticide and nutrient movement (1.00)		

Subsurface Water Management, Outflow Quality— Summary by Map Unit — Clackamas County Area, Oregon (OR610)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
				Water Erosion (1.00)		
11	Camas gravelly sandy loam	Very limited	Camas (80%)	Pesticide and nutrient movement (1.00)	78.0	1.3%
			Wapato (2%)	Pesticide and nutrient movement (1.00)		
12A	Canderly sandy loam, 0 to 3 percent slopes	Very limited	Canderly (90%)	Pesticide and nutrient movement (1.00)	29.1	0.5%
13B	Cascade silt loam, 3 to 8 percent slopes	Somewhat limited	Cascade (80%)	Pesticide and nutrient movement (0.99)	130.4	2.2%
				Water Erosion (0.12)		
13C	Cascade silt loam, 8 to 15 percent slopes	Very limited	Cascade (80%)	Water Erosion (1.00)	134.6	2.2%
				Pesticide and nutrient movement (0.99)		
13D	Cascade silt loam, 15 to 30 percent slopes	Very limited	Cascade (80%)	Water Erosion (1.00)	53.4	0.9%
				Pesticide and nutrient movement (0.99)		
16	Chehalis silt loam	Somewhat limited	Chehalis (85%)	Pesticide and nutrient movement (0.22)	50.7	0.8%
19	Cloquato silt loam	Somewhat limited	Cloquato (85%)	Pesticide and nutrient movement (0.22)	113.2	1.9%
23B	Cornelius silt loam, 3 to 8 percent slopes	Somewhat limited	Cornelius (85%)	Pesticide and nutrient movement (0.71)	30.8	0.5%
				Water Erosion (0.12)		
23C	Cornelius silt loam, 8 to 15 percent slopes	Very limited	Cornelius (80%)	Water Erosion (1.00)	48.2	0.8%
				Pesticide and nutrient movement (0.71)		

Subsurface Water Management, Outflow Quality— Summary by Map Unit — Clackamas County Area, Oregon (OR610)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
			Delena (4%)	Pesticide and nutrient movement (1.00)		
				Water Erosion (1.00)		
25	Cove silty clay loam	Very limited	Cove (85%)	Pesticide and nutrient movement (1.00)	63.3	1.0%
			Wapato (5%)	Pesticide and nutrient movement (1.00)		
			Conser (4%)	Pesticide and nutrient movement (1.00)		
			Concord (2%)	Pesticide and nutrient movement (1.00)		
			Dayton (1%)	Pesticide and nutrient movement (1.00)		
30C	Delena silt loam, 3 to 12 percent slopes	Very limited	Delena (80%)	Pesticide and nutrient movement (1.00)	9.9	0.2%
				Water Erosion (0.90)		
			Borges (8%)	Pesticide and nutrient movement (1.00)		
				Water Erosion (0.04)		
36C	Hardscrabble silt loam, 7 to 20 percent slopes	Very limited	Hardscrabble (85%)	Pesticide and nutrient movement (1.00)	0.0	0.0%
				Water Erosion (1.00)		
				Too acid (0.04)		
37C	Helvetia silt loam, 8 to 15 percent slopes	Very limited	Helvetia (85%)	Water Erosion (1.00)	51.0	0.8%
				Pesticide and nutrient movement (0.14)		

Subsurface Water Management, Outflow Quality— Summary by Map Unit — Clackamas County Area, Oregon (OR610)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
			Delena (2%)	Pesticide and nutrient movement (1.00)		
				Water Erosion (1.00)		
37D	Helvetia silt loam, 15 to 30 percent slopes	Very limited	Helvetia (85%)	Water Erosion (1.00)	7.9	0.1%
				Pesticide and nutrient movement (0.14)		
41	Huberly silt loam	Very limited	Huberly (85%)	Pesticide and nutrient movement (1.00)	8.3	0.1%
			Dayton (5%)	Pesticide and nutrient movement (1.00)		
			Delena (2%)	Pesticide and nutrient movement (1.00)		
				Water Erosion (1.00)		
45C	Jory silty clay loam, 8 to 15 percent slopes	Very limited	Jory (90%)	Water Erosion (1.00)	0.7	0.0%
				Pesticide and nutrient movement (0.00)		
48B	Kinton silt loam, 3 to 8 percent slopes	Somewhat limited	Kinton (85%)	Pesticide and nutrient movement (0.71)	67.3	1.1%
				Water Erosion (0.42)		
48C	Kinton silt loam, 8 to 15 percent slopes	Very limited	Kinton (85%)	Water Erosion (1.00)	247.5	4.1%
				Pesticide and nutrient movement (0.71)		
			Delena (3%)	Pesticide and nutrient movement (1.00)		
				Water Erosion (1.00)		

Subsurface Water Management, Outflow Quality— Summary by Map Unit — Clackamas County Area, Oregon (OR610)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
48D	Kinton silt loam, 15 to 30 percent slopes	Very limited	Kinton (85%)	Water Erosion (1.00)	125.4	2.1%
				Pesticide and nutrient movement (0.71)		
			Delena (2%)	Pesticide and nutrient movement (1.00)		
				Water Erosion (1.00)		
53B	Latourell loam, 3 to 8 percent slopes	Somewhat limited	Latourell (90%)	Water Erosion (0.42)	94.8	1.6%
				Pesticide and nutrient movement (0.22)		
53C	Latourell loam, 8 to 15 percent slopes	Very limited	Latourell (85%)	Water Erosion (1.00)	37.2	0.6%
				Pesticide and nutrient movement (0.22)		
54C	Laurelwood silt loam, 8 to 15 percent slopes	Very limited	Laurelwood (85%)	Water Erosion (1.00)	16.3	0.3%
				Pesticide and nutrient movement (0.00)		
54D	Laurelwood silt loam, 15 to 30 percent slopes	Very limited	Laurelwood (80%)	Water Erosion (1.00)	62.1	1.0%
				Pesticide and nutrient movement (0.00)		
54E	Laurelwood silt loam, 30 to 60 percent slopes	Very limited	Laurelwood (80%)	Water Erosion (1.00)	6.5	0.1%
				Pesticide and nutrient movement (0.00)		
56	McBee silty clay loam	Somewhat limited	McBee (85%)	Pesticide and nutrient movement (0.82)	74.6	1.2%
57	McBee variant loam	Very limited	McBee, Variant (90%)	Pesticide and nutrient movement (1.00)	35.5	0.6%

Subsurface Water Management, Outflow Quality— Summary by Map Unit — Clackamas County Area, Oregon (OR610)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
			Wapato (3%)	Pesticide and nutrient movement (1.00)		
64B	Nekia silty clay loam, 2 to 8 percent slopes	Somewhat limited	Nekia (80%)	Water Erosion (0.08)	17.7	0.3%
				Pesticide and nutrient movement (0.00)		
64C	Nekia silty clay loam, 8 to 15 percent slopes	Very limited	Nekia (80%)	Water Erosion (1.00)	61.0	1.0%
				Pesticide and nutrient movement (0.00)		
67	Newberg fine sandy loam	Very limited	Newberg (85%)	Pesticide and nutrient movement (1.00)	189.0	3.1%
			Wapato (2%)	Pesticide and nutrient movement (1.00)		
70C	Powell silt loam, 8 to 15 percent slopes	Very limited	Powell (85%)	Pesticide and nutrient movement (1.00)	23.5	0.4%
				Water Erosion (1.00)		
			Delena (3%)	Pesticide and nutrient movement (1.00)		
				Water Erosion (1.00)		
73	Riverwash	Not rated	Riverwash (100%)		39.8	0.7%
76B	Salem silt loam, 0 to 7 percent slopes	Somewhat limited	Salem (85%)	Pesticide and nutrient movement (0.22)	89.8	1.5%
				Water Erosion (0.12)		
78B	Saum silt loam, 3 to 8 percent slopes	Somewhat limited	Saum (80%)	Water Erosion (0.42)	110.0	1.8%
				Pesticide and nutrient movement (0.22)		

Subsurface Water Management, Outflow Quality— Summary by Map Unit — Clackamas County Area, Oregon (OR610)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
78C	Saum silt loam, 8 to 15 percent slopes	Very limited	Saum (80%)	Water Erosion (1.00)	229.2	3.8%
				Pesticide and nutrient movement (0.22)		
78D	Saum silt loam, 15 to 30 percent slopes	Very limited	Saum (80%)	Water Erosion (1.00)	157.1	2.6%
				Pesticide and nutrient movement (0.22)		
78E	Saum silt loam, 30 to 60 percent slopes	Very limited	Saum (80%)	Water Erosion (1.00)	39.9	0.7%
				Pesticide and nutrient movement (0.22)		
82	Urban land	Not rated	Urban land (100%)		363.1	6.0%
83	Wapato silt loam	Very limited	Wapato (90%)	Pesticide and nutrient movement (1.00)	6.5	0.1%
			Cove (6%)	Pesticide and nutrient movement (1.00)		
84	Wapato silty clay loam	Very limited	Wapato (85%)	Pesticide and nutrient movement (1.00)	146.1	2.4%
			Cove (6%)	Pesticide and nutrient movement (1.00)		
			Humaquepts (4%)	Pesticide and nutrient movement (1.00)		
88A	Willamette silt loam, wet, 0 to 3 percent slopes	Somewhat limited	Willamette, wet (85%)	Pesticide and nutrient movement (0.64)	192.6	3.2%
88B	Willamette silt loam, wet, 3 to 7 percent slopes	Somewhat limited	Willamette, wet (85%)	Pesticide and nutrient movement (0.64)	42.8	0.7%
				Water Erosion (0.36)		
89D	Witzel very stony silt loam, 3 to	Somewhat limited	Witzel (80%)	Water Erosion (0.68)	439.2	7.3%

Subsurface Water Management, Outflow Quality— Summary by Map Unit — Clackamas County Area, Oregon (OR610)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
	40 percent slopes			Pesticide and nutrient movement (0.22)		
91A	Woodburn silt loam, 0 to 3 percent slopes	Somewhat limited	Woodburn (85%)	Pesticide and nutrient movement (0.96)	88.6	1.5%
91B	Woodburn silt loam, 3 to 8 percent slopes	Somewhat limited	Woodburn (90%)	Pesticide and nutrient movement (0.96)	779.4	12.9%
				Water Erosion (0.12)		
91C	Woodburn silt loam, 8 to 15 percent slopes	Very limited	Woodburn (90%)	Water Erosion (1.00)	283.3	4.7%
				Pesticide and nutrient movement (0.96)		
			Dayton (2%)	Pesticide and nutrient movement (1.00)		
92F	Xerochrepts and Haploxerolls, very steep	Very limited	Xerochrepts (50%)	Water Erosion (1.00)	287.0	4.7%
				Pesticide and nutrient movement (0.14)		
			Haploxerolls (35%)	Water Erosion (1.00)		
				Pesticide and nutrient movement (0.48)		
93E	Xerochrepts-Rock outcrop complex, moderately steep	Somewhat limited	Xerochrepts (60%)	Water Erosion (0.72)	115.8	1.9%
				Pesticide and nutrient movement (0.00)		
W	Water	Not rated	Water (100%)		477.5	7.9%
Totals for Area of Interest					**6,050.5**	**100.0%**

Subsurface Water Management, Outflow Quality— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Very limited	2,732.4	45.2%
Somewhat limited	2,437.8	40.3%

Subsurface Water Management, Outflow Quality— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Null or Not Rated	880.4	14.5%
Totals for Area of Interest	**6,050.5**	**100.0%**

Rating Options—Subsurface Water Management, Outflow Quality

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

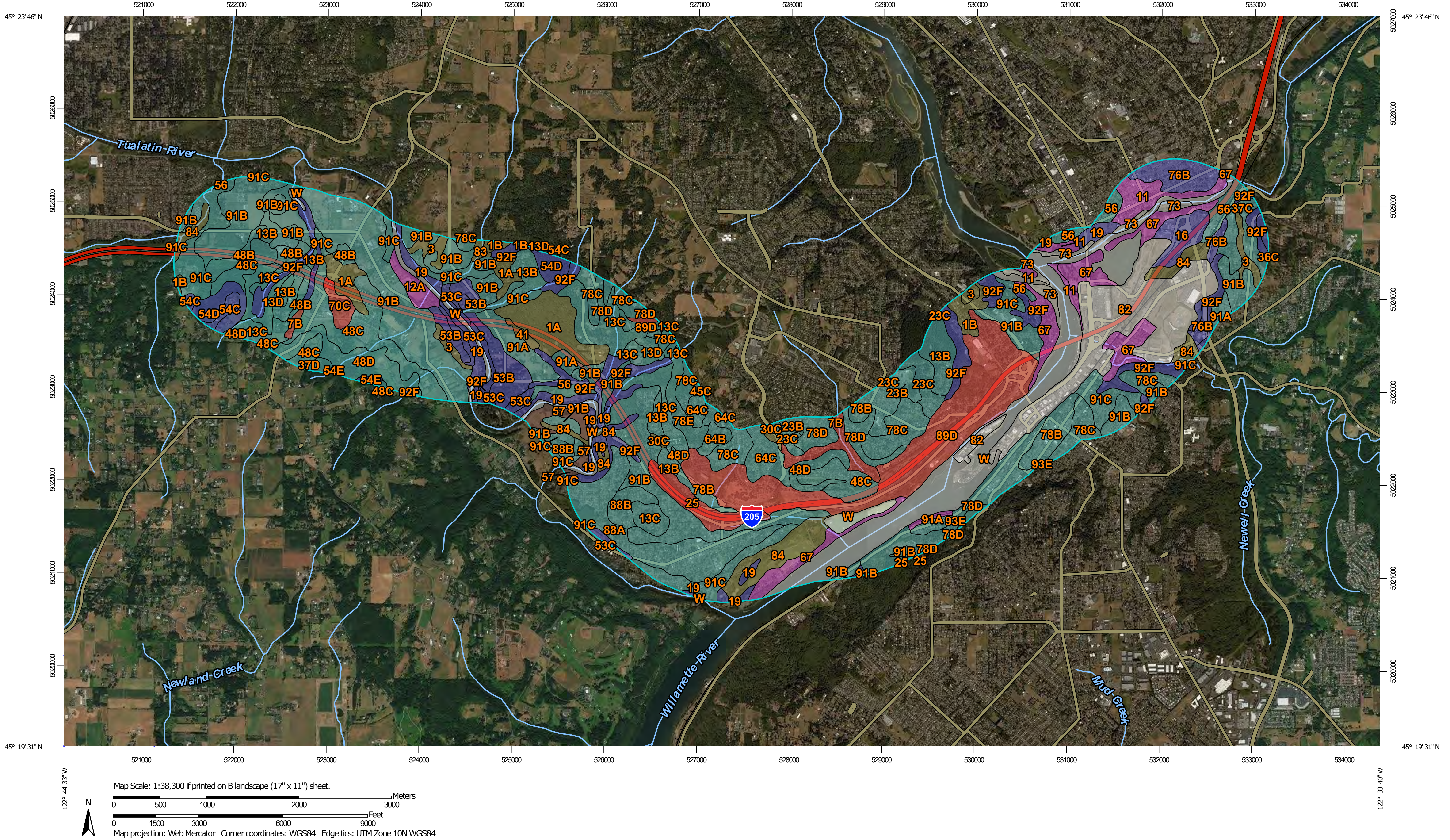
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Map—Hydrologic Soil Group



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clackamas County Area, Oregon
Survey Area Data: Version 11, Sep 16, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 8, 2010—Sep 13, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Clackamas County Area, Oregon (OR610)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1A	Aloha silt loam, 0 to 3 percent slopes	C/D	161.9	2.7%
1B	Aloha silt loam, 3 to 6 percent slopes	C/D	34.9	0.6%
3	Amity silt loam	C/D	51.2	0.8%
7B	Borges silty clay loam, 0 to 8 percent slopes	D	47.0	0.8%
11	Camas gravelly sandy loam	A	78.0	1.3%
12A	Canderly sandy loam, 0 to 3 percent slopes	A	29.1	0.5%
13B	Cascade silt loam, 3 to 8 percent slopes	C	130.4	2.2%
13C	Cascade silt loam, 8 to 15 percent slopes	C	134.6	2.2%
13D	Cascade silt loam, 15 to 30 percent slopes	C	53.4	0.9%
16	Chehalis silt loam	B	50.7	0.8%
19	Cloquato silt loam	B	113.2	1.9%
23B	Cornelius silt loam, 3 to 8 percent slopes	C	30.8	0.5%
23C	Cornelius silt loam, 8 to 15 percent slopes	C	48.2	0.8%
25	Cove silty clay loam	D	63.3	1.0%
30C	Delena silt loam, 3 to 12 percent slopes	C/D	9.9	0.2%
36C	Hardscrabble silt loam, 7 to 20 percent slopes	D	0.0	0.0%
37C	Helvetia silt loam, 8 to 15 percent slopes	C	51.0	0.8%
37D	Helvetia silt loam, 15 to 30 percent slopes	C	7.9	0.1%
41	Huberly silt loam	C/D	8.3	0.1%
45C	Jory silty clay loam, 8 to 15 percent slopes	C	0.7	0.0%
48B	Kinton silt loam, 3 to 8 percent slopes	C	67.3	1.1%
48C	Kinton silt loam, 8 to 15 percent slopes	C	247.5	4.1%
48D	Kinton silt loam, 15 to 30 percent slopes	C	125.4	2.1%
53B	Latourell loam, 3 to 8 percent slopes	B	94.8	1.6%

Hydrologic Soil Group— Summary by Map Unit — Clackamas County Area, Oregon (OR610)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
53C	Latourell loam, 8 to 15 percent slopes	B	37.2	0.6%
54C	Laurelwood silt loam, 8 to 15 percent slopes	B	16.3	0.3%
54D	Laurelwood silt loam, 15 to 30 percent slopes	B	62.1	1.0%
54E	Laurelwood silt loam, 30 to 60 percent slopes	B	6.5	0.1%
56	McBee silty clay loam	C	74.6	1.2%
57	McBee variant loam	B/D	35.5	0.6%
64B	Nekia silty clay loam, 2 to 8 percent slopes	C	17.7	0.3%
64C	Nekia silty clay loam, 8 to 15 percent slopes	C	61.0	1.0%
67	Newberg fine sandy loam	A	189.0	3.1%
70C	Powell silt loam, 8 to 15 percent slopes	D	23.5	0.4%
73	Riverwash		39.8	0.7%
76B	Salem silt loam, 0 to 7 percent slopes	B	89.8	1.5%
78B	Saum silt loam, 3 to 8 percent slopes	C	110.0	1.8%
78C	Saum silt loam, 8 to 15 percent slopes	C	229.2	3.8%
78D	Saum silt loam, 15 to 30 percent slopes	C	157.1	2.6%
78E	Saum silt loam, 30 to 60 percent slopes	C	39.9	0.7%
82	Urban land		363.1	6.0%
83	Wapato silt loam	C/D	6.5	0.1%
84	Wapato silty clay loam	C/D	146.1	2.4%
88A	Willamette silt loam, wet, 0 to 3 percent slopes	C	192.6	3.2%
88B	Willamette silt loam, wet, 3 to 7 percent slopes	C	42.8	0.7%
89D	Witzel very stony silt loam, 3 to 40 percent slopes	D	439.2	7.3%
91A	Woodburn silt loam, 0 to 3 percent slopes	C	88.6	1.5%
91B	Woodburn silt loam, 3 to 8 percent slopes	C	779.4	12.9%
91C	Woodburn silt loam, 8 to 15 percent slopes	C	283.3	4.7%
92F	Xerochrepts and Haploxerolls, very steep	B	287.0	4.7%

Hydrologic Soil Group— Summary by Map Unit — Clackamas County Area, Oregon (OR610)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
93E	Xerochrepts-Rock outcrop complex, moderately steep	C	115.8	1.9%
W	Water		477.5	7.9%
Totals for Area of Interest			**6,050.5**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group

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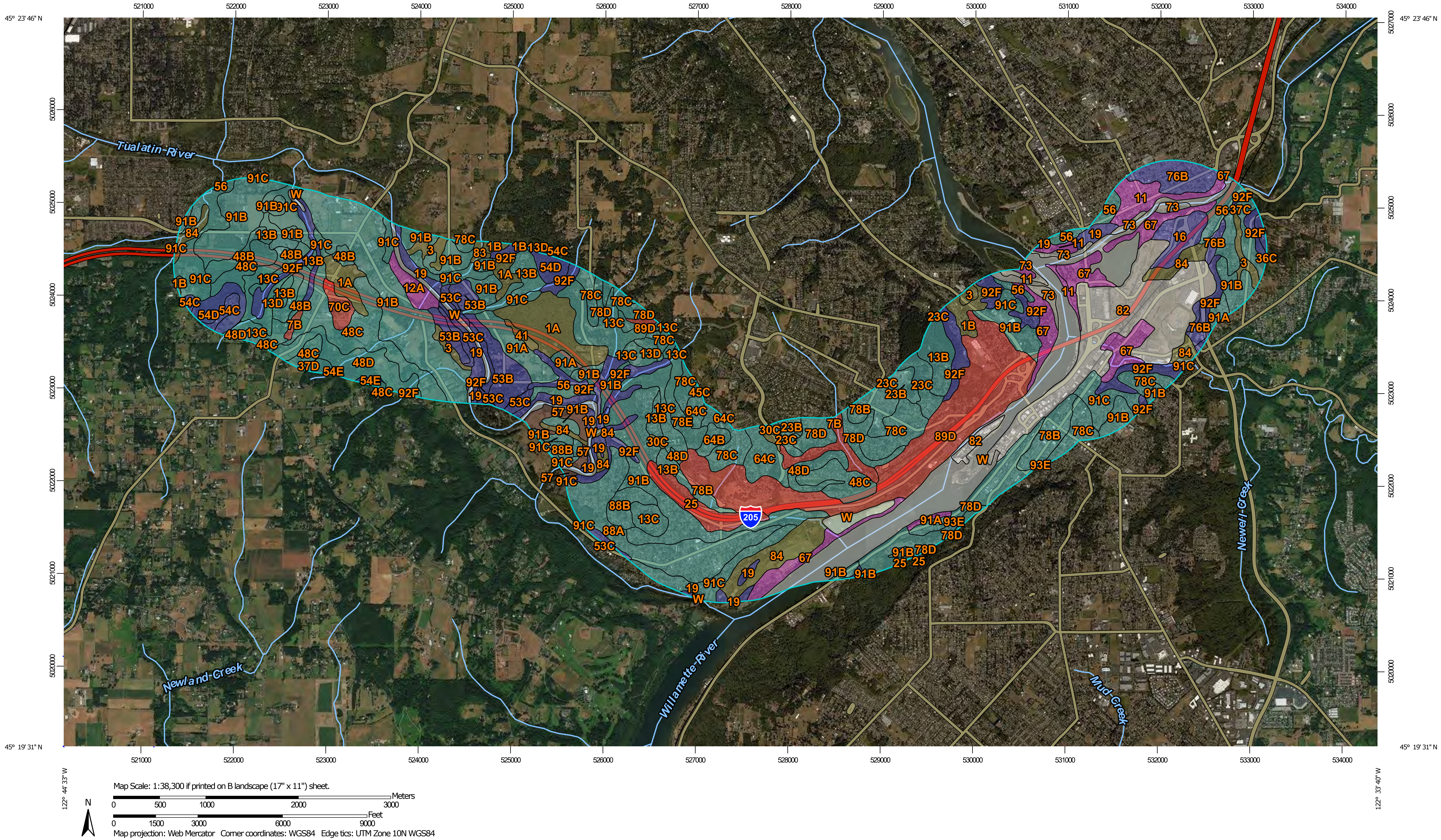
Custom Soil Resource Report
Map—Hydrologic Soil Group



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 11, Sep 16, 2016

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3	Amity silt loam	C/D	51.2	0.8%
7B	Borges silty clay loam, 0 to 8 percent slopes	D	47.0	0.8%
11	Camas gravelly sandy loam	A	78.0	1.3%
12A	Canderly sandy loam, 0 to 3 percent slopes	A	29.1	0.5%
13B	Cascade silt loam, 3 to 8 percent slopes	C	130.4	2.2%
13C	Cascade silt loam, 8 to 15 percent slopes	C	134.6	2.2%
13D	Cascade silt loam, 15 to 30 percent slopes	C	53.4	0.9%
16	Chehalis silt loam	B	50.7	0.8%
19	Cloquato silt loam	B	113.2	1.9%
23B	Cornelius silt loam, 3 to 8 percent slopes	C	30.8	0.5%
23C	Cornelius silt loam, 8 to 15 percent slopes	C	48.2	0.8%
25	Cove silty clay loam	D	63.3	1.0%
30C	Delena silt loam, 3 to 12 percent slopes	C/D	9.9	0.2%
36C	Hardscrabble silt loam, 7 to 20 percent slopes	D	0.0	0.0%
37C	Helvetia silt loam, 8 to 15 percent slopes	C	51.0	0.8%
37D	Helvetia silt loam, 15 to 30 percent slopes	C	7.9	0.1%
41	Huberly silt loam	C/D	8.3	0.1%
45C	Jory silty clay loam, 8 to 15 percent slopes	C	0.7	0.0%
48B	Kinton silt loam, 3 to 8 percent slopes	C	67.3	1.1%
48C	Kinton silt loam, 8 to 15 percent slopes	C	247.5	4.1%
48D	Kinton silt loam, 15 to 30 percent slopes	C	125.4	2.1%
53B	Latourell loam, 3 to 8 percent slopes	B	94.8	1.6%

Hydrologic Soil Group— Summary by Map Unit — Clackamas County Area, Oregon (OR610)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
53C	Latourell loam, 8 to 15 percent slopes	B	37.2	0.6%
54C	Laurelwood silt loam, 8 to 15 percent slopes	B	16.3	0.3%
54D	Laurelwood silt loam, 15 to 30 percent slopes	B	62.1	1.0%
54E	Laurelwood silt loam, 30 to 60 percent slopes	B	6.5	0.1%
56	McBee silty clay loam	C	74.6	1.2%
57	McBee variant loam	B/D	35.5	0.6%
64B	Nekia silty clay loam, 2 to 8 percent slopes	C	17.7	0.3%
64C	Nekia silty clay loam, 8 to 15 percent slopes	C	61.0	1.0%
67	Newberg fine sandy loam	A	189.0	3.1%
70C	Powell silt loam, 8 to 15 percent slopes	D	23.5	0.4%
73	Riverwash		39.8	0.7%
76B	Salem silt loam, 0 to 7 percent slopes	B	89.8	1.5%
78B	Saum silt loam, 3 to 8 percent slopes	C	110.0	1.8%
78C	Saum silt loam, 8 to 15 percent slopes	C	229.2	3.8%
78D	Saum silt loam, 15 to 30 percent slopes	C	157.1	2.6%
78E	Saum silt loam, 30 to 60 percent slopes	C	39.9	0.7%
82	Urban land		363.1	6.0%
83	Wapato silt loam	C/D	6.5	0.1%
84	Wapato silty clay loam	C/D	146.1	2.4%
88A	Willamette silt loam, wet, 0 to 3 percent slopes	C	192.6	3.2%
88B	Willamette silt loam, wet, 3 to 7 percent slopes	C	42.8	0.7%
89D	Witzel very stony silt loam, 3 to 40 percent slopes	D	439.2	7.3%
91A	Woodburn silt loam, 0 to 3 percent slopes	C	88.6	1.5%
91B	Woodburn silt loam, 3 to 8 percent slopes	C	779.4	12.9%
91C	Woodburn silt loam, 8 to 15 percent slopes	C	283.3	4.7%
92F	Xerochrepts and Haploxerolls, very steep	B	287.0	4.7%

Hydrologic Soil Group— Summary by Map Unit — Clackamas County Area, Oregon (OR610)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
93E	Xerochrepts-Rock outcrop complex, moderately steep	C	115.8	1.9%
W	Water		477.5	7.9%
Totals for Area of Interest			**6,050.5**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Water Features

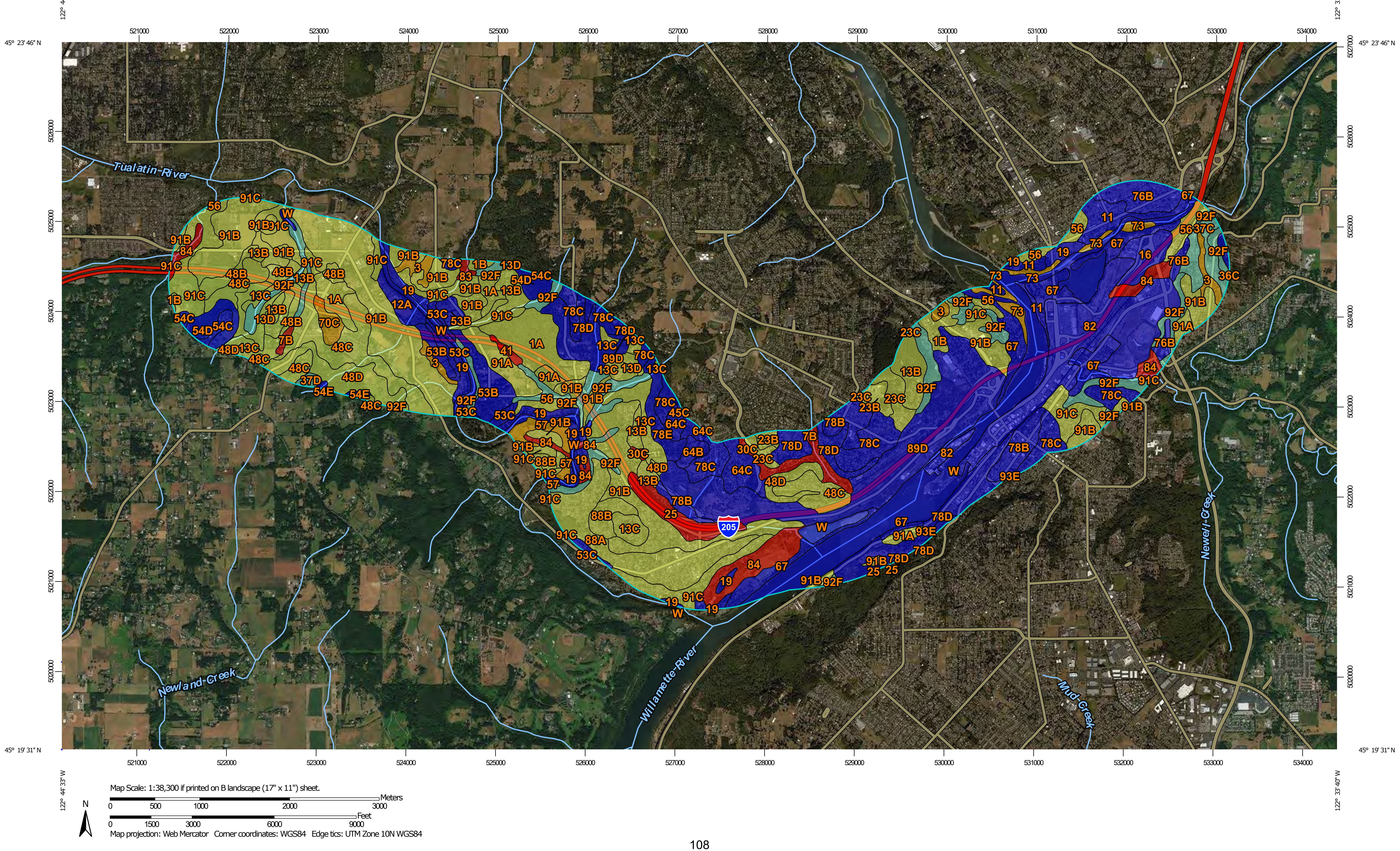
Water Features include ponding frequency, flooding frequency, and depth to water table.

Depth to Water Table

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report
Map—Depth to Water Table



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clackamas County Area, Oregon
Survey Area Data: Version 11, Sep 16, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 8, 2010—Sep 13, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Depth to Water Table

Depth to Water Table— Summary by Map Unit — Clackamas County Area, Oregon (OR610)				
Map unit symbol	**Map unit name**	**Rating (centimeters)**	**Acres in AOI**	**Percent of AOI**
1A	Aloha silt loam, 0 to 3 percent slopes	54	161.9	2.7%
1B	Aloha silt loam, 3 to 6 percent slopes	54	34.9	0.6%
3	Amity silt loam	31	51.2	0.8%
7B	Borges silty clay loam, 0 to 8 percent slopes	8	47.0	0.8%
11	Camas gravelly sandy loam	>200	78.0	1.3%
12A	Canderly sandy loam, 0 to 3 percent slopes	>200	29.1	0.5%
13B	Cascade silt loam, 3 to 8 percent slopes	61	130.4	2.2%
13C	Cascade silt loam, 8 to 15 percent slopes	61	134.6	2.2%
13D	Cascade silt loam, 15 to 30 percent slopes	61	53.4	0.9%
16	Chehalis silt loam	>200	50.7	0.8%
19	Cloquato silt loam	>200	113.2	1.9%
23B	Cornelius silt loam, 3 to 8 percent slopes	86	30.8	0.5%
23C	Cornelius silt loam, 8 to 15 percent slopes	86	48.2	0.8%
25	Cove silty clay loam	15	63.3	1.0%
30C	Delena silt loam, 3 to 12 percent slopes	23	9.9	0.2%
36C	Hardscrabble silt loam, 7 to 20 percent slopes	31	0.0	0.0%
37C	Helvetia silt loam, 8 to 15 percent slopes	137	51.0	0.8%
37D	Helvetia silt loam, 15 to 30 percent slopes	137	7.9	0.1%
41	Huberly silt loam	23	8.3	0.1%
45C	Jory silty clay loam, 8 to 15 percent slopes	>200	0.7	0.0%
48B	Kinton silt loam, 3 to 8 percent slopes	86	67.3	1.1%
48C	Kinton silt loam, 8 to 15 percent slopes	86	247.5	4.1%
48D	Kinton silt loam, 15 to 30 percent slopes	86	125.4	2.1%
53B	Latourell loam, 3 to 8 percent slopes	>200	94.8	1.6%

Depth to Water Table— Summary by Map Unit — Clackamas County Area, Oregon (OR610)				
Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
53C	Latourell loam, 8 to 15 percent slopes	>200	37.2	0.6%
54C	Laurelwood silt loam, 8 to 15 percent slopes	>200	16.3	0.3%
54D	Laurelwood silt loam, 15 to 30 percent slopes	>200	62.1	1.0%
54E	Laurelwood silt loam, 30 to 60 percent slopes	>200	6.5	0.1%
56	McBee silty clay loam	76	74.6	1.2%
57	McBee variant loam	31	35.5	0.6%
64B	Nekia silty clay loam, 2 to 8 percent slopes	>200	17.7	0.3%
64C	Nekia silty clay loam, 8 to 15 percent slopes	>200	61.0	1.0%
67	Newberg fine sandy loam	>200	189.0	3.1%
70C	Powell silt loam, 8 to 15 percent slopes	38	23.5	0.4%
73	Riverwash	31	39.8	0.7%
76B	Salem silt loam, 0 to 7 percent slopes	>200	89.8	1.5%
78B	Saum silt loam, 3 to 8 percent slopes	>200	110.0	1.8%
78C	Saum silt loam, 8 to 15 percent slopes	>200	229.2	3.8%
78D	Saum silt loam, 15 to 30 percent slopes	>200	157.1	2.6%
78E	Saum silt loam, 30 to 60 percent slopes	>200	39.9	0.7%
82	Urban land	>200	363.1	6.0%
83	Wapato silt loam	0	6.5	0.1%
84	Wapato silty clay loam	8	146.1	2.4%
88A	Willamette silt loam, wet, 0 to 3 percent slopes	92	192.6	3.2%
88B	Willamette silt loam, wet, 3 to 7 percent slopes	92	42.8	0.7%
89D	Witzel very stony silt loam, 3 to 40 percent slopes	>200	439.2	7.3%
91A	Woodburn silt loam, 0 to 3 percent slopes	64	88.6	1.5%
91B	Woodburn silt loam, 3 to 8 percent slopes	64	779.4	12.9%
91C	Woodburn silt loam, 8 to 15 percent slopes	64	283.3	4.7%
92F	Xerochrepts and Haploxerolls, very steep	137	287.0	4.7%

Depth to Water Table— Summary by Map Unit — Clackamas County Area, Oregon (OR610)				
Map unit symbol	**Map unit name**	**Rating (centimeters)**	**Acres in AOI**	**Percent of AOI**
93E	Xerochrepts-Rock outcrop complex, moderately steep	>200	115.8	1.9%
W	Water	>200	477.5	7.9%
Totals for Area of Interest			**6,050.5**	**100.0%**

Rating Options—Depth to Water Table

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

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SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

August 22, 2018

Mr. Steve Drahota
HDR, Inc.
1001 SW 5th Avenue, Suite 1800
Portland, Oregon 97204

RE: DRAFT PRELIMINARY INFILTRATION TESTING RESULTS MEMORANDUM CLACKAMAS COUNTY, OREGON

Dear Mr. Drahota:

This letter report summarizes results of infiltration testing performed by Shannon & Wilson, Inc. (Shannon & Wilson), to support design of stormwater management facilities for the I-205: Stafford Road to OR99E Corridor Widening Project. The project area is shown on the Vicinity Map, Figure 1. We understand the Oregon Department of Transportation (ODOT) is planning to widen the Interstate-205 (I-205) corridor from Stafford Road to OR99E. This project will widen I-205 to three lanes northbound and three lanes southbound from Stafford Road to OR213. We also understand the project will include proposed facilities such as detention ponds and swales which will be deeper than 3 feet.

To assist HDR, Inc. (HDR), for the design of the proposed stormwater management facilities, Shannon & Wilson is providing geotechnical field explorations and infiltration testing services. Our services were performed in accordance with the scope of services defined in the HDR Subconsultant Task Order No.10063137-001, dated June 14, 2018.

INFILTRATION TESTING

Shannon & Wilson is currently performing a subsurface investigation for Amendment 3 at the project site. As part of the ongoing subsurface investigation, we completed 15 infiltration tests. Approximate locations of the infiltration test sites are shown on the Site and Exploration Plan, Figure 2. A Shannon & Wilson representative was on site to perform each infiltration test.

Infiltration Testing

Infiltration tests were conducted in accordance with the procedures described in the Infiltration Testing Guide, of the *Stormwater Standards, Clackamas County Stormwater Service District No.*

1(E.2.2). Infiltration tests must be performed at the base of the proposed facilities, which is anticipated to be approximately six feet. As shown in Table 1 below, nine of the holes were excavated to less than 3.5 feet. At these locations, we encountered refusal conditions after several attempts due to gravels, cobbles, and boulders, at or near the surface.

The test hole was advanced using a gasoline-powered auger and hand tools. A 6-inch-diameter PVC casing was embedded into the underlying soil to perform the Encased Falling Head Test method. This method is not appropriate in gravelly soils or conditions in which a good seal with the casing cannot be established. In these cases, the Open Pit Falling Head Test method was followed.

The excavated hole was then filled with clean water a minimum of 12 inches deep, and this depth was maintained for at least 4 hours to presoak the native material. After the presaturation period, the holes were refilled with water to 6 inches (12 inches for Open Pit Falling Head Test Method) and the drawdown time was measured. Measurements were made every 10 minutes for one hour in faster draining soils, or 20 minutes for two hours in slower draining soils.

The process of refilling the hole and taking measurements (a trial) is repeated until the change in measured infiltration rate between two successive trials is no more than five percent. At least three trials were conducted for each test.

The infiltration test results of all infiltration tests are presented on Figures 3 through 17.

RESULTS

According to the *Stormwater Standards, Clackamas County Stormwater Service District No. 1(E.2.2),* the final infiltration rates were calculated using the following standard calculation. The calculation is performed for each water level drop and is outlined below:

= (Drop in water level/Time interval) x conversion

= 0.055ft/20min x (12in/ft) x (60min/hr)

= 1.98 inches per hour

Field-measured infiltration rates in the final test of each trial for each test location are provided in Table 1 below.

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TABLE 1
INFILTRATION TESTING SUMMARY

Designation	Approximate Depth (feet)	Infiltration Testing Method	Final Infiltration Rate (inches/hour) for each Trial		
			1	2	3
INF19786-01	5.0	Encased Falling Head Test	0.06	0.00	0.00
INF19786-02	5.5	Encased Falling Head Test	0.72	0.36	0.72
INF19786-03	5.5	Encased Falling Head Test	0.09	0.18	0.0
INF19786-04	6	Encased Falling Head Test	1.44	1.44	0.72
INF19786-05	5.25	Encased Falling Head Test	0.00	0.00	0.00
INF19786-06	2.5	Open Pit Falling Head Test	0.36	0.17	0.36
INF19786-07	5.5	Encased Falling Head Test	0.72	0.72	0.72
INF19786-08	2.0	Open Pit Falling Head Test	1.44	1.44	1.44
INF19786-09	2.0	Open Pit Falling Head Test	3.60	3.60	2.88
INF19786-10	2.0	Open Pit Falling Head Test	2.88	2.88	2.88
INF19786-11	2.0	Open Pit Falling Head Test	0.72	0.36	0.36
INF19786-12	2.0	Open Pit Falling Head Test	1.44	0.72	1.44
INF19786-13	3.0	Open Pit Falling Head Test	1.44	1.44	1.44
INF19786-14	3.5	Open Pit Falling Head Test	1.44	0.72	1.44
INF19786-15	2.0	Open Pit Falling Head Test	0.36	0.00	0.36

LIMITATIONS

Shannon & Wilson has prepared this report in a professional manner, using a level of skill and care normally exercised for similar projects under similar conditions by reputable and competent geotechnical consultants currently practicing in the area, and in accordance with the terms and conditions set forth in our proposal. The facts and conditions referenced in this report may change over time, and the conclusions set forth herein are applicable to the facts and conditions

SHANNON & WILSON, INC.

as described only at the time of this report. Conclusions were made within the operative constraints of the scope, budget, and schedule for this project. We believe that the conditions stated here are factual, but no guarantee is made or implied. This report is for the exclusive use of HDR, Inc. We have prepared an enclosure, "Important Information About Your Geotechnical/Environmental Report," to help you and others understand the use and limitations of our reports.

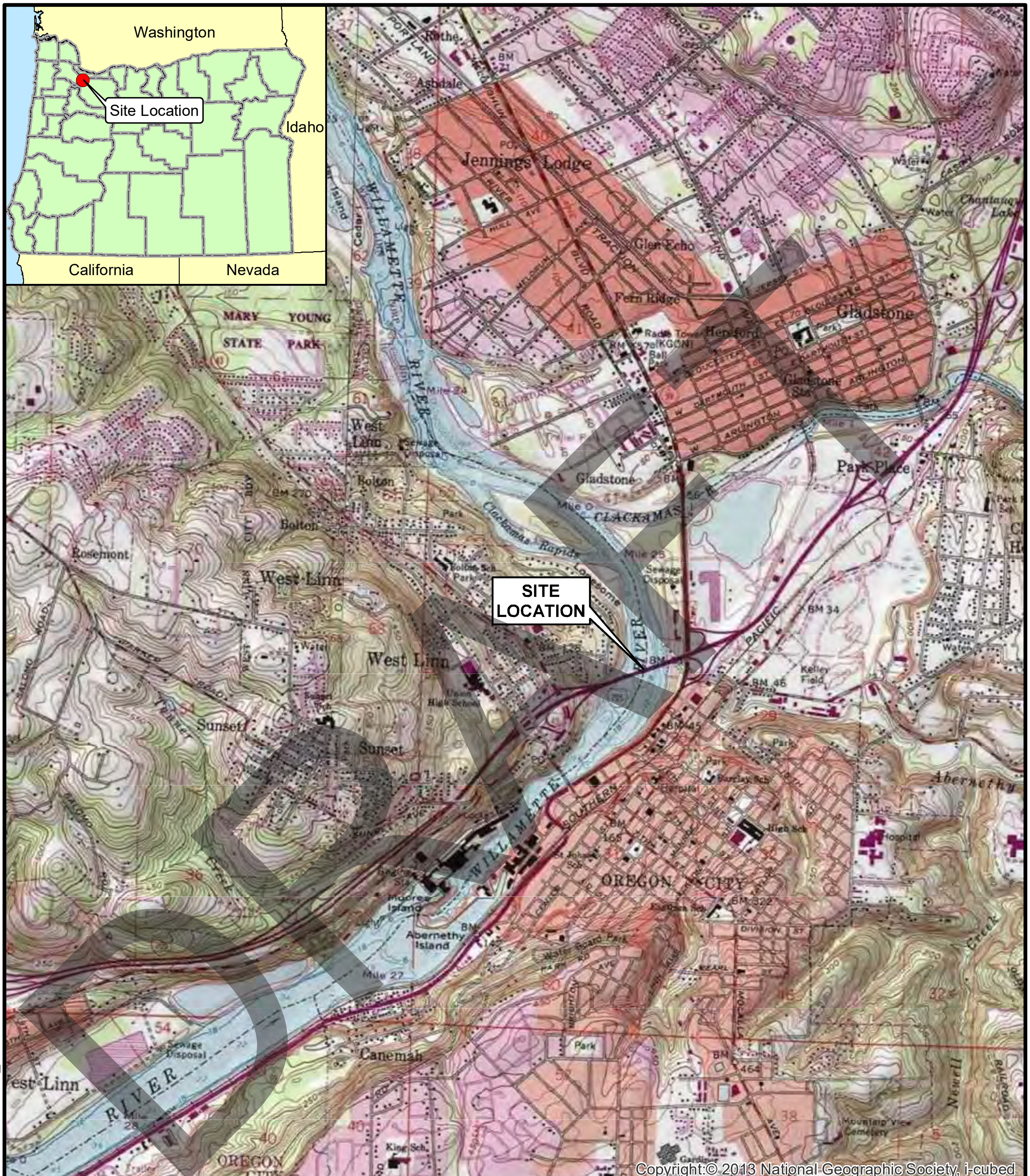
Sincerely,

SHANNON & WILSON, INC.

Cody Sorensen, CEG	Christina Villeneuve, GIT
Senior Engineering Geologist	Staff Geologist

CLV:NMV/mmm

Enc: Figure 1: Vicinity Map
Figure 2: Site and Exploration Plan
Figures 3 through 17: Infiltration Test Results
Important Information About Your Geotechnical/Environmental Report



I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

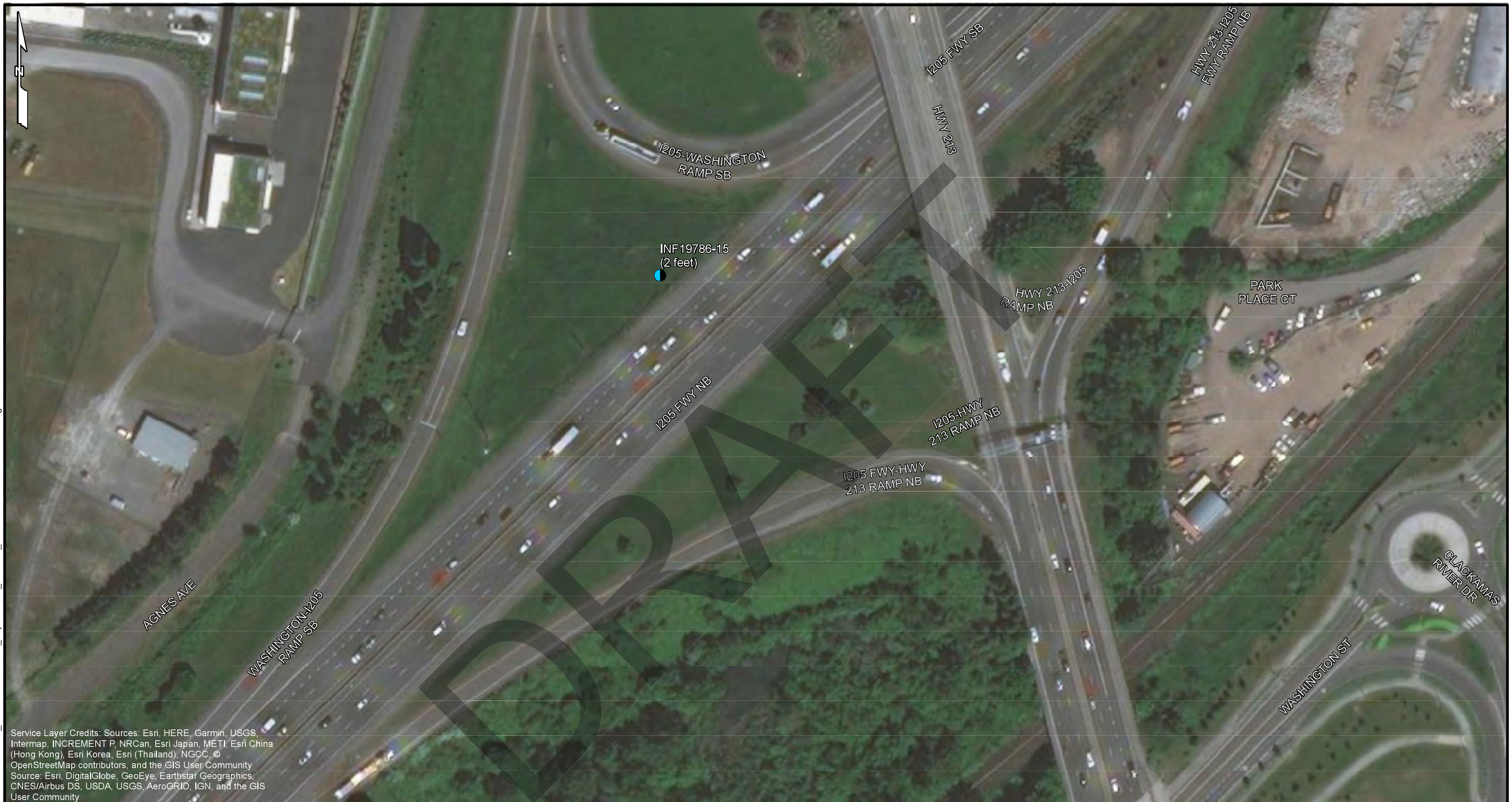
VICINITY MAP

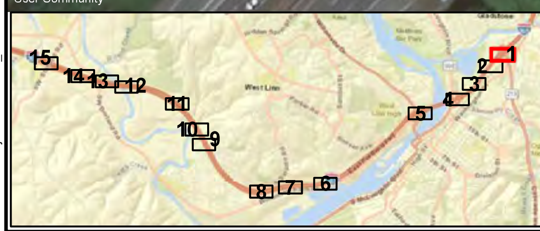
August 2018 24-1-04165-006

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 1

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\2018_Amendment 3\VicinityMap.mxd Date: 11/15/2017 Login: ath





LEGEND

INF19786-15A (Final Depth) — Approximate Infiltration Location

0 50 100 200
Scale in Feet

I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

EXPLORATION PLAN
INFILTRATION TESTING

August 2018 24-1-04165-006

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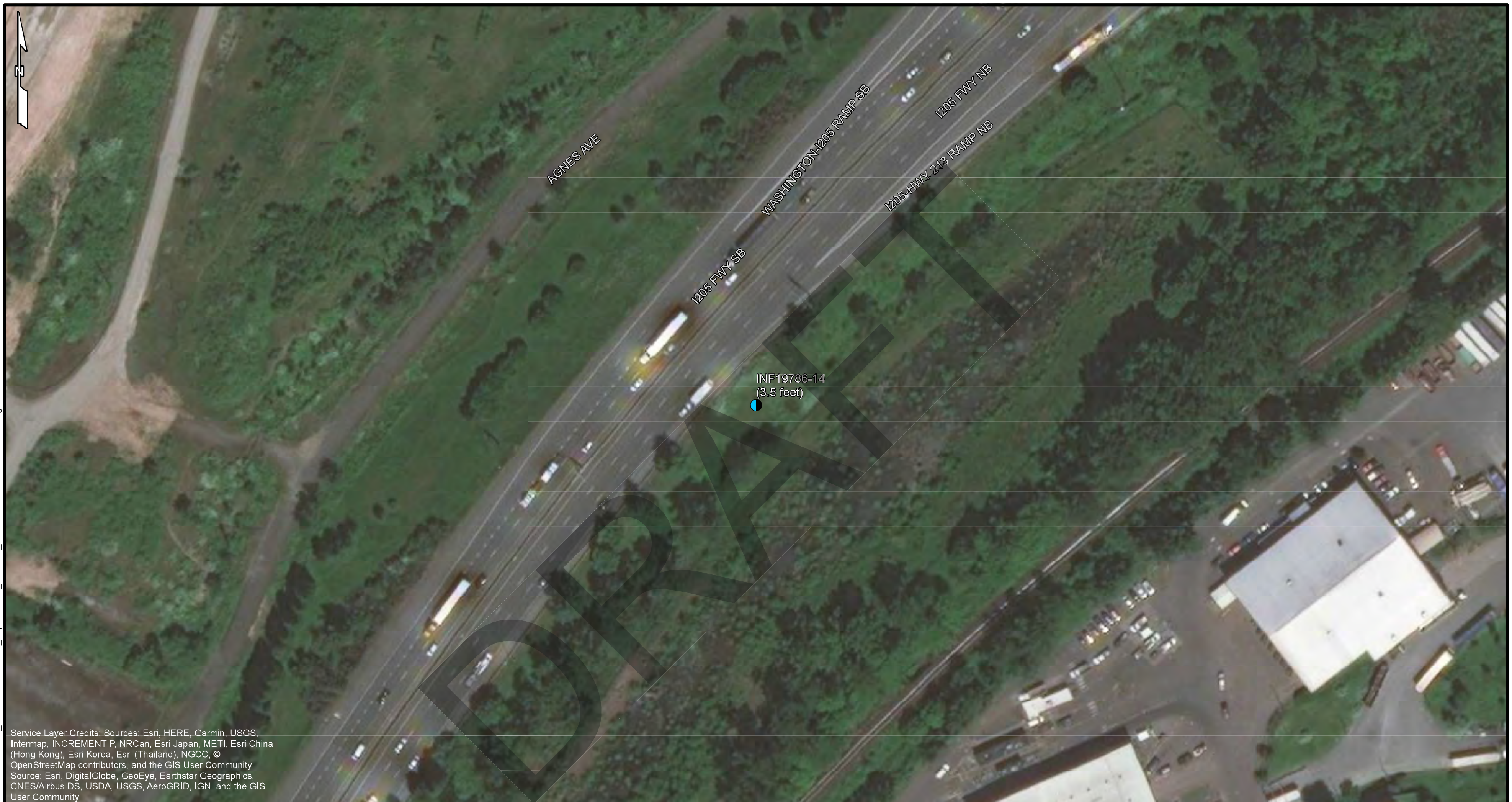
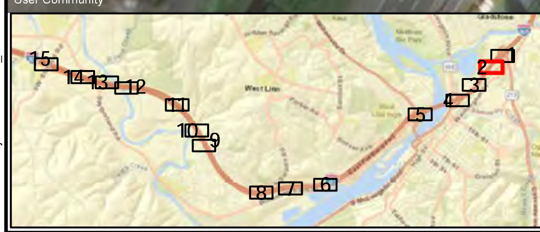
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 1 of 15

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\2018_Amendment 3\2018_Explorations_Amend3_inf.mxd Date: 8/10/2018 Login: ath





LEGEND

INF19786-15A
(Final Depth)

Approximate Infiltration Location

0 50 100 200

Scale in Feet

I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

EXPLORATION PLAN
INFILTRATION TESTING

August 2018 24-1-04165-006

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 2 of 15

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\2018_Amendment 3\2018_Explorations_Amend3_inf.mxd Date: 8/10/2018 Login: ath

LEGEND

INF19786-15A
(Final Depth)

Approximate Infiltration Location

0 50 100 200
Scale in Feet

I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

EXPLORATION PLAN
INFILTRATION TESTING

August 2018 24-1-04165-006

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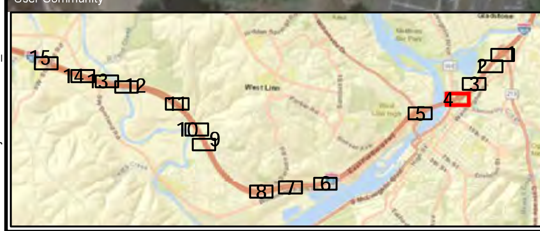
FIG. 2
Sheet 3 of 15

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\2018_Amendment 3\2018_Explorations_Amend3_inf.mxd Date: 8/10/2018 Login: ath

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



LEGEND

INF19786-15A
(Final Depth)

Approximate Infiltration Location

0 50 100 200
Scale in Feet

N

I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

EXPLORATION PLAN
INFILTRATION TESTING

August 2018 24-1-04165-006

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FIG. 2
Sheet 4 of 15

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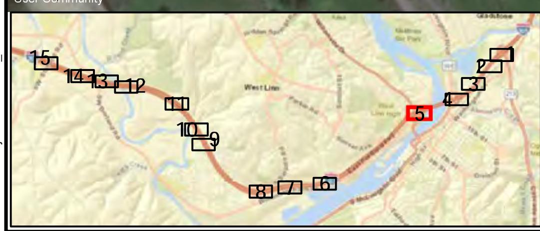

LEGEND

INF19786-15A
(Final Depth)

Approximate Infiltration Location

0 50 100 200

Scale in Feet

I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

EXPLORATION PLAN
INFILTRATION TESTING

August 2018 24-1-04165-006

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FIG. 2
Sheet 5 of 15

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\2018_Amendment 3\2018_Explorations_Amend3_inf.mxd Date: 8/10/2018 Login: ath

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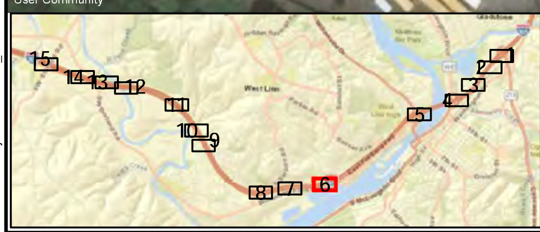

LEGEND

INF19786-15A
(Final Depth)

Approximate Infiltration Location

0 50 100 200

Scale in Feet

I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

EXPLORATION PLAN
INFILTRATION TESTING

August 2018 24-1-04165-006

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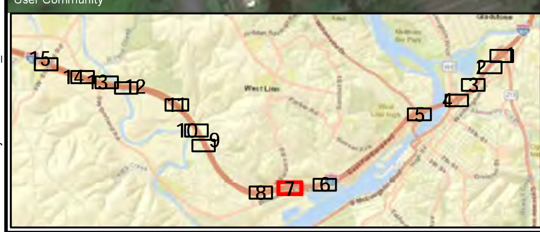
FIG. 2
Sheet 6 of 15



LEGEND

INF19786-15A
(Final Depth)
Approximate Infiltration Location

0 50 100 200
Scale in Feet

I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

EXPLORATION PLAN
INFILTRATION TESTING

August 2018 24-1-04165-006

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 7 of 15

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\2018_Amendment 3\2018_Explorations_Amend3_inf.mxd Date: 8/10/2018 Login: ath

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\2018_Amendment 3\2018_Explorations_Amend3_inf.mxd Date: 8/10/2018 Login: ath

LEGEND

INF19786-15A
(Final Depth)

Approximate Infiltration Location

0 50 100 200

Scale in Feet

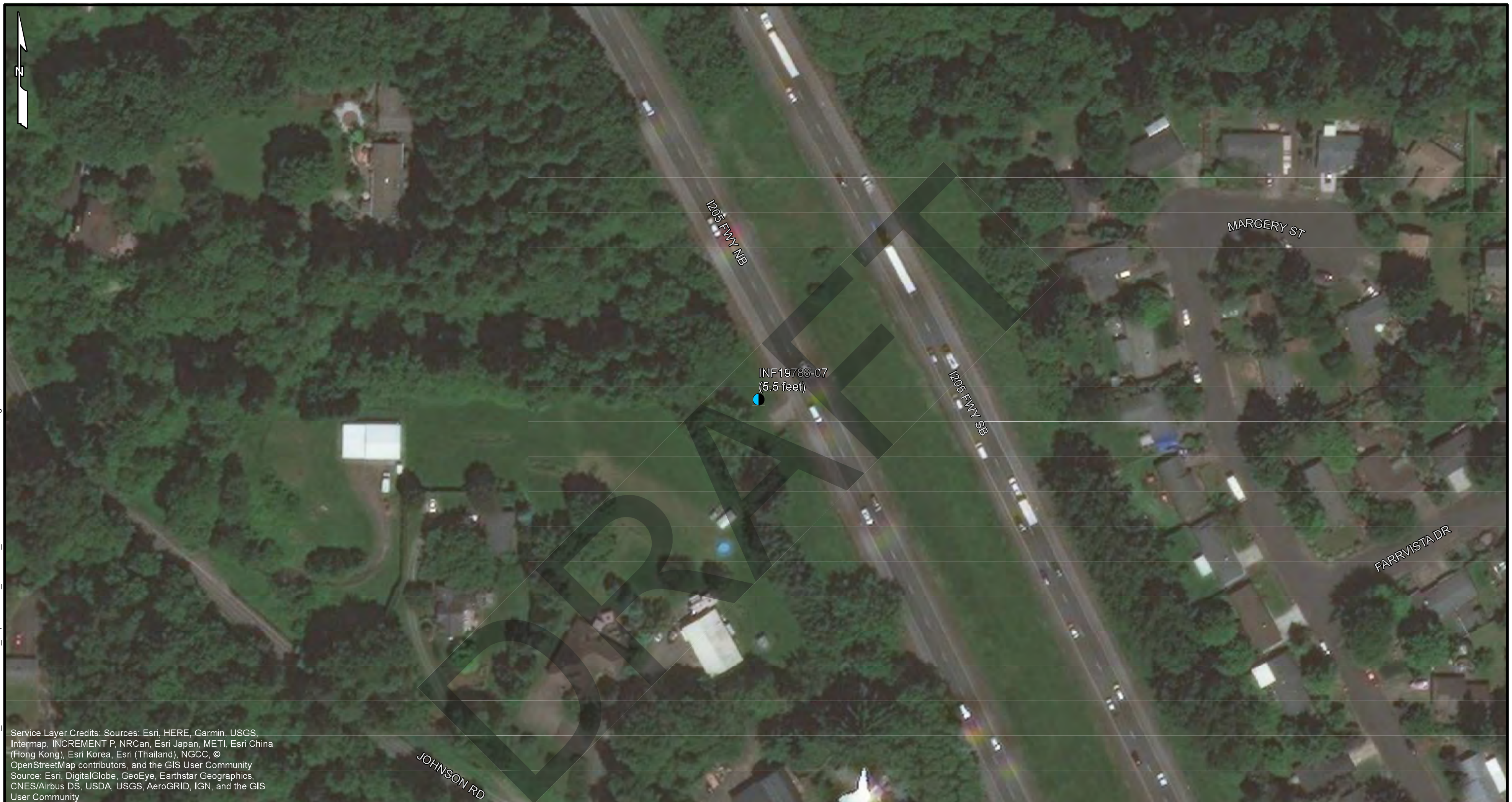
I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

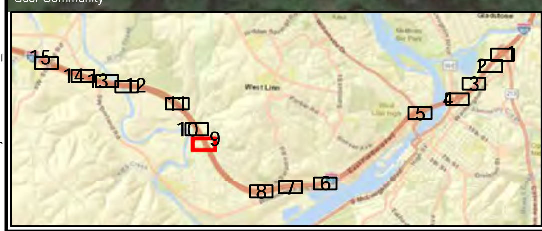
EXPLORATION PLAN
INFILTRATION TESTING

August 2018 24-1-04165-006

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 8 of 15





LEGEND

INF19786-15A (Final Depth) — Approximate Infiltration Location

0 50 100 200
Scale in Feet

I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

EXPLORATION PLAN
INFILTRATION TESTING

August 2018 24-1-04165-006

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 9 of 15

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\2018_Amendment 3\2018_Explorations_Amend3_inf.mxd Date: 8/10/2018 Login: ath

LEGEND

INF19786-15A
(Final Depth)

Approximate Infiltration Location

0 50 100 200

Scale in Feet

I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

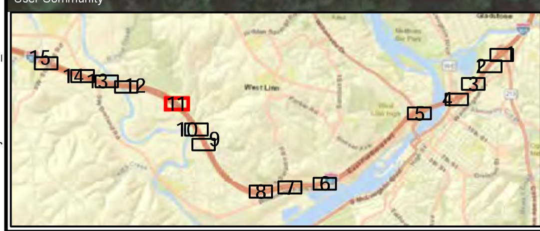
EXPLORATION PLAN
INFILTRATION TESTING

August 2018 24-1-04165-006

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 10 of 15

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\2018_Amendment 3\2018_Explorations_Amend3_inf.mxd Date: 8/10/2018 Login: ath



LEGEND

INF19786-15A
(Final Depth)

Approximate Infiltration Location

0 50 100 200

Scale in Feet

I-205: Stafford Road to OR99E Corridor Widening Clackamas County, Oregon	
EXPLORATION PLAN INFILTRATION TESTING	
August 2018	24-1-04165-006
SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS	FIG. 2 Sheet 11 of 15

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\2018_Amendment 3\2018_Explorations_Amend3_inf.mxd   Date: 8/10/2018   Login: ath

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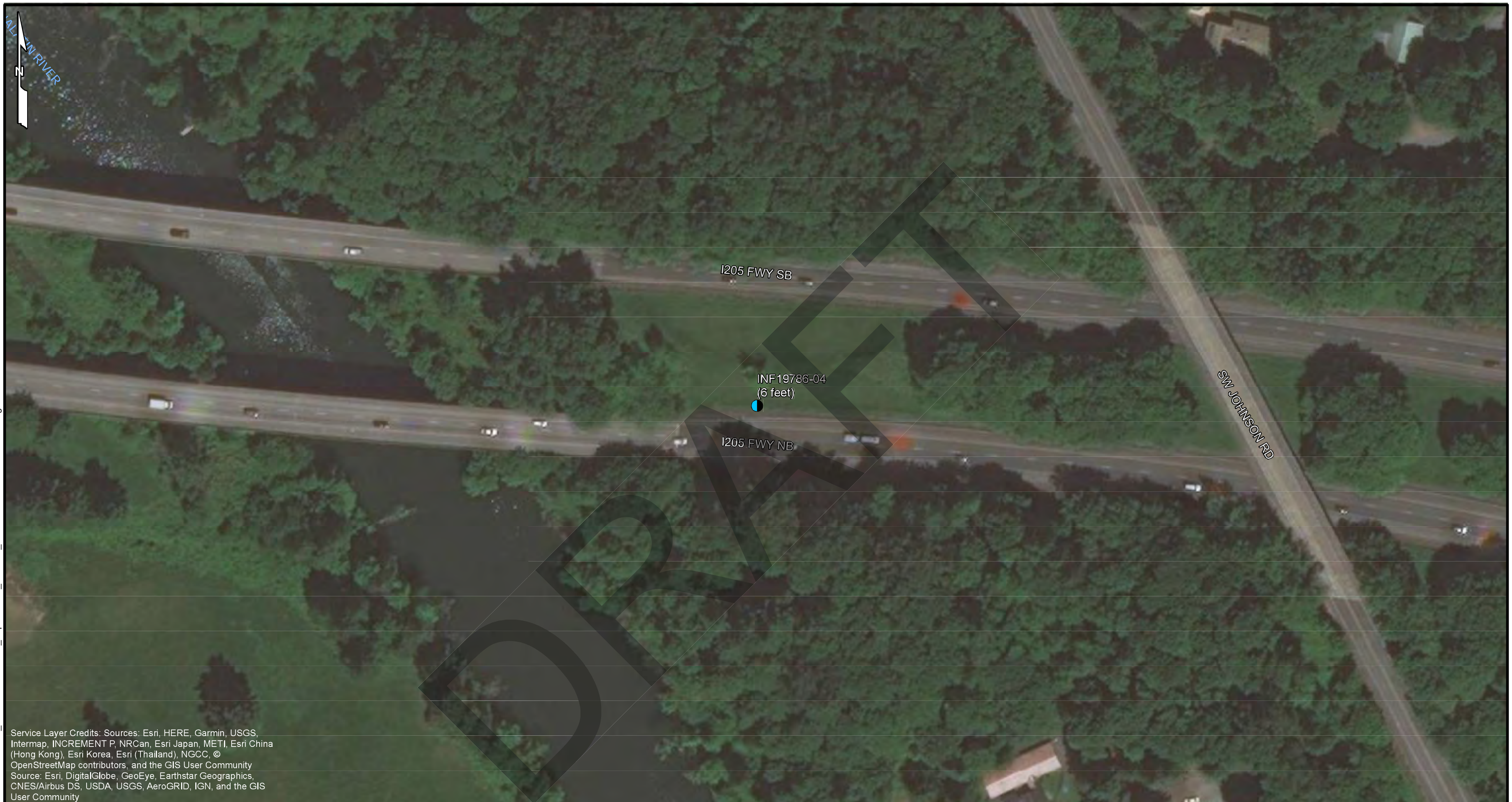
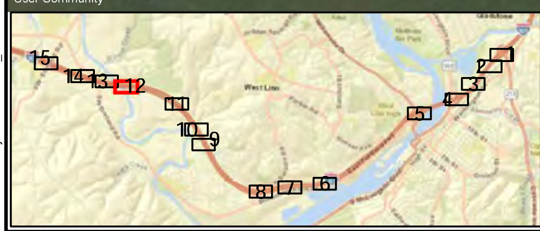




LEGEND

INF19786-15A
(Final Depth)

Approximate Infiltration Location

0 50 100 200

Scale in Feet

N

I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

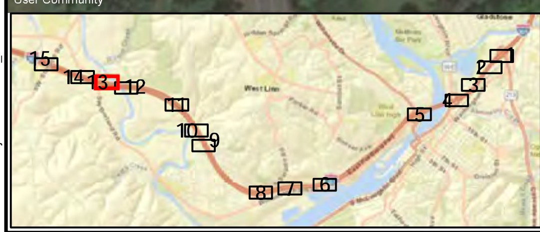
EXPLORATION PLAN
INFILTRATION TESTING

August 2018 24-1-04165-006

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 12 of 15

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\2018_Amendment 3\2018_Explorations_Amend3_inf.mxd Date: 8/10/2018 Login: ath



LEGEND

INF19786-15A
(Final Depth)

Approximate Infiltration Location

0 50 100 200

Scale in Feet

N

I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

EXPLORATION PLAN
INFILTRATION TESTING

August 2018 24-1-04165-006

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 13 of 15

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\2018_Amendment 3\2018_Explorations_Amend3_inf.mxd Date: 8/10/2018 Login: ath

LEGEND

INF19786-15A
(Final Depth)

Approximate Infiltration Location

0 50 100 200
Scale in Feet

I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

EXPLORATION PLAN
INFILTRATION TESTING

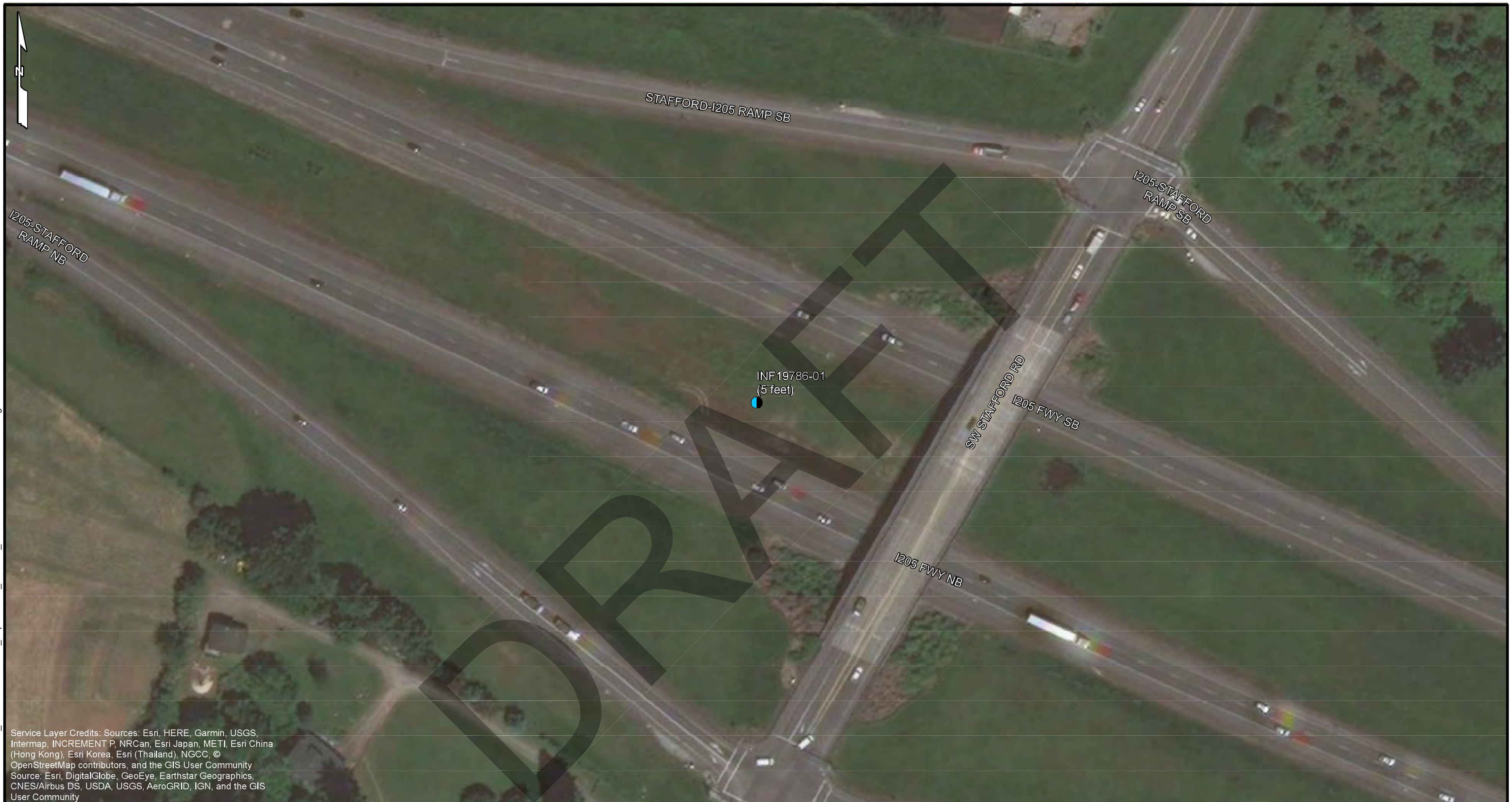
August 2018 24-1-04165-006

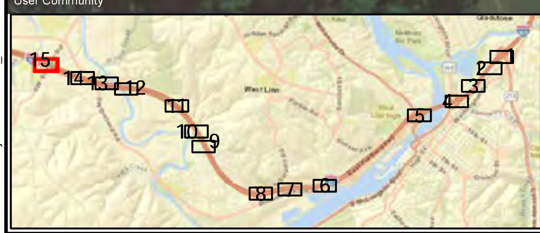
SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 14 of 15

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\2018_Amendment 3\2018_Explorations_Amend3_inf.mxd Date: 8/10/2018 Login: ath

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\2018_Amendment 3\2018_Explorations_Amend3_inf.mxd   Date: 8/10/2018   Login: ath





LEGEND

INF19786-15A (Final Depth)

Approximate Infiltration Location

0 50 100 200

Scale in Feet

N

I-205: Stafford Road to OR99E
Corridor Widening
Clackamas County, Oregon

EXPLORATION PLAN
INFILTRATION TESTING

August 2018 24-1-04165-006

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 15 of 15

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/6/2018

Location: I-205 northbound median mile marker 3.0		**Test Hole Number:** INF19786-01
Depth to bottom of hole: 5.0 feet	**Diameter of hole:** 6 inches	**Test method:** Encased Falling Head Test
Depth (feet):	**Soil Texture:**	
0 - 2.0	Sandy SILT; ML; Light brown; Moist	
2.0 - 5.0	Silty SAND; SM; Brown; Nonplastic fines; Moist; Fine to medium sand	
Presaturation Start Time:	8:00 AM	

Time:	Time Interval (minutes):	Measurement (feet):	Drop in water level (feet):	Drop in water level - Corrected (feet):	Infiltration rate (inches per hour):	Remarks:
12:00	0	5.40	-	-	-	Trial #1
12:20	20	5.40	0.00	0.01	0.06	
12:40	20	5.40	0.00			
13:00	20	5.40	0.00			
13:20	20	5.40	0.00			
13:40	20	5.40	0.00			
14:00	20	5.41	0.01			
14:00	0	5.40		-	-	Trial #2
14:20	20	5.40	0.00	0.00	0.00	
14:40	20	5.40	0.00			
15:00	20	5.40	0.00			
15:20	20	5.40	0.00			
15:40	20	5.40	0.00			
16:00	20	5.40	0.00			
16:00	0	5.40		-	-	Trial #3
16:20	20	5.40	0.00	0.00	0.00	
16:40	20	5.40	0.00			
17:00	20	5.40	0.00			
17:20	20	5.40	0.00			
17:40	20	5.40	0.00			
18:00	20	5.40	0.00			

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
INF19786-01

August 2018 24-1-04165-006

SHANNON & WILSON, INC.
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FIG. 3

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/9/2018

Location: I-205 southbound median mile marker 3.5		**Test Hole Number:** INF19786-02
Depth to bottom of hole: 5.5 feet	**Diameter of hole:** 6 inches	**Test method:** Encased Falling Head Test
Depth (feet):	**Soil Texture:**	
0 -5.5	SILT with trace sand; ML; Brown; Nonplastic fines; Moist	
Presaturation Start Time:	8:15 AM	

Time:	Time Interval (minutes):	Measurement (feet):	Drop in water level (feet):	Drop in water level - Corrected (feet):	Infiltration rate (inches per hour):	Remarks:
12:02	0	5.45	-	-	-	Trial #1
12:12	10	5.46	0.01	0.01	0.72	
12:22	10	5.47	0.01	0.01	0.72	
12:32	10	5.48	0.01	0.01	0.72	
12:42	10	5.48	0.00	0.01	0.36	
12:52	10	5.49	0.01			
13:02	10	5.50	0.01	0.01	0.72	
13:06	0	5.45	-	-	-	Trial #2
13:26	20	5.47	0.02		0.72	
13:46	20	5.48	0.01		0.36	
14:06	20	5.50	0.02		0.72	
14:26	20	5.52	0.02		0.72	
14:46	20	5.54	0.02		0.72	
15:06	20	5.55	0.01		0.36	
15:10	0	5.45	-	-	-	Trial #3
15:30	20	5.47	0.02		0.72	
15:50	20	5.49	0.02		0.72	
16:10	20	5.50	0.01		0.36	
16:30	20	5.52	0.02		0.72	
16:50	20	5.54	0.02		0.72	
17:10	20	5.56	0.02		0.72	

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
INF19786-02

August 2018 24-1-04165-006

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FIG. 4

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/10/2018

Location: I-205 southbound shoulder mile marker 4.0	**Test Hole Number:** INF19786-03
Depth to bottom of hole: 5.5 feet	**Diameter of hole:** 6 inches
Test method: Encased Falling Head Test	

Depth (feet):	**Soil Texture:**
0 - 2.0	SILT; ML; Light brown; Moist
2.0 - 5.5	Sandy SILT; ML; Brown; Nonplastic fines; Moist; Fine to medium sand

Presaturation Start Time: 8:09 AM

Time:	**Time Interval (minutes):**	**Measurement (feet):**	**Drop in water level (feet):**	**Drop in water level - Corrected (feet):**	**Infiltration rate (inches per hour):**	**Remarks:**
12:00	0	5.97	-	-	-	Trial #1
12:20	20	5.97	0.00	0.01	0.36	
12:40	20	5.98	0.01	0.01	0.36	
13:00	20	5.99	0.01	0.01	0.36	
13:20	20	5.99	0.00			
13:40	20	5.99	0.00	0.01	0.09	
14:00	20	6.00	0.01			
14:00	0	5.97	-	-	-	Trial #2
14:20	20	5.97	0.00			
14:40	20	5.97	0.00	0.01	0.09	
15:00	20	5.98	0.01			
15:40	20	5.99	0.00	0.01	0.18	
16:00	20	6.00	0.01			
16:00	0	5.97	-	-	-	Trial #3
16:20	20	5.97	0.00			
16:40	20	5.97	0.00	0.01	0.09	
17:00	20	5.98	0.01			
17:40	20	5.99	0.01	0.01	0.18	
18:00	20	5.99	0.00	0.00	0.00	

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
INF19786-03

August 2018 24-1-04165-006

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FIG. 5

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/11/2018

Location: I-205 northbound median mile marker 4.1		**Test Hole Number:** INF19786-04
Depth to bottom of hole: 6.0 feet	**Diameter of hole:** 6 inches	**Test method:** Encased Falling Head Test
Depth (feet):	**Soil Texture:**	
0 - 1.5	Sandy SILT; ML; Light brown; Moist	
1.5 - 6.0	Silty SAND; ML; Light brown; Moist; Fine to medium sand	
Presaturation Start Time:	8:07 AM	

Time:	Time Interval (minutes):	Measurement (feet):	Drop in water level (feet):	Infiltration rate (inches per hour):	Remarks:
12:02	0	6.14	-	-	Trial #1
12:12	10	6.15	0.01	0.72	
12:22	10	6.17	0.02	1.44	
12:32	10	6.19	0.02	1.44	
12:42	10	6.20	0.01	0.72	
12:52	10	6.22	0.02	1.44	
13:02	10	6.24	0.02	1.44	
13:03	0	6.14	-	-	Trial #2
13:13	10	6.15	0.01	0.72	
13:23	10	6.16	0.01	0.72	
13:33	10	6.18	0.02	1.44	
13:43	10	6.19	0.01	0.72	
13:53	10	6.21	0.02	1.44	
14:03	10	6.23	0.02	1.44	
14:05	0	6.14	-	-	Trial #3
14:15	10	6.16	0.02	1.44	
14:25	10	6.17	0.01	0.72	
14:35	10	6.19	0.02	1.44	
14:45	10	6.20	0.01	0.72	
14:55	10	6.22	0.02	1.44	
15:05	10	6.23	0.01	0.72	

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
INF19786-04

August 2018 24-1-04165-006

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FIG. 6

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/12/2018

Location: I-205 southbound median mile marker 4.7

Test Hole Number: INF19786-05

Depth to bottom of hole: 5.25 feet

Diameter of hole: 6 inches

Test method: Encased Falling Head Test

Depth (feet):	Soil Texture:
0 - 0.5	SILT; ML; Light brown; Moist
0.5 - 5.25	SILT with some sand; ML; Light brown; Moist

Presaturation Start Time: 8:17 AM

Time:	Time Interval (minutes):	Measurement (feet):	Drop in water level (feet):	Drop in water level - Corrected (feet):	Infiltration rate (inches per hour):	Remarks:
12:00	0	6.04	-	-	-	Trial #1
12:20	20	6.04	0.00			
12:40	20	6.04	0.00			
13:00	20	6.04	0.00			
13:20	20	6.04	0.00	0.00	0.00	
13:40	20	6.04	0.00			
14:00	20	6.04	0.00			
14:00	0	6.04	-	-	-	Trial #2
14:20	20	6.04	0.00			
14:40	20	6.04	0.00	0.01	0.09	
15:00	20	6.04	0.00			
15:20	20	6.05	0.01			
15:40	20	6.05	0.00	0.00	0.00	
16:00	20	6.05	0.00			
16:00	0	6.04	-	-	-	Trial #3
16:20	20	6.04	0.00			
16:40	20	6.04	0.00			
17:00	20	6.04	0.00			
17:20	20	6.04	0.00	0.00	0.00	
17:40	20	6.04	0.00			
18:00	20	6.04	0.00			

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
INF19786-05

August 2018 24-1-04165-006

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FIG. 7

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/16/2018

Location: I-205 northbound median mile marker 5.4	**Test Hole Number:** INF19786-06

Depth to bottom of hole: 2.5 feet	**Diameter of hole: 8** inches	**Test method:** Open Pit Falling Head Test

Depth (feet):	**Soil Texture:**
0 - 1.0	SILT; ML; Light brown; Moist
0.5 - 2.5	SILT with trace sand and gravel, with cobbles; ML; Light brown; Moist
2.5	Silty GRAVEL with Cobbles; GM; Refusal

Presaturation Start Time: 8:20 AM

Time:	Time Interval (minutes):	Measurement (feet):	Drop in water level (feet):	Drop in water level - Corrected (feet):	Infiltration rate (inches per hour):	Remarks:
11:24	0	4.01	-	-	-	Trial #1
11:44	20	4.01	0.00	0.02	0.24	
12:04	20	4.01	0.00			
12:24	20	4.03	0.02			
12:44	20	4.03	0.00	0.02	0.36	
13:04	20	4.05	0.02			
13:24	20	4.06	0.01	0.01	0.36	
13:25	0	4.01	-	-	-	Trial #2
13:45	20	4.01	0.00	0.01	0.17	
14:05	20	4.02	0.01			
14:25	20	4.03	0.01	0.01	0.36	
14:45	20	4.04	0.01	0.01	0.36	
15:05	20	4.04	0.00	0.01	0.17	
15:25	20	4.05	0.01			
15:26	0	4.01	-	-	-	Trial #3
15:46	20	4.02	0.01	0.01	0.36	
16:06	20	4.02	0.00	0.01	0.17	
16:26	20	4.03	0.01			
16:46	20	4.03	0.00	0.01	0.17	
17:06	20	4.04	0.01			
17:26	20	4.05	0.01	0.01	0.36	

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
INF19786-06

August 2018 24-1-04165-006

SHANNON & WILSON, INC.
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FIG. 8

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/13/2018

Location: I-205 northbound shoulder mile marker 5.5

Test Hole Number: INF19786-07

Depth to bottom of hole: 5.5 feet

Diameter of hole: 6 inches

Test method: Encased Falling Head Test

Depth (feet):	Soil Texture:
0 - 5.5	Sandy SILT; ML; Light brown; Moist

Presaturation Start Time: 8:40 AM

Time:	Time Interval (minutes):	Measurement (feet):	Drop in water level (feet):	Drop in water level - Corrected (feet):	Infiltration rate (inches per hour):	Remarks:
12:00	0	5.91	-	-	-	Trial #1
12:10	10	5.93	0.02	0.02	1.44	
12:20	10	5.93	0.00	0.01	0.36	
12:30	10	5.94	0.01			
12:40	10	5.96	0.02	0.02	1.44	
12:50	10	5.97	0.01	0.01	0.72	
13:00	10	5.98	0.01	0.01	0.72	
13:01	0	5.91	-	-	-	Trial #2
13:11	10	5.92	0.01	0.01	0.72	
13:21	10	5.93	0.01	0.01	0.72	
13:31	10	5.94	0.01	0.01	0.72	
13:41	10	5.95	0.01	0.03	2.15	
13:51	10	5.97	0.02	0.02	0.72	
14:01	10	5.97	0.00			
14:02	0	5.91	-	-	-	Trial #3
14:12	10	5.92	0.01	0.01	0.72	
14:22	10	5.93	0.01	0.01	0.72	
14:32	10	5.94	0.01	0.01	0.72	
14:42	10	5.96	0.02	0.02	1.44	
14:52	10	5.97	0.01	0.01	0.72	
15:02	10	5.98	0.01	0.01	0.72	

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
INF19786-07

August 2018 24-1-04165-006

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 9

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/19/2018

Location: I-205 southbound median mile marker 6.5

Test Hole Number: INF19786-08

Depth to bottom of hole: 2.0 feet

Diameter of hole: 10 inches

Test method: Open Pit Falling Head Test

Depth (feet):	**Soil Texture:**
0.0 - 0.5	SILT; ML; Light brown; Moist
0.5-2.0	SILT with trace sand and gravel, with cobbles; ML; Light brown; **Moist**
2.0	Silty GRAVEL with Cobbles; ML; Refusal

Presaturation Start Time: 8:25 AM

Time:	Time Interval (minutes):	Measurement (feet):	Drop in water level (feet):	Infiltration rate (inches per hour):	Remarks:
12:01	0	3.81	-	-	Trial #1
12:11	10	3.83	0.02	1.44	
12:21	10	3.87	0.04	2.88	
12:31	10	3.90	0.03	2.16	
12:41	10	3.92	0.02	1.44	
12:51	10	3.94	0.02	1.44	
13:01	10	3.96	0.02	1.44	
13:02	0	3.83	-	-	Trial #2
13:12	10	3.86	0.03	2.16	
13:22	10	3.89	0.03	2.16	
13:32	10	3.91	0.02	1.44	
13:42	10	3.93	0.02	1.44	
13:52	10	3.95	0.02	1.44	
14:02	10	3.97	0.02	1.44	
14:04	0	3.83	-	-	Trial #3
14:14	10	3.85	0.02	1.44	
14:24	10	3.87	0.02	1.44	
14:34	10	3.89	0.02	1.44	
14:44	10	3.92	0.03	2.16	
14:54	10	3.93	0.01	0.72	
15:04	10	3.95	0.02	1.44	

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
INF19786-08

August 2018 24-1-04165-006

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Geotechnical and Environmental Consultants

FIG. 10

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/17/2018

Location: I-205 northbound median mile marker 7.0

Test Hole Number: INF19786-09

Depth to bottom of hole: 2.0 feet	**Diameter of hole:** 12 inches	**Test method:** Open Pit Falling Head Test

Depth (feet):	**Soil Texture:**
0.0 - 0.5	SILT; ML; Light brown; Moist
0.5-2.0	Gravelly SILT with some sand, with cobbles; ML; Light brown; **Moist**
2.0	Silty GRAVEL with Cobbles; GM; Refusal

Presaturation Start Time: 9:00 AM

Time:	Time Interval (minutes):	Measurement (feet):	Drop in water level (feet):	Infiltration rate (inches per hour):	Remarks:
13:00	0	3.43	-	-	Trial #1
13:10	10	3.64	0.21	15.12	
13:20	10	3.75	0.11	7.92	
13:30	10	3.83	0.08	5.76	
13:40	10	3.91	0.08	5.76	
13:50	10	3.97	0.06	4.32	
14:00	10	4.02	0.05	3.60	
14:34	0	3.44	-	-	Trial #2
14:44	10	3.59	0.15	10.80	
14:54	10	3.69	0.10	7.20	
15:04	10	3.77	0.08	5.76	
15:14	10	3.84	0.07	5.04	
15:24	10	3.90	0.06	4.32	
15:34	10	3.95	0.05	3.60	
15:37	0	3.42	-	-	Trial #3
15:47	10	3.57	0.15	10.80	
15:57	10	3.67	0.10	7.20	
16:07	10	3.74	0.07	5.04	
16:17	10	3.81	0.07	5.04	
16:27	10	3.87	0.06	4.32	
16:37	10	3.91	0.04	2.88	

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
INF19786-09

August 2018 24-1-04165-006

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FIG. 11

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/20/2018

Location: I-205 southbound shoulder mile marker 7.2

Test Hole Number: INF19786-10

Depth to bottom of hole: 2.0 feet

Diameter of hole: 14 inches

Test method: Open Pit Falling Head Test

Depth (feet):	Soil Texture:
0.0 - 2.0	GRAVEL with some silt and sand, with Cobbles; GP-GM; Light brown, Moist
2.0	GRAVEL with Cobbles; Refusal

Presaturation Start Time: 9:20 AM

Time:	Time Interval (minutes):	Measurement (feet):	Drop in water level (feet):	Infiltration rate (inches per hour):	Remarks:
13:01	0	3.88	-	-	Trial #1
13:11	10	3.99	0.11	7.92	
13:21	10	4.06	0.07	5.04	
13:31	10	4.12	0.06	4.32	
13:41	10	4.18	0.06	4.32	
13:51	10	4.22	0.04	2.88	
14:01	10	4.26	0.04	2.88	
14:03	0	3.88	-	-	Trial #2
14:13	10	3.98	0.10	7.20	
14:23	10	4.04	0.06	4.32	
14:33	10	4.10	0.06	4.32	
14:43	10	4.14	0.04	2.88	
14:53	10	4.19	0.05	3.60	
15:03	10	4.23	0.04	2.88	
15:05	0	3.82	-	-	Trial #3
15:15	10	3.93	0.11	7.92	
15:25	10	4.01	0.08	5.76	
15:35	10	4.07	0.06	4.32	
15:45	10	4.11	0.04	2.88	
15:55	10	4.16	0.05	3.60	
16:05	10	4.20	0.04	2.88	

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
INF19786-10

August 2018 24-1-04165-006

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FIG. 12

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/23/2018

Location: I-205 northbound beneath east Abernethy Bridge abutment mile marker 8.9		**Test Hole Number:** INF19786-11
Depth to bottom of hole: 2.0 feet	**Diameter of hole:** 14 inches	**Test method:** Open Pit Falling Head Test

Depth (feet):	**Soil Texture:**
0.0 - 1.5	GRAVEL with some silt and sand, with Cobbles; GP-GM; Light brown, Moist
1.5-3.0	SILT with some sand and gravel, with Cobbles; ML, Light brown, Moist
3.0	GRAVEL and Cobbles; Refusal

Presaturation Start Time: 9:05 AM

Time:	Time Interval (minutes):	Measurement (feet):	Drop in water level (feet):	Drop in water level - Corrected (feet):	Infiltration rate (inches per hour):	Remarks:
13:00	0	4.44	-	-	-	Trial #1
13:10	10	4.45	0.01	0.01	0.72	
13:20	10	4.45	0.00	0.01	0.36	
13:30	10	4.46	0.01			
13:40	10	4.46	0.00	0.02	0.72	
13:50	10	4.48	0.02			
14:00	10	4.49	0.01	0.01	0.72	
14:02	0	4.43	-		-	Trial #2
14:22	20	4.45	0.02		0.72	
14:42	20	4.47	0.02		0.72	
15:02	20	4.48	0.01		0.36	
15:22	20	4.49	0.01		0.36	
15:42	20	4.51	0.02		0.72	
16:02	20	4.52	0.01		0.36	
16:04	0	4.44	-		-	Trial #3
16:24	20	4.46	0.02		0.72	
16:44	20	4.47	0.01		0.36	
17:04	20	4.49	0.02		0.72	
17:24	20	4.50	0.01		0.36	
17:44	20	4.51	0.01		0.36	
18:04	20	4.52	0.01		0.36	

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
INF19786-11

August 2018 24-1-04165-006

SHANNON & WILSON, INC.
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FIG. 13

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/24/2018

Location: I-205 northbound shoulder mile marker 9.4

Test Hole Number: INF19786-12

Depth to bottom of hole: 2.0 feet

Diameter of hole: 10 inches

Test method: Open Pit Falling Head Test

Depth (feet):	Soil Texture:
0.0 - 2.0	SILT; ML; Light brown, Moist
2.0	BASALT fragments and GRAVEL; GP; Refusal

Presaturation Start Time: 8:05 AM

Time:	Time Interval (minutes):	Measurement (feet):	Drop in water level (feet):	Infiltration rate (inches per hour):	Remarks:
11:31	0	4.01	-	-	Trial #1
11:41	10	4.03	0.02	1.44	
11:51	10	4.06	0.03	2.16	
12:01	10	4.08	0.02	1.44	
12:11	10	4.11	0.03	2.16	
12:21	10	4.14	0.03	2.16	
12:31	10	4.16	0.02	1.44	
12:32	0	4.01	-	-	Trial #2
12:42	10	4.03	0.02	1.44	
12:52	10	4.05	0.02	1.44	
13:02	10	4.08	0.03	2.16	
13:12	10	4.10	0.02	1.44	
13:22	10	4.13	0.03	2.16	
13:32	10	4.14	0.01	0.72	
13:33	0	4.01	-	-	Trial #3
13:33	10	4.03	0.02	1.44	
13:33	10	4.06	0.03	2.16	
14:03	10	4.08	0.02	1.44	
14:13	10	4.10	0.02	1.44	
14:23	10	4.12	0.02	1.44	
14:33	10	4.15	0.02	1.44	

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
INF19786-12

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FIG. 14

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/25/2018

Location: I-205 southbound south of Agnes Avenue mile marker 9.7

Test Hole Number: INF19786-13

Depth to bottom of hole: 3.0 feet

Diameter of hole: 10 inches

Test method: Open Pit Falling Head Test

Depth (feet):	Soil Texture:
0.0 - 3.0	SILT with some sand and gravel; ML; Light brown, Moist
3.0	GRAVEL and Cobbles; Refusal

Presaturation Start Time: 7:55 AM

Time:	Time Interval (minutes):	Measurement (feet):	Drop in water level (feet):	Infiltration rate (inches per hour):	Remarks:
11:30	0	3.86	-	-	Trial #1
11:40	10	3.89	0.03	2.16	
11:50	10	3.92	0.03	2.16	
12:00	10	3.95	0.03	2.16	
12:10	10	3.97	0.02	1.44	
12:20	10	3.99	0.02	1.44	
12:30	10	4.01	0.02	1.44	
12:31	0	3.85	-	-	Trial #2
12:41	10	3.88	0.03	2.16	
12:51	10	3.91	0.03	2.16	
13:01	10	3.94	0.03	2.16	
13:11	10	3.96	0.02	1.44	
13:21	10	3.98	0.02	1.44	
13:31	10	4.00	0.02	1.44	
13:32	0	3.86	-	-	Trial #3
13:32	10	3.89	0.03	2.16	
13:32	10	3.92	0.03	2.16	
14:02	10	3.94	0.02	1.44	
14:12	10	3.97	0.03	2.16	
14:22	10	3.99	0.02	1.44	
14:32	10	4.01	0.02	1.44	

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
INF19786-13

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FIG. 15

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/26/2018

Location: I-205 northbound shoulder mile marker 10.0

Test Hole Number: INF19786-14

Depth to bottom of hole: 3.5 feet

Diameter of hole: 8 inches

Test method: Open Pit Falling Head Test

Depth (feet):	**Soil Texture:**
0.0 - 2.0	SILT with some gravel, ML, Brown, Moist
2.0-3.5	SILT with some gravel, with Cobbles; trace organics, ML, **Dark brown,** Moist
3.5	GRAVEL with Cobbles; Refusal

Presaturation Start Time: 9:12 AM

Time:	**Time Interval (minutes):**	**Measurement (feet):**	**Drop in water level (feet):**	**Infiltration rate (inches per hour):**	**Remarks:**
13:00	0	3.78	-	-	Trial #1
13:10	10	3.82	0.04	2.88	
13:20	10	3.86	0.04	2.88	
13:30	10	3.89	0.03	2.16	
13:40	10	3.91	0.02	1.44	
13:50	10	3.93	0.02	1.44	
14:00	10	3.95	0.02	1.44	
14:01	0	3.82	-	-	Trial #2
14:11	10	3.84	0.02	1.44	
14:21	10	3.87	0.03	2.16	
14:31	10	3.88	0.01	0.72	
14:41	10	3.90	0.02	1.44	
14:51	10	3.92	0.02	1.44	
15:01	10	3.93	0.01	0.72	
15:02	0	3.81	-	-	Trial #3
15:12	10	3.82	0.01	0.72	
15:22	10	3.84	0.02	1.44	
15:32	10	3.87	0.03	2.16	
15:42	10	3.89	0.02	1.44	
15:52	10	3.90	0.01	0.72	
16:02	10	3.92	0.02	1.44	

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
INF19786-14

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SHANNON & WILSON, INC.
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FIG. 16

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Job #:	24-1-04165-006
Field Rep.:	PJS
Date	7/16/2018

Location: I-205 southbound shoulder mile marker 10.1

Test Hole Number: INF19786-15A

Depth to bottom of hole: 2.0 feet

Diameter of hole: 10 inches

Test method: Open Pit Falling Head Test

Depth (feet):	**Soil Texture:**
0 - 2.0	SILT with some sand and gravel, with Cobbles; ML; Light brown; Moist
2.0	GRAVEL with Cobbles; Refusal

Presaturation Start Time: 8:30 AM

Time:	Time Interval (minutes):	Measurement (feet):	Drop in water level (feet):	Drop in water level - Corrected (feet):	Infiltration rate (inches per hour):	Remarks:
11:30	0	3.98	-		-	Trial #1
11:50	20	3.99	0.01		0.36	
12:10	20	4.00	0.01		0.36	
12:30	20	4.01	0.01		0.36	
12:50	20	4.03	0.02		0.72	
13:10	20	4.04	0.01		0.36	
13:30	20	4.05	0.01		0.36	
13:31	0	3.98	-	-	-	Trial #2
13:51	20	3.99	0.01	0.01	0.36	
14:11	20	4.01	0.02	0.02	0.72	
14:31	20	4.02	0.01	0.01	0.36	
14:51	20	4.03	0.01	0.02	0.36	
15:11	20	4.04	0.01			
15:31	20	4.04	0.00	0.00	0.00	
15:32	0	3.98	-		-	Trial #3
15:52	20	3.99	0.01		0.36	
16:12	20	4.00	0.01		0.36	
16:32	20	4.01	0.01		0.36	
16:52	20	4.02	0.01		0.36	
17:12	20	4.03	0.01		0.36	
17:32	20	4.04	0.01		0.36	

I-205: Stafford Road to OR99E Corridor Widening
Clackamas County, Oregon

INFILTRATION TEST RESULTS
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FIG. 17

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\SitePlan-VWPs_10.3.mxd Date: 3/4/2019 Login: AEH

LEGEND

- Boring (Shannon & Wilson, 2017-2019)
- CPT (Shannon & Wilson, 2017)
- Historic Boring (ODOT or Dames & Moore)
- Infiltration Test (Shannon & Wilson, 2017)
- Vibrating Wire Piezometer
- Shear Wave Velocity Profile
- Proposed Retaining Wall
- Proposed Sound Wall
- Proposed Traffic Sign

0 50 100 200

Scale in Feet

NOTES

1. Locations of proposed features from files downloaded from ProjectWise: TN_K19786_OBEC_snd_bas_01.dgn, TN_K21400_OBEC_snd_bas_01.dgn, TN_K21401_OBEC_snd_bas_01.dgn, R_K19786_rtw_bas_01.dgn, and R_K21401_rtw_bas_01.dgn, on December 10, 2018, file R_K19786_QEI_bas_03.dgn, on December 26, 2018, and file R_K21401_OBEC_bas_01.dgn, on December 31, 2018.

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SITE AND EXPLORATION PLAN

March 2019 24-1-04165

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 1
Sheet 1 of 4

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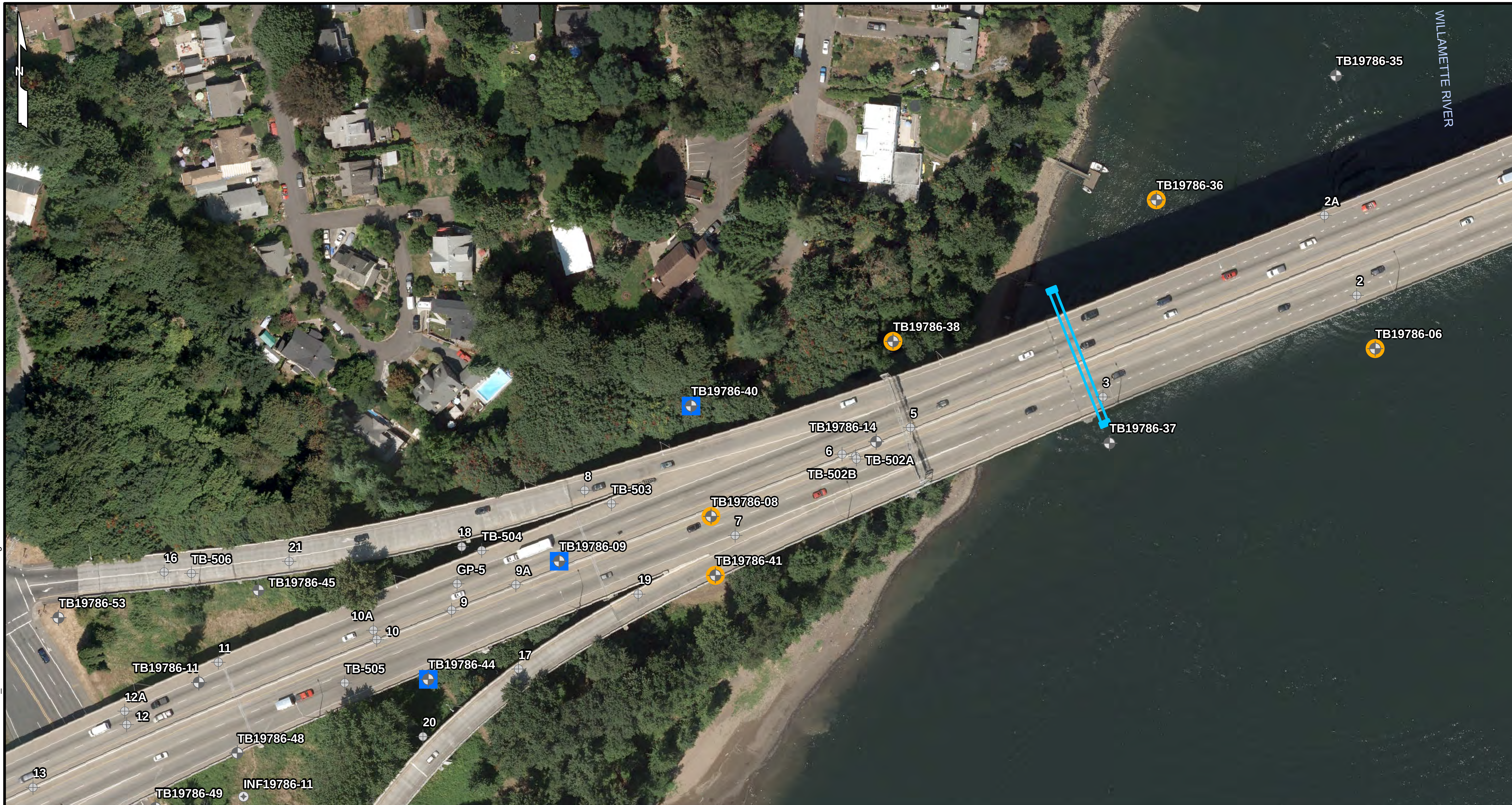

Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\SitePlan-VWPs_10.3.mxd Date: 3/4/2019 Login: AEH

LEGEND

- Boring (Shannon & Wilson, 2017-2019)
- CPT (Shannon & Wilson, 2017)
- Historic Boring (ODOT or Dames & Moore)
- Infiltration Test (Shannon & Wilson, 2017)
- Vibrating Wire Piezometer
- Shear Wave Velocity Profile
- Proposed Retaining Wall
- Proposed Sound Wall
- Proposed Traffic Sign

0 50 100 200

Scale in Feet

NOTES

1. Locations of proposed features from files downloaded from ProjectWise: TN_K19786_OBEC_snd_bas_01.dgn, TN_K21400_OBEC_snd_bas_01.dgn, TN_K21401_OBEC_snd_bas_01.dgn, R_K19786_rtw_bas_01.dgn, and R_K21401_rtw_bas_01.dgn, on December 10, 2018, file R_K19786_QEI_bas_03.dgn, on December 26, 2018, and file R_K21401_OBEC_bas_01.dgn, on December 31, 2018.

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Clackamas County, Oregon

SITE AND EXPLORATION PLAN

March 2019 24-1-04165

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 1
Sheet 2 of 4

LEGEND

- Boring (Shannon & Wilson or FEI, 2017-2019)
- CPT (Shannon & Wilson, 2017)
- Historic Boring (ODOT or Dames & Moore)
- Infiltration Test (Shannon & Wilson, 2017)
- Shear Wave Velocity Profile
- Vibrating Wire Piezometer
- Proposed Retaining Wall
- Approximate Culvert Location at Wall A1
- Approximate Limits of Proposed Embankment Fill
- A1 A1' Location and Designation of Interpretive Subsurface Profile

0 50 100 200

Scale in Feet

NOTES

1. Existing contours from file S_K19786_e_bas.dgn, downloaded from ProjectWise on November 19, 2018.
2. Culvert location based on file GT_K19786_OBEC_rtwpe_01.dgn, downloaded from ProjectWise on July 11, 2019.
3. Locations of proposed retaining walls from files GT_K19786_OBEC_rtwpe_A1.dgn and GT_K19786_OBEC_rtwpe_A3.dgn, provided by OBEC Consulting Engineers on June 18, 2019.
4. Embankment fill limits based on file R_K19786_QEI_cn_bas_03.dgn, downloaded from ProjectWise on July 1, 2019.

I-205: Stafford Road to OR99E Widening
(Key #19786 & 21401)
Clackamas County, Oregon

SITE AND EXPLORATION PLAN

July 2019 24-1-04165-007

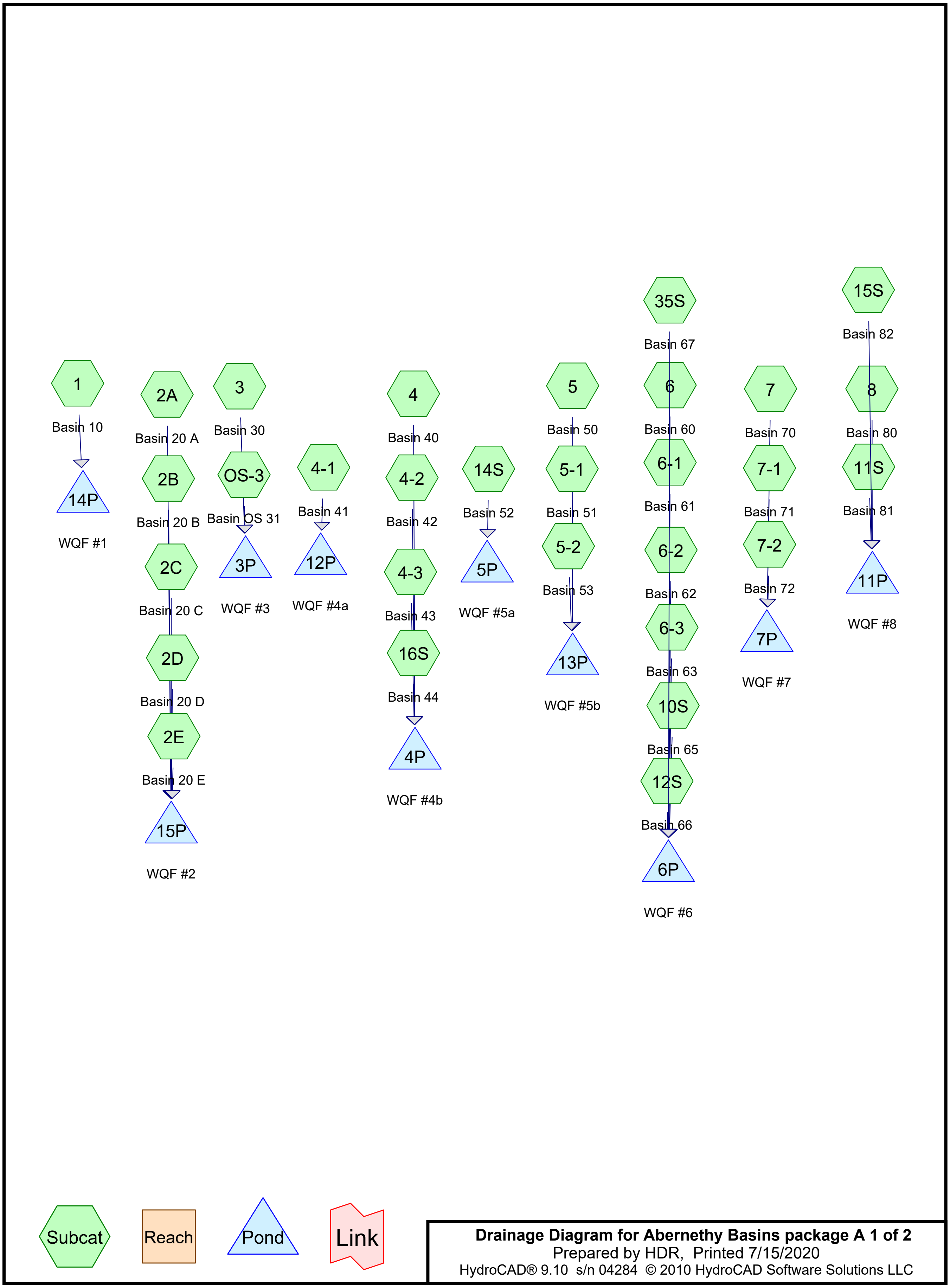
SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 9 of 11

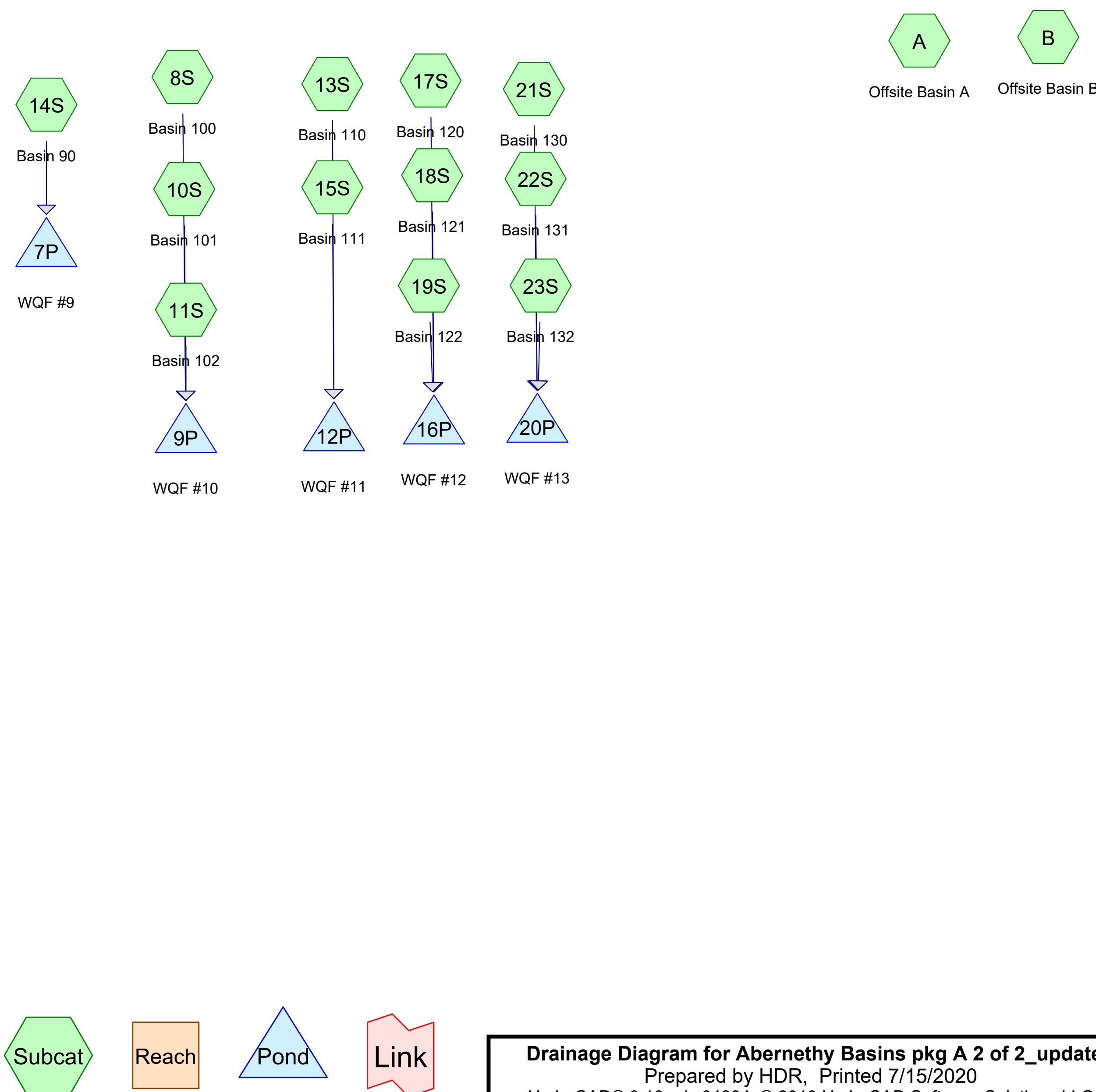
Filename: T:\Projects\24-1\4165_I-205 Stafford\Avmxd\SitePlan-WallsEmbank_10.6.mxd Date: 7/12/2019 Login: AEH

440

Appendix E. Hydrology Calculations (HydroCAD Analysis)



Drainage Diagram for Abernethy Basins package A 1 of 2
Prepared by HDR, Printed 7/15/2020
HydroCAD® 9.10 s/n 04284 © 2010 HydroCAD Software Solutions LLC



Drainage Diagram for Abernethy Basins pkg A 2 of 2_updated
Prepared by HDR, Printed 7/15/2020
HydroCAD® 9.10 s/n 04284 © 2010 HydroCAD Software Solutions LLC

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Basin 10 Runoff Area=1.065 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.28 cfs 0.089 af

Subcatchment 2A: Basin 20 A Runoff Area=0.253 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.07 cfs 0.021 af

Subcatchment 2B: Basin 20 B Runoff Area=0.840 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.22 cfs 0.070 af

Subcatchment 2C: Basin 20 C Runoff Area=0.517 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.13 cfs 0.043 af

Subcatchment 2D: Basin 20 D Runoff Area=0.496 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.13 cfs 0.042 af

Subcatchment 2E: Basin 20 E Runoff Area=1.042 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.27 cfs 0.087 af

Subcatchment 3: Basin 30 Runoff Area=3.045 ac 100.00% Impervious Runoff Depth=1.01"
Tc=8.0 min CN=0/98 Runoff=0.77 cfs 0.255 af

Subcatchment 4: Basin 40 Runoff Area=0.304 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.08 cfs 0.025 af

Subcatchment 4-1: Basin 41 Runoff Area=2.673 ac 100.00% Impervious Runoff Depth=1.01"
Tc=10.0 min CN=0/98 Runoff=0.66 cfs 0.224 af

Subcatchment 4-2: Basin 42 Runoff Area=0.886 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.23 cfs 0.074 af

Subcatchment 4-3: Basin 43 Runoff Area=0.316 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.08 cfs 0.026 af

Subcatchment 5: Basin 50 Runoff Area=0.696 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.18 cfs 0.058 af

Subcatchment 5-1: Basin 51 Runoff Area=0.474 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.12 cfs 0.040 af

Subcatchment 5-2: Basin 53 Runoff Area=0.550 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.14 cfs 0.046 af

Subcatchment 6: Basin 60 Runoff Area=1.115 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.29 cfs 0.093 af

Subcatchment 6-1: Basin 61 Runoff Area=0.474 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.12 cfs 0.040 af

Subcatchment 6-2: Basin 62 Runoff Area=2.320 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.60 cfs 0.194 af

Subcatchment 6-3: Basin 63 Runoff Area=0.123 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.03 cfs 0.010 af

Subcatchment 7: Basin 70 Runoff Area=0.287 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.07 cfs 0.024 af

Subcatchment 7-1: Basin 71 Runoff Area=0.432 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.11 cfs 0.036 af

Subcatchment 7-2: Basin 72 Runoff Area=0.590 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.15 cfs 0.049 af

Subcatchment 8: Basin 80 Runoff Area=2.320 ac 100.00% Impervious Runoff Depth=1.01"
Tc=12.0 min CN=0/98 Runoff=0.56 cfs 0.194 af

Subcatchment 10S: Basin 65 Runoff Area=7.606 ac 100.00% Impervious Runoff Depth=1.01"
Tc=17.0 min CN=0/98 Runoff=1.71 cfs 0.637 af

Subcatchment 11S: Basin 81 Runoff Area=7.675 ac 100.00% Impervious Runoff Depth=1.01"
Tc=16.0 min CN=0/98 Runoff=1.75 cfs 0.643 af

Subcatchment 12S: Basin 66 Runoff Area=0.450 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.12 cfs 0.038 af

Subcatchment 14S: Basin 52 Runoff Area=2.591 ac 100.00% Impervious Runoff Depth=1.01"
Tc=10.0 min CN=0/98 Runoff=0.64 cfs 0.217 af

Subcatchment 15S: Basin 82 Runoff Area=0.207 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.05 cfs 0.017 af

Subcatchment 16S: Basin 44 Runoff Area=0.374 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.10 cfs 0.031 af

Subcatchment 35S: Basin 67 Runoff Area=0.305 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.08 cfs 0.026 af

Subcatchment OS-3: Basin OS 31 Runoff Area=1.368 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.36 cfs 0.115 af

Total Runoff Area = 41.394 ac Runoff Volume = 3.467 af Average Runoff Depth = 1.01"
0.00% Pervious = 0.000 ac 100.00% Impervious = 41.394 ac

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 8S: Basin 100 Runoff Area=1.533 ac 100.00% Impervious Runoff Depth=1.01"
Tc=10.0 min CN=0/98 Runoff=0.38 cfs 0.128 af

Subcatchment 10S: Basin 101 Runoff Area=2.461 ac 100.00% Impervious Runoff Depth=1.01"
Tc=9.0 min CN=0/98 Runoff=0.61 cfs 0.206 af

Subcatchment 11S: Basin 102 Runoff Area=0.490 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.13 cfs 0.041 af

Subcatchment 13S: Basin 110 Runoff Area=3.507 ac 100.00% Impervious Runoff Depth=1.01"
Tc=11.0 min CN=0/98 Runoff=0.86 cfs 0.294 af

Subcatchment 14S: Basin 90 Runoff Area=0.268 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.07 cfs 0.022 af

Subcatchment 15S: Basin 111 Runoff Area=2.329 ac 100.00% Impervious Runoff Depth=1.01"
Tc=11.0 min CN=0/98 Runoff=0.57 cfs 0.195 af

Subcatchment 17S: Basin 120 Runoff Area=3.287 ac 100.00% Impervious Runoff Depth=1.01"
Tc=9.0 min CN=0/98 Runoff=0.82 cfs 0.275 af

Subcatchment 18S: Basin 121 Runoff Area=1.252 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.33 cfs 0.105 af

Subcatchment 19S: Basin 122 Runoff Area=0.386 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.10 cfs 0.032 af

Subcatchment 21S: Basin 130 Runoff Area=3.528 ac 100.00% Impervious Runoff Depth=1.01"
Tc=10.0 min CN=0/98 Runoff=0.87 cfs 0.296 af

Subcatchment 22S: Basin 131 Runoff Area=0.433 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.11 cfs 0.036 af

Subcatchment 23S: Basin 132 Runoff Area=0.447 ac 100.00% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=0/98 Runoff=0.12 cfs 0.037 af

Subcatchment A: Offsite Basin A Runoff Area=19.530 ac 38.00% Impervious Runoff Depth=0.42"
Tc=20.0 min CN=74/98 Runoff=1.60 cfs 0.689 af

Subcatchment B: Offsite Basin B Runoff Area=97.740 ac 38.00% Impervious Runoff Depth=0.42"
Tc=60.0 min CN=74/98 Runoff=5.27 cfs 3.446 af

Total Runoff Area = 137.191 ac Runoff Volume = 5.804 af Average Runoff Depth = 0.51"
53.00% Pervious = 72.707 ac 47.00% Impervious = 64.484 ac

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Pond 3P: WQF #3 Inflow=1.12 cfs 0.370 af
Primary=1.12 cfs 0.370 af

Pond 4P: WQF #4b Inflow=0.49 cfs 0.157 af
Primary=0.49 cfs 0.157 af

Pond 5P: WQF #5a Inflow=0.64 cfs 0.217 af
Primary=0.64 cfs 0.217 af

Pond 6P: WQF #6 Inflow=2.92 cfs 1.038 af
Primary=2.92 cfs 1.038 af

Pond 7P: WQF #7 Inflow=0.34 cfs 0.110 af
Primary=0.34 cfs 0.110 af

Pond 11P: WQF #8 Inflow=2.36 cfs 0.855 af
Primary=2.36 cfs 0.855 af

Pond 12P: WQF #4a Inflow=0.66 cfs 0.224 af
Primary=0.66 cfs 0.224 af

Pond 13P: WQF #5b Inflow=0.45 cfs 0.144 af
Primary=0.45 cfs 0.144 af

Pond 14P: WQF #1 Inflow=0.28 cfs 0.089 af
Primary=0.28 cfs 0.089 af

Pond 15P: WQF #2 Inflow=0.82 cfs 0.264 af
Primary=0.82 cfs 0.264 af

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Pond 7P: WQF #9	Inflow=0.07 cfs 0.022 af Primary=0.07 cfs 0.022 af
Pond 9P: WQF #10	Inflow=1.12 cfs 0.376 af Primary=1.12 cfs 0.376 af
Pond 12P: WQF #11	Inflow=1.42 cfs 0.489 af Primary=1.42 cfs 0.489 af
Pond 16P: WQF #12	Inflow=1.24 cfs 0.413 af Primary=1.24 cfs 0.413 af
Pond 20P: WQF #13	Inflow=1.10 cfs 0.369 af Primary=1.10 cfs 0.369 af

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Basin 10 Runoff Area=1.065 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.82 cfs 0.270 af

Subcatchment 2A: Basin 20 A Runoff Area=0.253 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.19 cfs 0.064 af

Subcatchment 2B: Basin 20 B Runoff Area=0.840 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.64 cfs 0.213 af

Subcatchment 2C: Basin 20 C Runoff Area=0.517 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.40 cfs 0.131 af

Subcatchment 2D: Basin 20 D Runoff Area=0.496 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.38 cfs 0.126 af

Subcatchment 2E: Basin 20 E Runoff Area=1.042 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.80 cfs 0.265 af

Subcatchment 3: Basin 30 Runoff Area=3.045 ac 100.00% Impervious Runoff Depth=3.05"
Tc=8.0 min CN=0/98 Runoff=2.26 cfs 0.773 af

Subcatchment 4: Basin 40 Runoff Area=0.304 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.23 cfs 0.077 af

Subcatchment 4-1: Basin 41 Runoff Area=2.673 ac 100.00% Impervious Runoff Depth=3.05"
Tc=10.0 min CN=0/98 Runoff=1.94 cfs 0.679 af

Subcatchment 4-2: Basin 42 Runoff Area=0.886 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.68 cfs 0.225 af

Subcatchment 4-3: Basin 43 Runoff Area=0.316 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.24 cfs 0.080 af

Subcatchment 5: Basin 50 Runoff Area=0.696 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.53 cfs 0.177 af

Subcatchment 5-1: Basin 51 Runoff Area=0.474 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.36 cfs 0.120 af

Subcatchment 5-2: Basin 53 Runoff Area=0.550 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.42 cfs 0.140 af

Subcatchment 6: Basin 60 Runoff Area=1.115 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.85 cfs 0.283 af

Subcatchment 6-1: Basin 61 Runoff Area=0.474 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.36 cfs 0.120 af

Subcatchment 6-2: Basin 62 Runoff Area=2.320 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=1.78 cfs 0.589 af

Subcatchment 6-3: Basin 63 Runoff Area=0.123 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.09 cfs 0.031 af

Subcatchment 7: Basin 70 Runoff Area=0.287 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.22 cfs 0.073 af

Subcatchment 7-1: Basin 71 Runoff Area=0.432 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.33 cfs 0.110 af

Subcatchment 7-2: Basin 72 Runoff Area=0.590 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.45 cfs 0.150 af

Subcatchment 8: Basin 80 Runoff Area=2.320 ac 100.00% Impervious Runoff Depth=3.05"
Tc=12.0 min CN=0/98 Runoff=1.64 cfs 0.589 af

Subcatchment 10S: Basin 65 Runoff Area=7.606 ac 100.00% Impervious Runoff Depth=3.05"
Tc=17.0 min CN=0/98 Runoff=5.06 cfs 1.931 af

Subcatchment 11S: Basin 81 Runoff Area=7.675 ac 100.00% Impervious Runoff Depth=3.05"
Tc=16.0 min CN=0/98 Runoff=5.17 cfs 1.949 af

Subcatchment 12S: Basin 66 Runoff Area=0.450 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.34 cfs 0.114 af

Subcatchment 14S: Basin 52 Runoff Area=2.591 ac 100.00% Impervious Runoff Depth=3.05"
Tc=10.0 min CN=0/98 Runoff=1.88 cfs 0.658 af

Subcatchment 15S: Basin 82 Runoff Area=0.207 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.16 cfs 0.053 af

Subcatchment 16S: Basin 44 Runoff Area=0.374 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.29 cfs 0.095 af

Subcatchment 35S: Basin 67 Runoff Area=0.305 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=0.23 cfs 0.077 af

Subcatchment OS-3: Basin OS 31 Runoff Area=1.368 ac 100.00% Impervious Runoff Depth=3.05"
Tc=5.0 min CN=0/98 Runoff=1.05 cfs 0.347 af

Total Runoff Area = 41.394 ac Runoff Volume = 10.511 af Average Runoff Depth = 3.05"
0.00% Pervious = 0.000 ac 100.00% Impervious = 41.394 ac

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 8S: Basin 100	Runoff Area=1.533 ac 100.00% Impervious Runoff Depth=3.05" Tc=10.0 min CN=0/98 Runoff=1.11 cfs 0.389 af
Subcatchment 10S: Basin 101	Runoff Area=2.461 ac 100.00% Impervious Runoff Depth=3.05" Tc=9.0 min CN=0/98 Runoff=1.81 cfs 0.625 af
Subcatchment 11S: Basin 102	Runoff Area=0.490 ac 100.00% Impervious Runoff Depth=3.05" Tc=5.0 min CN=0/98 Runoff=0.38 cfs 0.124 af
Subcatchment 13S: Basin 110	Runoff Area=3.507 ac 100.00% Impervious Runoff Depth=3.05" Tc=11.0 min CN=0/98 Runoff=2.52 cfs 0.891 af
Subcatchment 14S: Basin 90	Runoff Area=0.268 ac 100.00% Impervious Runoff Depth=3.05" Tc=5.0 min CN=0/98 Runoff=0.21 cfs 0.068 af
Subcatchment 15S: Basin 111	Runoff Area=2.329 ac 100.00% Impervious Runoff Depth=3.05" Tc=11.0 min CN=0/98 Runoff=1.67 cfs 0.591 af
Subcatchment 17S: Basin 120	Runoff Area=3.287 ac 100.00% Impervious Runoff Depth=3.05" Tc=9.0 min CN=0/98 Runoff=2.42 cfs 0.835 af
Subcatchment 18S: Basin 121	Runoff Area=1.252 ac 100.00% Impervious Runoff Depth=3.05" Tc=5.0 min CN=0/98 Runoff=0.96 cfs 0.318 af
Subcatchment 19S: Basin 122	Runoff Area=0.386 ac 100.00% Impervious Runoff Depth=3.05" Tc=5.0 min CN=0/98 Runoff=0.30 cfs 0.098 af
Subcatchment 21S: Basin 130	Runoff Area=3.528 ac 100.00% Impervious Runoff Depth=3.05" Tc=10.0 min CN=0/98 Runoff=2.56 cfs 0.896 af
Subcatchment 22S: Basin 131	Runoff Area=0.433 ac 100.00% Impervious Runoff Depth=3.05" Tc=5.0 min CN=0/98 Runoff=0.33 cfs 0.110 af
Subcatchment 23S: Basin 132	Runoff Area=0.447 ac 100.00% Impervious Runoff Depth=3.05" Tc=5.0 min CN=0/98 Runoff=0.34 cfs 0.114 af
Subcatchment A: Offsite Basin A	Runoff Area=19.530 ac 38.00% Impervious Runoff Depth=1.83" Tc=20.0 min CN=74/98 Runoff=6.61 cfs 2.985 af
Subcatchment B: Offsite Basin B	Runoff Area=97.740 ac 38.00% Impervious Runoff Depth=1.83" Tc=60.0 min CN=74/98 Runoff=21.39 cfs 14.939 af

Total Runoff Area = 137.191 ac Runoff Volume = 22.982 af Average Runoff Depth = 2.01"
53.00% Pervious = 72.707 ac 47.00% Impervious = 64.484 ac

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Pond 3P: WQF #3	Inflow=3.31 cfs 1.121 af Primary=3.31 cfs 1.121 af
Pond 4P: WQF #4b	Inflow=1.44 cfs 0.477 af Primary=1.44 cfs 0.477 af
Pond 5P: WQF #5a	Inflow=1.88 cfs 0.658 af Primary=1.88 cfs 0.658 af
Pond 6P: WQF #6	Inflow=8.61 cfs 3.147 af Primary=8.61 cfs 3.147 af
Pond 7P: WQF #7	Inflow=1.00 cfs 0.332 af Primary=1.00 cfs 0.332 af
Pond 11P: WQF #8	Inflow=6.97 cfs 2.591 af Primary=6.97 cfs 2.591 af
Pond 12P: WQF #4a	Inflow=1.94 cfs 0.679 af Primary=1.94 cfs 0.679 af
Pond 13P: WQF #5b	Inflow=1.32 cfs 0.437 af Primary=1.32 cfs 0.437 af
Pond 14P: WQF #1	Inflow=0.82 cfs 0.270 af Primary=0.82 cfs 0.270 af
Pond 15P: WQF #2	Inflow=2.41 cfs 0.799 af Primary=2.41 cfs 0.799 af

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Pond 7P: WQF #9	Inflow=0.21 cfs 0.068 af Primary=0.21 cfs 0.068 af
Pond 9P: WQF #10	Inflow=3.29 cfs 1.139 af Primary=3.29 cfs 1.139 af
Pond 12P: WQF #11	Inflow=4.19 cfs 1.482 af Primary=4.19 cfs 1.482 af
Pond 16P: WQF #12	Inflow=3.66 cfs 1.251 af Primary=3.66 cfs 1.251 af
Pond 20P: WQF #13	Inflow=3.23 cfs 1.119 af Primary=3.23 cfs 1.119 af

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Basin 10 Runoff Area=1.065 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.96 cfs 0.318 af

Subcatchment 2A: Basin 20 A Runoff Area=0.253 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.23 cfs 0.076 af

Subcatchment 2B: Basin 20 B Runoff Area=0.840 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.75 cfs 0.251 af

Subcatchment 2C: Basin 20 C Runoff Area=0.517 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.46 cfs 0.154 af

Subcatchment 2D: Basin 20 D Runoff Area=0.496 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.44 cfs 0.148 af

Subcatchment 2E: Basin 20 E Runoff Area=1.042 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.93 cfs 0.311 af

Subcatchment 3: Basin 30 Runoff Area=3.045 ac 100.00% Impervious Runoff Depth=3.59"
Tc=8.0 min CN=0/98 Runoff=2.65 cfs 0.910 af

Subcatchment 4: Basin 40 Runoff Area=0.304 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.27 cfs 0.091 af

Subcatchment 4-1: Basin 41 Runoff Area=2.673 ac 100.00% Impervious Runoff Depth=3.59"
Tc=10.0 min CN=0/98 Runoff=2.27 cfs 0.799 af

Subcatchment 4-2: Basin 42 Runoff Area=0.886 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.79 cfs 0.265 af

Subcatchment 4-3: Basin 43 Runoff Area=0.316 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.28 cfs 0.094 af

Subcatchment 5: Basin 50 Runoff Area=0.696 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.62 cfs 0.208 af

Subcatchment 5-1: Basin 51 Runoff Area=0.474 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.43 cfs 0.142 af

Subcatchment 5-2: Basin 53 Runoff Area=0.550 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.49 cfs 0.164 af

Subcatchment 6: Basin 60 Runoff Area=1.115 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=1.00 cfs 0.333 af

Subcatchment 6-1: Basin 61 Runoff Area=0.474 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.43 cfs 0.142 af

Subcatchment 6-2: Basin 62 Runoff Area=2.320 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=2.08 cfs 0.693 af

Subcatchment 6-3: Basin 63 Runoff Area=0.123 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.11 cfs 0.037 af

Subcatchment 7: Basin 70 Runoff Area=0.287 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.26 cfs 0.086 af

Subcatchment 7-1: Basin 71 Runoff Area=0.432 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.39 cfs 0.129 af

Subcatchment 7-2: Basin 72 Runoff Area=0.590 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.53 cfs 0.176 af

Subcatchment 8: Basin 80 Runoff Area=2.320 ac 100.00% Impervious Runoff Depth=3.59"
Tc=12.0 min CN=0/98 Runoff=1.93 cfs 0.693 af

Subcatchment 10S: Basin 65 Runoff Area=7.606 ac 100.00% Impervious Runoff Depth=3.59"
Tc=17.0 min CN=0/98 Runoff=5.92 cfs 2.273 af

Subcatchment 11S: Basin 81 Runoff Area=7.675 ac 100.00% Impervious Runoff Depth=3.59"
Tc=16.0 min CN=0/98 Runoff=6.05 cfs 2.293 af

Subcatchment 12S: Basin 66 Runoff Area=0.450 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.40 cfs 0.134 af

Subcatchment 14S: Basin 52 Runoff Area=2.591 ac 100.00% Impervious Runoff Depth=3.59"
Tc=10.0 min CN=0/98 Runoff=2.20 cfs 0.774 af

Subcatchment 15S: Basin 82 Runoff Area=0.207 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.19 cfs 0.062 af

Subcatchment 16S: Basin 44 Runoff Area=0.374 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.34 cfs 0.112 af

Subcatchment 35S: Basin 67 Runoff Area=0.305 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.27 cfs 0.091 af

Subcatchment OS-3: Basin OS 31 Runoff Area=1.368 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=1.23 cfs 0.409 af

Total Runoff Area = 41.394 ac Runoff Volume = 12.368 af Average Runoff Depth = 3.59"
0.00% Pervious = 0.000 ac 100.00% Impervious = 41.394 ac

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 8S: Basin 100 Runoff Area=1.533 ac 100.00% Impervious Runoff Depth=3.59"
Tc=10.0 min CN=0/98 Runoff=1.30 cfs 0.458 af

Subcatchment 10S: Basin 101 Runoff Area=2.461 ac 100.00% Impervious Runoff Depth=3.59"
Tc=9.0 min CN=0/98 Runoff=2.12 cfs 0.735 af

Subcatchment 11S: Basin 102 Runoff Area=0.490 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.44 cfs 0.146 af

Subcatchment 13S: Basin 110 Runoff Area=3.507 ac 100.00% Impervious Runoff Depth=3.59"
Tc=11.0 min CN=0/98 Runoff=2.95 cfs 1.048 af

Subcatchment 14S: Basin 90 Runoff Area=0.268 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.24 cfs 0.080 af

Subcatchment 15S: Basin 111 Runoff Area=2.329 ac 100.00% Impervious Runoff Depth=3.59"
Tc=11.0 min CN=0/98 Runoff=1.96 cfs 0.696 af

Subcatchment 17S: Basin 120 Runoff Area=3.287 ac 100.00% Impervious Runoff Depth=3.59"
Tc=9.0 min CN=0/98 Runoff=2.83 cfs 0.982 af

Subcatchment 18S: Basin 121 Runoff Area=1.252 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=1.12 cfs 0.374 af

Subcatchment 19S: Basin 122 Runoff Area=0.386 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.35 cfs 0.115 af

Subcatchment 21S: Basin 130 Runoff Area=3.528 ac 100.00% Impervious Runoff Depth=3.59"
Tc=10.0 min CN=0/98 Runoff=3.00 cfs 1.054 af

Subcatchment 22S: Basin 131 Runoff Area=0.433 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.39 cfs 0.129 af

Subcatchment 23S: Basin 132 Runoff Area=0.447 ac 100.00% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=0/98 Runoff=0.40 cfs 0.134 af

Subcatchment A: Offsite Basin A Runoff Area=19.530 ac 38.00% Impervious Runoff Depth=2.27"
Tc=20.0 min CN=74/98 Runoff=8.38 cfs 3.696 af

Subcatchment B: Offsite Basin B Runoff Area=97.740 ac 38.00% Impervious Runoff Depth=2.27"
Tc=60.0 min CN=74/98 Runoff=27.10 cfs 18.498 af

Total Runoff Area = 137.191 ac Runoff Volume = 28.147 af Average Runoff Depth = 2.46"
53.00% Pervious = 72.707 ac 47.00% Impervious = 64.484 ac

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Pond 3P: WQF #3	Inflow=3.87 cfs 1.319 af Primary=3.87 cfs 1.319 af
Pond 4P: WQF #4b	Inflow=1.69 cfs 0.562 af Primary=1.69 cfs 0.562 af
Pond 5P: WQF #5a	Inflow=2.20 cfs 0.774 af Primary=2.20 cfs 0.774 af
Pond 6P: WQF #6	Inflow=10.08 cfs 3.703 af Primary=10.08 cfs 3.703 af
Pond 7P: WQF #7	Inflow=1.17 cfs 0.391 af Primary=1.17 cfs 0.391 af
Pond 11P: WQF #8	Inflow=8.16 cfs 3.048 af Primary=8.16 cfs 3.048 af
Pond 12P: WQF #4a	Inflow=2.27 cfs 0.799 af Primary=2.27 cfs 0.799 af
Pond 13P: WQF #5b	Inflow=1.54 cfs 0.514 af Primary=1.54 cfs 0.514 af
Pond 14P: WQF #1	Inflow=0.96 cfs 0.318 af Primary=0.96 cfs 0.318 af
Pond 15P: WQF #2	Inflow=2.82 cfs 0.941 af Primary=2.82 cfs 0.941 af

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Pond 7P: WQF #9	Inflow=0.24 cfs 0.080 af Primary=0.24 cfs 0.080 af
Pond 9P: WQF #10	Inflow=3.85 cfs 1.340 af Primary=3.85 cfs 1.340 af
Pond 12P: WQF #11	Inflow=4.90 cfs 1.744 af Primary=4.90 cfs 1.744 af
Pond 16P: WQF #12	Inflow=4.29 cfs 1.472 af Primary=4.29 cfs 1.472 af
Pond 20P: WQF #13	Inflow=3.78 cfs 1.317 af Primary=3.78 cfs 1.317 af