Tillamook County

DEPARTMENT OF COMMUNITY DEVELOPMENT
BUILDING, PLANNING & ON-SITE SANITATION SECTIONS

1510 – B Third Street
Tillamook, Oregon 97141
www.tillamookcounty.gov

Building (503) 842-3407
Planning (503) 842-3408
Sanitation (503) 842-3409
FAX (503) 842-1819
Toll Free 1(800) 488-8280

Land of Cheese, Trees and Ocean Breeze

Estuary/Floodplain Development Permit Request #851-24-000659-PLNG: Trask River Scour Repair Project

NOTICE TO MORTGAGEE, LIENHOLDER, VENDOR OR SELLER:
ORS 215 REQUIRES THAT IF YOU RECEIVE THIS NOTICE,
IT MUST BE PROMPTLY FORWARDED TO THE PURCHASER

NOTICE OF ADMINISTRATIVE REVIEW
Date of Notice: August 15, 2025

Notice is hereby given that the Tillamook County Department of Community Development is considering the following:

#851-24-000659-PLNG: An Estuary and Floodplain Development Permit for the Trask River Scour Repair Project in the Trask River at a location south of the City of Tillamook and Oregon State Highway 101. The project location is zoned Estuary Conservation 1 (EC1), and the project location is between two properties designated as Tax Lot 200 in Section 6, and Tax Lot 2200 in Section 5, both located in Township 2 South, Range 9 West W.M., Tillamook County Oregon. The applicant is the Oregon Department of Transportation (ODOT).

Written comments received by the Department of Community Development prior to 4:00 p.m. on August 29, 2025, will be considered in rendering a decision. Comments should address the standards upon which the Department must base its decision. A decision will be rendered no sooner than the next business day, September 2, 2025.

Notice of the application, a map of the subject area, and the applicable criteria are being mailed to all property owners within 250-feet of the exterior boundaries of the subject parcel for which an application has been made and other appropriate agencies at least 14-days prior to this Department rendering a decision on the request.

A copy of the application, along with a map of the request area and the applicable criteria for review are available for inspection at the Department of Community Development office located at 1510-B Third Street, Tillamook, Oregon 97141, or on the Tillamook County Department of Community Development website: https://www.co.tillamook.or.us/commdev/landuseapps

If you have any questions about this application, please call the Department of Community Development at 503-842-3408. Comments can be emailed to Sarah Thompson, Office Specialist 2, at Sarah.thompson@tillamookcounty.gov.

Sincerely,

Sarah Absher

Melissa Jenck, CFM, Senior Planner
Sarah Absher, CFM, Director

Enc. Maps, Applicable Ordinance Standards

Applicable Ordinances & Development Standards

Tillamook County Land Use Ordinance (TCLUO)
https://www.co.tillamook.or.us/gov/ComDev/planning/luo.htm

- Section 3.106: Estuary Conservation 1 (EC1) Zone
- Section 3.120: Regulated Activities and Impacts Assessments
- Section 3.140: Estuary Development Standards
- Section 3.510: Flood Hazard Overlay (FH)
- Section 4.140: Requirements for Protection of Water Quality and Streambank Stabilization

ARTICLE III – ZONE REGULATIONS

TCLUO SECTION 3.510: FLOOD HAZARD OVERLAY ZONE

(1) The fill is not within a Coastal High Hazard Area.

(2) Fill placed within the Regulatory Floodway shall not result in any increase in flood levels during the occurrence of the base flood discharge.

(3) The fill is necessary for an approved use on the property.

(4) The fill is the minimum amount necessary to achieve the approved use.

(5) No feasible alternative upland locations exist on the property.

(6) The fill does not impede or alter drainage or the flow of floodwaters.

(7) If the proposal is for a new critical facility, no feasible alternative site is available.

(8) For creation of new, and modification of, Flood Refuge Platforms, the following apply, in addition to (14)(a)(1-4) and (b)(1-5):

i. The fill is not within a floodway, wetland, riparian area or other sensitive area regulated by the Tillamook County Land Use Ordinance.

ii. The property is actively used for livestock and/or farm purposes,

iii. Maximum platform size = 10 sq ft of platform surface per acre of pasture in use, or 30 sq ft per animal, with a 10-ft wide buffer around the outside of the platform,

iv. Platform surface shall be at least 1 ft above base flood elevation,

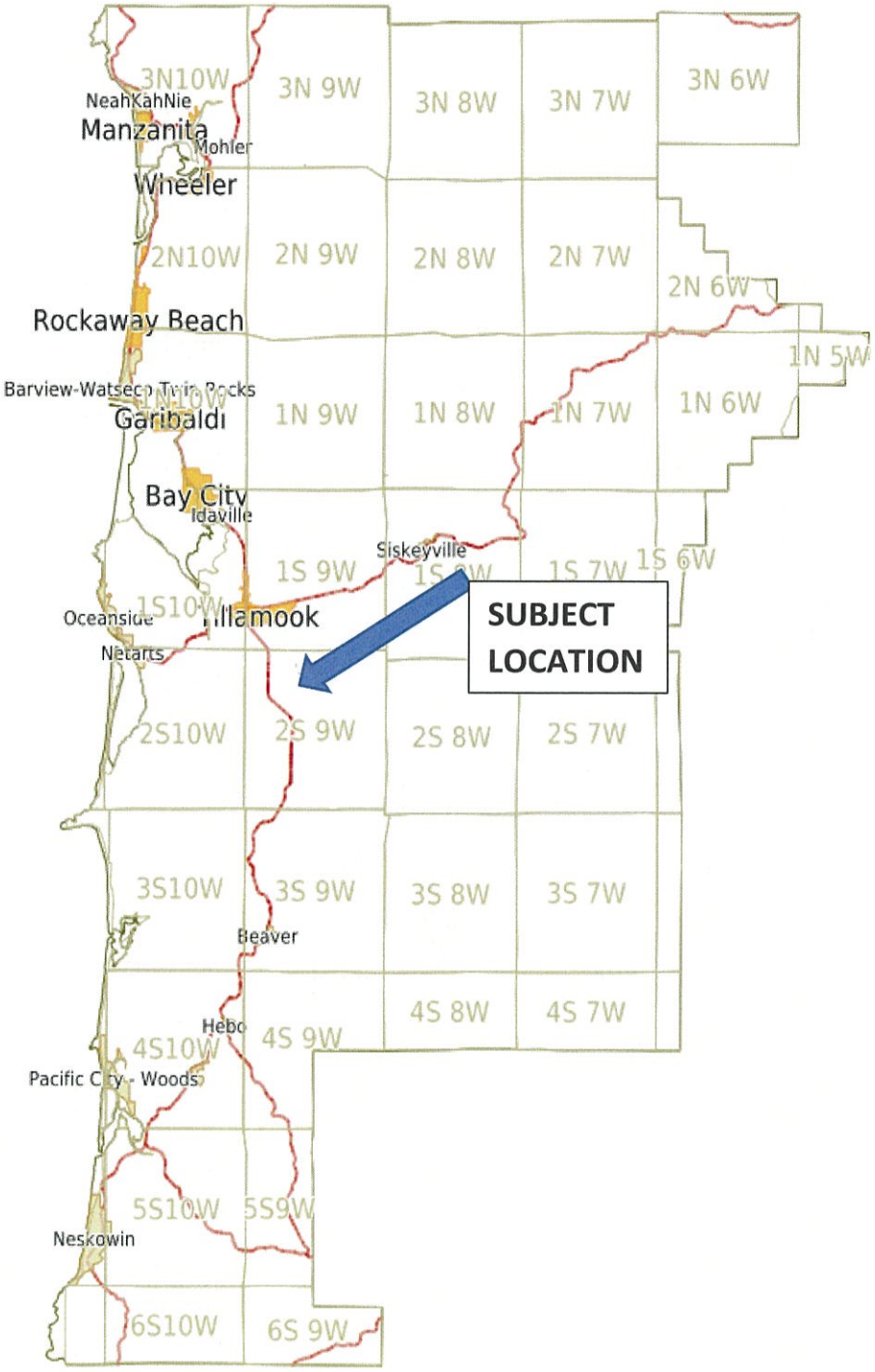
v. Slope of fill shall be no steeper than 1.5 horizontal to 1 vertical,

vi. Slope shall be constructed and/or fenced in a manner so as to prevent and avoid erosion.

Conditions of approval may require that if the fill is found to not meet criterion (5), the fill shall be removed or, where reasonable and practical, appropriate mitigation measures shall be required of the property owner. Such measures shall be verified by a certified engineer or hydrologist that the mitigation measures will not result in a net rise in floodwaters and be in coordination with applicable state, federal and local agencies, including the Oregon Department of Fish and Wildlife.

EXHIBIT A

VICINITY MAP

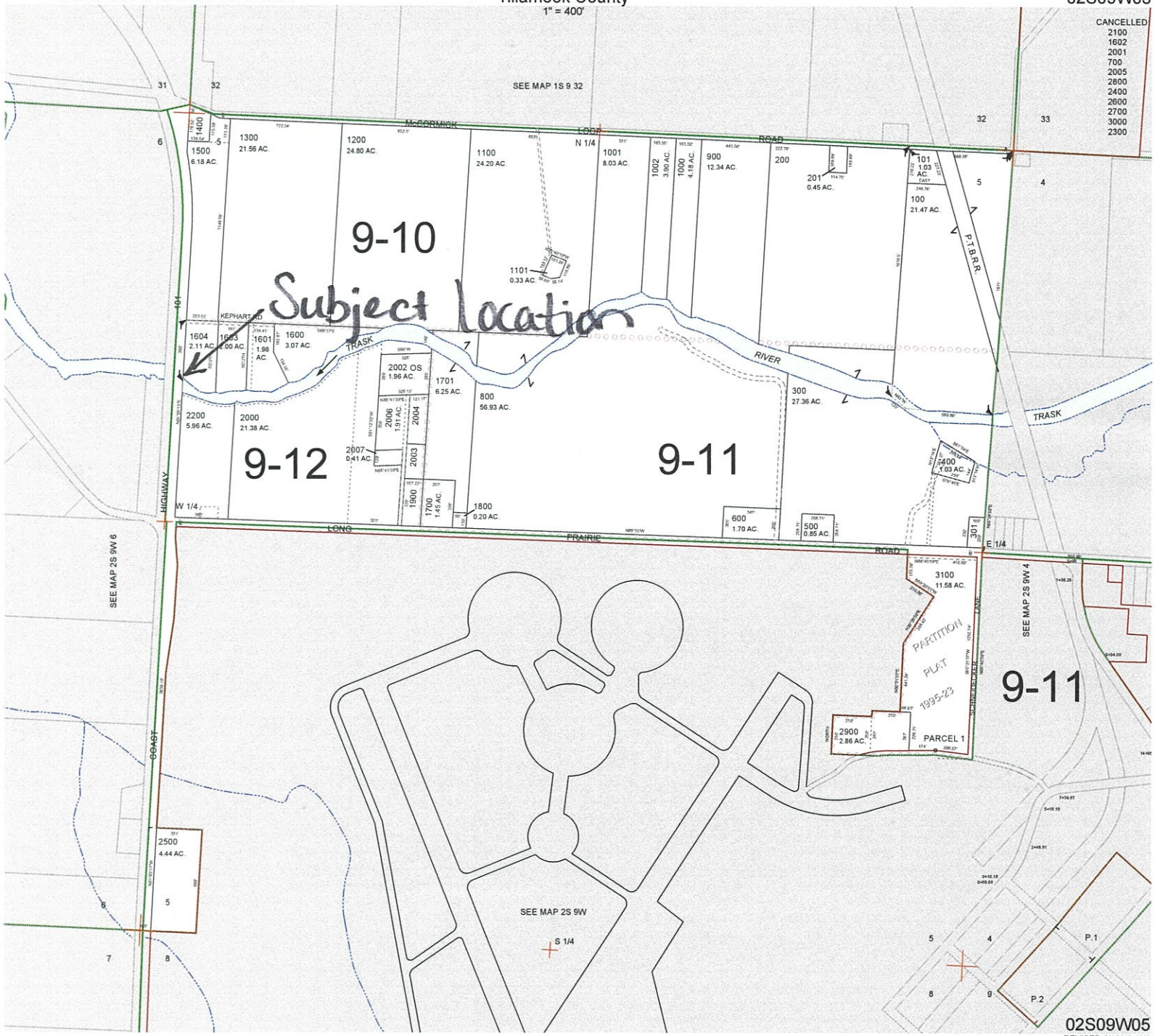


#851-24-000659-PLNG:
TRASK RIVER SCOUR REPAIR PROJECT

FOR ASSESSMENT AND TAXATION ONLY, NOT SUITABLE FOR LEGAL, ENGINEERING, OR SURVEY PURPOSES

SECTION 5 T.2S. R.9W. W.M.
Tillamook County
1" = 400'

02S09W05



02S09W05
REVISED 2/18/16, WS

FOR ASSESSMENT AND TAXATION ONLY, NOT SUITABLE FOR LEGAL, ENGINEERING, OR SURVEY PURPOSES

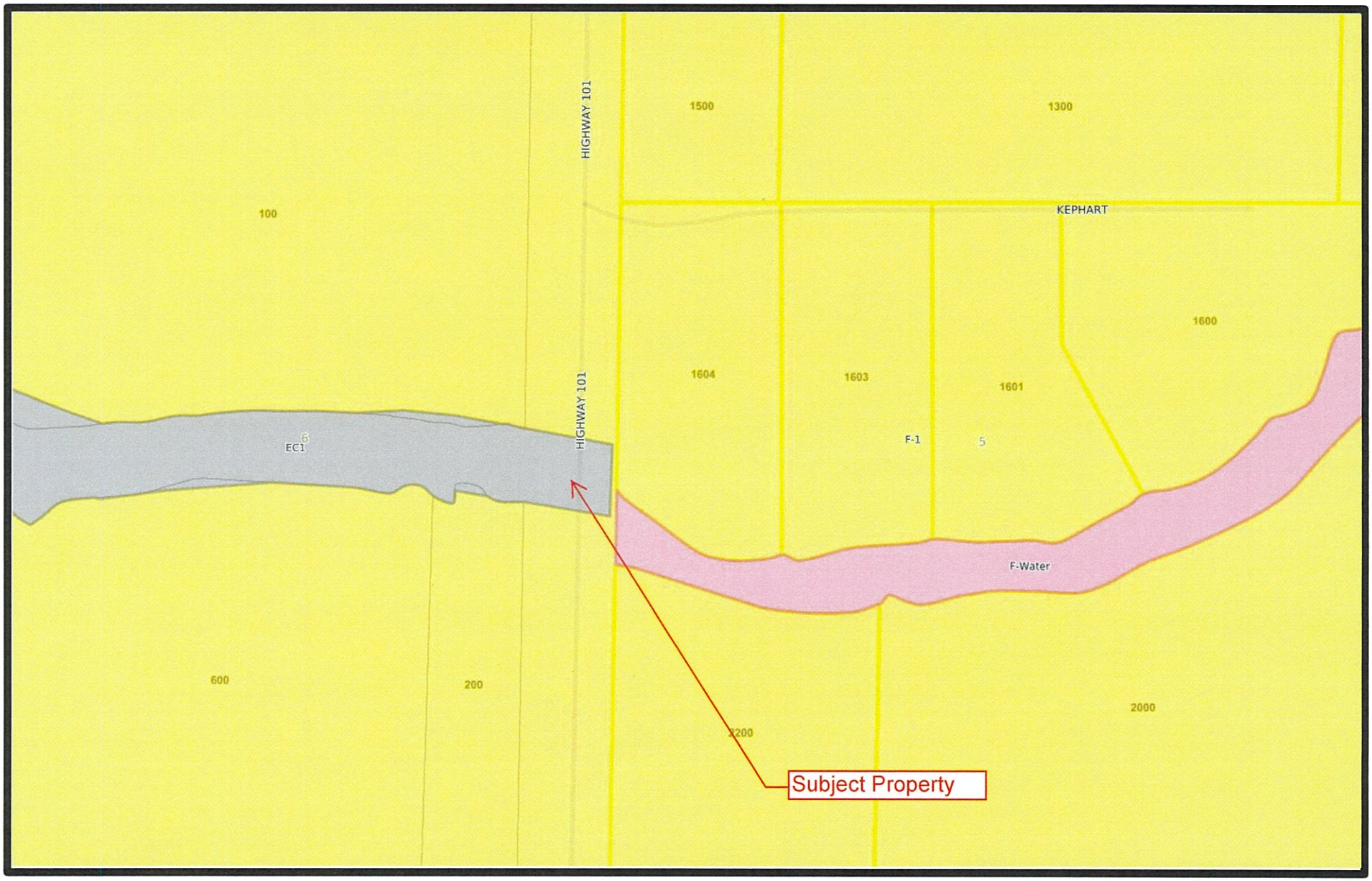
SECTION 6 T.2S. R.9W. W.M.
Tillamook County

02S09W06

1" = 400'

02S09W06
REVISED 2/18/16, WS

Zoning Map



Generated with the GeoMOOSE Printing Utilities

National Flood Hazard Layer FIRMette

FEMA

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- **SPECIAL FLOOD HAZARD AREAS**
  - Without Base Flood Elevation (BFE) *Zone A, V, A99*
  - With BFE or Depth *Zone AE, AO, AH, VE, AR*
  - Regulatory Floodway
- **OTHER AREAS OF FLOOD HAZARD**
  - 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainag areas of less than one square mile *Zone X*
  - Future Conditions 1% Annual Chance Flood Hazard *Zone X*
  - Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
  - Area with Flood Risk due to Levee *Zone D*
- **OTHER AREAS**
  - NO SCREEN Area of Minimal Flood Hazard *Zone X*
  - Effective LOMRs
  - Area of Undetermined Flood Hazard *Zone*
- **GENERAL STRUCTURES**
  - Channel, Culvert, or Storm Sewer
  - Levee, Dike, or Floodwall
- **OTHER FEATURES**
  - 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
  - Coastal Transect
  - Base Flood Elevation Line (BFE)
  - Limit of Study
  - Jurisdiction Boundary
  - Coastal Transect Baseline
  - Profile Baseline
  - Hydrographic Feature
- **MAP PANELS**
  - Digital Data Available
  - No Digital Data Available
  - Unmapped

N

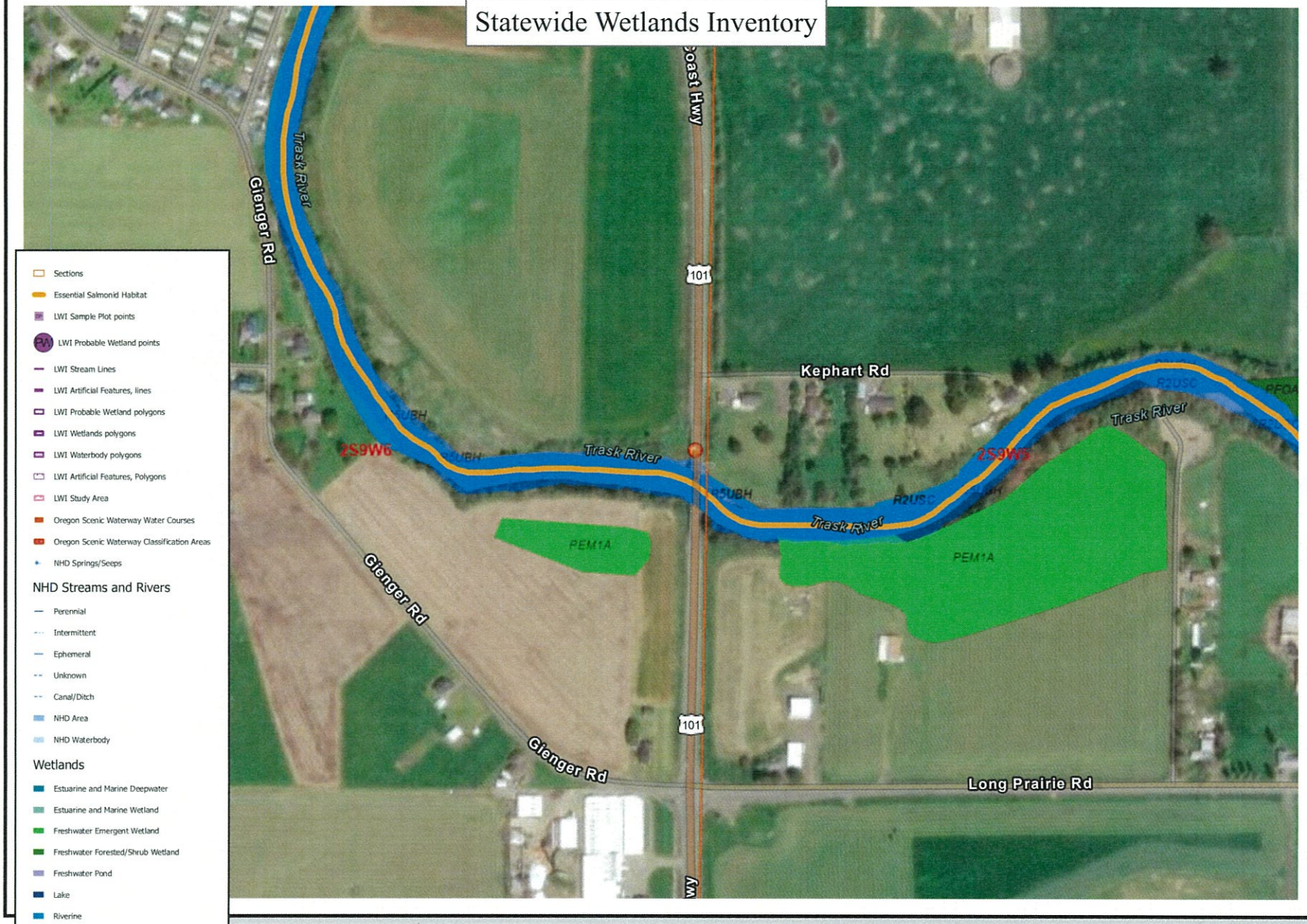
The pin displayed on the map is an approximate point selected by the user and does not represe an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/14/2025 at 8:28 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Statewide Wetlands Inventory



- Sections
- Essential Salmonid Habitat
- LWI Sample Plot points
- LWI Probable Wetland points
- LWI Stream Lines
- LWI Artificial Features, lines
- LWI Probable Wetland polygons
- LWI Wetlands polygons
- LWI Waterbody polygons
- LWI Artificial Features, Polygons
- LWI Study Area
- Oregon Scenic Waterway Water Courses
- Oregon Scenic Waterway Classification Areas
- NHD Springs/Seeps

NHD Streams and Rivers

- Perennial
- Intermittent
- Ephemeral
- Unknown
- Canal/Ditch
- NHD Area
- NHD Waterbody

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine
- SWI Predominantly Hydric Soil Map Units
- SWI Agate-Winlo Soils

1:6,817

0 0.04 0.09 0.17 0.26 0.34 mi

The Statewide Wetlands Inventory (SWI) represents the best data available at the time this map was published and is updated as new data becomes available. In all cases, actual field conditions determine the presence, absence and boundaries of wetlands and waters (such as creeks and ponds). An onsite investigation by a wetland professional can verify actual field conditions.

https://www.oregon.gov/dsl/WW/Pages/SWI.aspx

N

Date: 8/14/2025

State of Oregon
Department of State Lands
775 Summer Street, NE, Ste 100
Salem, OR. 97301-1279

EXHIBIT B

Tillamook County Department of Community Development
1510-B Third Street. Tillamook, OR 97141 | Tel: 503-842-3408 Fax: 503-842-1819
www.co.tillamook.or.us

DEVELOPMENT PERMIT

OFFICE USE ONLY
Date Stamp: RECEIVED NOV 2 7 2024 BY:
☐Approved ☐Denied
Received by:
Receipt #:
Fees: 1,600 + 5% tech fee
Permit No: 851-24-000059-PLNG

Applicant ☐ *(Check Box if Same as Property Owner)*

Name: Bill Jablonski Phone: 503.338.7334

Address: ODOT, 350 West Marine Drive

City: Astoria State: OR Zip: 97103

Email: William.R.JABLONSKI@odot.oregon.gov

Property Owner

Name: Phone:

Address:

City: State: Zip:

Email:

Description of Work: Scour repair project located within the Estuary Conservation Zone 1 at the US 101 crossing of Trask River

Location:

Site Address: US 101 bridge at the Trask River

Map Number: 2S	9W	5, 6	ORW, 2200
Township	Range	Section	Tax Lot(s)

Complete all applicable fields:

Regulatory Floodway:		Estuary:	✓	Floodplain:	✓				
New:		Addition:		Replacement:		Remodel:		Demolish:	

Dwelling:	Accessory Structure:
Culvert Diameter: Length:	Bridge Length: 336 ft, 39 ft Width:
Fence Height:	Retaining Wall Height:
Streambank Stabilization: Yes	Other:
Fill/Removal/Grading: 5000 CY	Vegetation Removal: 5000 CY

Structure/Damage $:	5 Year Construction $:
Substantial improvement/damage threshold 50% cost vs. value	

Flood Insurance Rate Map (FIRM) Panel Info

Tillamook County	Panel Number: 41057C 410196-0587
Effective Date:	Property Flood Zone(s): AE
Floodway: Y (N)	Project Flood Zone(s): AE
Stream/Waterbody Name: Trask River	

Elevation Data (NAVD 88)

Base Flood Elevation: 28.8	First Habitable Floor:
Lowest Floor/Horizontal Member:	
Enclosed Area:	Flood Vent Area:

Other Required Permits

Authorization

This permit application does not assure permit approval. The applicant and/or property owner shall be responsible for obtaining any other necessary federal, state, and local permits. The applicant verifies that the information submitted is complete, accurate, and consistent with other information submitted with this application.

William R Jablonski Digitally signed by William R Jablonski Date: 2024.11.27 11:41:28 -08'00'

Property Owner Signature (Required) Date

Applicant Signature Date

Tillamook County Department of Community Development
1510-B Third Street. Tillamook, OR 97141 | Tel: 503-842-3408 Fax: 503-842-1819
www.co.tillamook.or.us

PLANNING APPLICATION

OFFICE USE ONLY
Date Stamp: RECEIVED NOV 27 2024 BY:
☐Approved ☐Denied
Received by:
Receipt #:
Fees:
Permit No: 851-24-00059-PLNG-01

Applicant ☑ *(Check Box if Same as Property Owner)*

Name: Bill Jablonski Phone: 503.338.7334

Address: ODOT, 350 West Marine Drive

City: Astoria State: OR Zip: 97103

Email: William.R.JABLONSKI@odot.oregon.gov

Property Owner

Name: Phone:

Address:

City: State: Zip:

Email:

Request: Conditional Use review for a scour repair project located within the Estuary Conservation Zone 1 at the US 101 crossing of Trask River

Type II	Type III	Type IV
☐ Farm/Forest Review	☐ Detailed Hazard Report	☐ Ordinance Amendment
☑ Conditional Use Review	☐ Conditional Use (As deemed by Director)	☐ Large-Scale Zoning Map Amendment
☐ Variance	☐ Ordinance Amendment	☐ Plan and/or Code Text Amendment
☐ Exception to Resource or Riparian Setback	☐ Map Amendment	
☐ Nonconforming Review (Major or Minor)	☐ Goal Exception	
☑ Development Permit Review for Estuary Development	☐ Nonconforming Review (As deemed by Director)	
☐ Non-farm dwelling in Farm Zone	☐ Variance (As deemed by Director)	
☐ Foredune Grading Permit Review		
☐ Neskowin Coastal Hazards Area		

Location:

Site Address: US101 bridge at the Trask River

Map Number: 2S	9W	5, 6	ROW, 2200
Township	Range	Section	Tax Lot(s)

Clerk's Instrument #: _____

Authorization

This permit application does not assure permit approval. The applicant and/or property owner shall be responsible for obtaining any other necessary federal, state, and local permits. The applicant verifies that the information submitted is complete, accurate, and consistent with other information submitted with this application.

William R Jablonski Digitally signed by William R Jablonski Date: 2024.11.27 11:41:59 -08'00'

Property Owner Signature (Required) Date

Applicant Signature Date

TABLE OF CONTENTS

Attachments

1.0 INTRODUCTION

1.1 Project Background

This document is intended to provide supplemental information related to the land use permit application for the Trask River Scour Repair project. The project area is located along the US 101 highway at the Trask River crossing. The Trask River is designated as an Estuary Conservation Zone 1 (EC1) from the coast up to the US 101 bridge as mapped by the Tillamook County online Interactive Web Map (March 2025). However, the EC1 zone technically extends to the end of the tidal influence, which includes an area just upstream of the bridge. The scour repair project includes work just upstream of the bridge, and therefore the entire project is understood to be within the influence of the tide and within the EC1 zone. Adjacent upland areas are zoned as Farm Zone (F-1). The legal description for the Project site is Township 02S, 9W, Sections 5 and 6. The project is located within the existing US 101 right-of-way and on tax lot 2200 on tax map 02S09W05.

DOWL environmental staff conducted early coordination with Tillamook County Planning Department staff to determine the type of permits that will be required for this project. Based on this coordination, the project will require a Development Permit (Type I Planning Application) to show compliance with the Flood Hazard Overlay Zone (FH) (Section 3.510) of the Tillamook County Land Use Ordinance (TCLUO), and a Conditional Use Permit (Type II Planning Application) to show compliance with development in the Estuary Conservation 1 Zone (EC1) (Section 3.140). Included in this narrative are responses to TCLUO Section 3.120(5): Impact Assessments.

The scour repair construction activities located in EC1 are a permitted use with standards subject to the procedures of TCLUO Section 3.120 and the standards of TCLUO Section 3.140.

1.2 Project Description

The Oregon Department of Transportation (applicant) is proposing a scour repair project at the US 101 bridge (Bridge No. 07147) that crosses the Trask River, south of Tillamook, Oregon. The scour repair includes installing riprap protection along the southern bank bridge abutment to fill a scour hole where the existing riprap revetment has been undermined and has begun to fail. The bridge structure will remain in place and will not be modified.

The existing bridge is an 11-span bridge, 336 feet long by 39 feet wide, that was built in 1949. Riprap slope protection was previously installed along the southern bridge abutment sometime after 1972 based on review of as-built drawings and personal communication with the local ODOT bridge crew.

The proposed scour repair includes installing abutment/bank protection riprap revetment by extending the existing revetment with Class 200 riprap on the southern bridge abutment upstream and keying the riprap into the bank. The new riprap revetment will form a revised bank alignment to direct flows along the bank and fill in the upland area that was lost to scour. Three pieces of large wood will be installed among the riprap revetment that will extend into the river to enhance aquatic habitat. A secondary riprap abutment protection revetment will be installed above the elevation of the primary abutment/bank protection that will follow the roadway embankment (see Project Plans in Attachment 1, Appendix 3 for details). Native fill will be used to fill in the spaces between the riprap and provide substrate for planting. The revetment will be vegetated with willow stakes and native seed mix.

The Trask River Scour Repair project is located at the US 101 crossing of the Trask River, which is identified as the head of tide for the Trask River. The tidal influence at this location is roughly 1.5 feet. In tidal waterways, jurisdictional elevation for Oregon Department of State Lands (DSL) is based on the highest measured tide (HMT) and for the U.S. Army Corps of Engineers (USACE), the mean high water (MHW) line for Section 10 waters, and highest measured tide (HMT) for Section 404 waters. Based on the U.S. Geological Survey (USGS) stream gauge at the US 101 bridge, the MHW is 6.93 feet, and the HMT was calculated to be 11.01 feet. During the site visit, DOWL determined the ordinary high water mark (OHWM) to be 17 feet based on field indicators. The 17-foot elevation was approved by DSL and the USACE to be used for the jurisdictional elevation instead of MHW or HMT for the project area.

In-water construction activities below the OHWM in Trask River are required and will be conducted during the Oregon Department of Fish and Wildlife (ODFW) in-water work period (IWWP). Temporary work area isolation will be installed but will not block the entire river channel and will allow upstream/downstream fish migration. The project will comply with the Standard Local Operating Procedures for Endangered Species (SLOPES) V (Stormwater, Transportation, or Utilities) programmatic Biological Opinion and compensatory mitigation will not be required. The project team has determined that a fish passage plan will be required for this project. The applicant will therefore coordinate with ODFW to prepare a fish passage plan.

2.0 TILLAMOOK COUNTY LAND USE ORDINANCES

The following Permit Application Narrative provides a brief overview of the project and defines how this project complies with the sections of the TCLUO identified above.

According to Section 3.120 *Review of Regulated Activities*, this project is a regulated activity because it involves dredge and fill of more than 50 cubic yards within the EC1 zone and will require both State and Federal permits. As part of the procedures for regulated activities, responses to the Impact Assessment (Section 3.120(5)) have been included as part of this narrative.

SECTION 3.120: REVIEW OF REGULATED ACTIVITIES

(5) IMPACT ASSESSMENTS: The Planning Department shall, with the assistance of affected State and Federal agencies, develop impact assessments for regulated activities. Federal Environmental Impact Statements or Assessments may be substituted if made available to the Planning Department. The following considerations must be addressed in the impact assessment.

(a) The type and extent of alterations expected.

Response: The project proposes to repair existing scour at the US 101 bridge (Bridge No. 07147) that crosses the Trask River, south of Tillamook, Oregon. The scour repair includes installing riprap protection along the southern bank abutment to fill a scour hole and recontour the riverbank where the existing riprap revetment has been undermined and has begun to fail. The bridge structure will remain in place and will not be modified otherwise.

Construction will require temporary work area isolation. Temporary isolation will likely consist of sandbags (supersacks), plastic sheeting, sheet pile, or a combination of sandbags and sheet pile. The isolation will not block the entire channel of the Trask River and fish passage will be provided through the open portions of the channel during construction. Temporary water management will result in temporary impacts to the Trask River below the OHWM.

The proposed scour repair includes extending the existing riprap revetment by installing Class 200 riprap along the abutment to fill the existing scour hole. The new riprap revetment will provide fill in the upland area that was lost to scour. Three pieces of large wood will be installed among the riprap revetment that will extend into the river to enhance aquatic habitat. A secondary riprap abutment protection revetment will be installed above the primary abutment/bank

protection that will follow the roadway embankment. Native fill will be used to fill in the spaces between the riprap. Portions of the revetment will be planted with willows and the remaining portions of the revetment will be seeded.

Access on the south bank will be achieved by grading an access road path on the east side of the road to a point where equipment can enter the work area on the bridge abutment. Staging will occur in closed portions of the US 101 Highway, road ROW, and within the permanent easement on tax lot 2200.

(b) The type of resource(s) affected including, but not limited to aquatic life and habitats, riparian vegetation, water quality and hydraulic characteristics.

Response: Work will occur below the OHWM of Trask River during the ODFW-prescribed IWWP of July 1 – September 15 when water levels are lowest. DOWL did not identify any adjacent wetlands during fieldwork. Within the project area, the Trask River is habitat to salmonid species, including ESA-listed coho salmon and other native migratory aquatic species. The river is designated Essential Salmonid Habitat (ESH) by the DSL and as Essential Fish Habitat (EFH) for coho and Chinook salmon by the National Marine Fisheries Service (NMFS). Fish passage will be maintained through the active channel throughout the duration of the in-water work.

The riparian corridor throughout the assessment area consists of a narrow band of vegetation along the slopes of the banks and provides minimal water quality improvement function. Above the banks, the project area and vicinity consist of agricultural fields or maintained grasses. Construction access will temporarily impact riparian vegetation. These areas will be reseeded/replanted after construction is complete.

The work area below the OHWM will be temporarily isolated during removal and fill activities. Minor impacts to water quality (turbidity) may occur during placement and removal of temporary isolation; however, these impacts are anticipated to be temporary and localized. A 401 Certification from the Oregon Department of Environmental Quality (DEQ) will be acquired prior to the beginning of construction. DOWL anticipates metered turbidity monitoring will be required during construction. Erosion control BMPs will be in place before any ground disturbance occurs. Anticipated erosion and sediment control BMPs to be used on this project include (but are not limited to): compost filter berm; bio-filter bags; straw wattles; compost erosion blanket; permanent seeding; construction entrances; and the use of temporary access roads for construction access. Native fill will be used to fill the riprap gaps in the

revetment where planting will occur.

The placement of riprap for scour repair will result in a 0.1 foot rise of water at the 2-year storm level—with other storm levels remaining the same up to a 500-year event—while velocities through the bridge will decrease between 0.3 foot/second (ft/s) and 0.1 ft/s. See the Hydraulic Report in Attachment 2 for details.

(c) The expected extent of impacts of the proposed alteration on water quality and other physical characteristics of the estuary, living resources, recreation and aesthetic use, navigation and other existing and potential uses of the estuary.

Response: The work areas below the OHWM will be temporarily isolated during removal and fill activities. Minor impacts to water quality (turbidity) may occur during placement and removal of temporary isolation; however, these impacts are anticipated to be temporary, minor in nature, and localized. DOWL anticipates metered turbidity monitoring will occur during construction activities. Erosion control BMPs will be in place before any ground disturbance occurs. Native fill will be used to fill the riprap gaps in the revetment along the southern bridge abutment.

The project is not expected to impede passage of recreational boaters or anglers underneath the US 101 Highway bridge during active construction activities during the IWWP of July 1 – September 15.

There are no anticipated permanent significant adverse impacts to water quality, physical characteristics of the estuary, living resources, recreation uses, aesthetic uses, navigation, or other existing or potential uses of the estuary after construction has been completed.

(d) The methods which could be employed to avoid or minimize adverse impacts.

Response: The work areas below the OHWM will be temporarily isolated during removal and fill activities to prevent turbidity discharges. Petroleum-based fluids will be replaced with biodegradable fluids in vehicles, equipment, and tools. Erosion control BMPs will be in place before any ground disturbance occurs.

SECTION 3.140: ESTUARY DEVELOPMENT STANDARDS

The project has been designed to be consistent with all applicable Estuary Development Standards outlined in TCLUO Section 3.140[1]. Because the Project will require more than 50 cubic yards of removal within the Estuary Zone water resource present, TCLUO Subsection 3.140(5) will apply.

(5) DREDGING IN ESTUARINE WATERS, INTERTIDAL AREAS AND TIDAL WETLANDS: These standards shall apply only to dredging in excess of 50 c.y. within a 12-month period or dredging of 50 c.y. or less which requires a Section 10 permit from the U. S. Army Corps of Engineers.

a. When dredging in estuarine waters, intertidal areas or tidal wetlands is proposed, evidence shall be provided by the applicant and findings made by the County that:

i. The dredging is necessary for navigation or other water dependent uses that require an estuarine location, or is specifically allowed by the management unit or zone; and,

ii. A need (i.e. a substantial public benefit) is demonstrated and the use or alteration does not unreasonably interfere with public trust rights;

iii. If no feasible alternative upland locations exist; and,

iv. If adverse impacts are minimized.

Response: The project will provide a substantial public benefit by protecting the structural integrity of the US 101 bridge. The removal of 489 cubic yards of material below the OHWM is required to install new riprap and repair the scour at the southern abutment of the US 101 bridge across the Trask River. This activity will require a Section 10 permit from the USACE. It is therefore a

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[1] Only TCLUO Subsections 3.140(5), 3.140(7), 3.140(10), and 3.140(17) are applicable to this project. The remaining subsections of 3.140 do not apply and therefore, not addressed.

regulated activity allowed in the Estuary Conservation 1 Zone (EC1) listed in Section 3.106(4)(a)(1) *Dredging for on-site maintenance of:* (1) *Bridge crossing support structures.* Because this is a scour repair project requiring work on an existing structure below the OHWM, no feasible upland alternative location exists. Impacts within the EC1 zone have been minimized to the maximum extent practicable by installing the minimum amount of riprap required to protect the abutment from future scour damage.

b. Dredging projects shall meet all requirements of the State Fill and Removal Law (ORS 541.605 - 541.665), Section 10 of the Rivers and Harbors Act of 1899, and other applicable State and Federal laws. These requirements shall be enforced by State and Federal agencies with regulatory authority over dredging projects.

Response: The project will receive authorization from DSL and USACE pending review of the Joint Permit Application for impacts to jurisdictional waterways. DOWL expects the Oregon DEQ to issue a 401 Certification, and the NMFS to approve the use of the SLOPES Biological Opinion to cover the Endangered Species Act (ESA)-listed fish within Trask River. All in-water work will take place within the ODFW-prescribed IWWP of July 1 to September 15. No other state or federal permits are required for this project.

c. Existing water quality, quantity and rate of flow shall be maintained or improved. Minimum stream flow requirements shall be maintained. Water Quality policies shall apply.

Response: The work areas below the OHWM will be temporarily isolated with a sandbag barrier or sheet pile. However, most of the channel will remain open during construction activities. The placement of riprap for scour repair will result in a maximum rise of 0.1 feet of the water surface and a decrease in water velocities of between 0.1 and 0.3 ft/s for the proposed conditions (see the Hydraulic Report in Attachment 2). The project will also comply with DEQ's 401 certification and metered turbidity monitoring. Impacts to water quality (turbidity) may occur during construction; however, these impacts will be temporary, localized, and minor in nature.

d. Flushing capacity of estuaries shall be maintained. A hydrologic report from a professional registered hydrologist or engineer may be required by the Planning Department to ensure that this standard has been met.

Response: No adverse impacts to the flushing capacity of the estuary are

anticipated. Please refer to the Hydraulic Report in Attachment 2.

e. **Dredging shall be timed in order to minimize the effects of sedimentation and turbidity and to minimize impacts on fish, shellfish, and recreational and commercial fishery activities. The work periods specified in the Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources (ODFW, 2000) shall be followed unless approval of alternative work periods has been obtained from the O.D.F.W.**

Response: All in-water construction activities will occur during the ODFW-prescribed IWWP for the Trask River of July 1 to September 15. The main channel of the Trask River will remain open and passable for recreational uses during construction activities.

f. **Evidence shall be provided by the applicant and findings made by the County that projects requiring dredging are sited and designed so that initial and maintenance dredging are minimized.**

Response: Removal of sediment during scour repair activities will be limited to the extent practicable by installing the minimum amount of riprap required to protect the bridge abutment. Native fill will be placed over the riprap following installation. No maintenance dredging is anticipated.

g. **Dredging proposals shall provide at least a five-year program for disposal of dredged materials. Programs for disposal of dredged material shall be consistent with Dredged Material Disposal standards.**

Response: This project does not involve regular, long-term dredging. Any dredged material will be disposed of in accordance with Dredged Material Disposal Standards.

h. **Dredging proposals requiring mitigation shall include a mitigation plan consistent with Mitigation Standards.**

Response: This project will not require compensatory mitigation for DSL or USACE as the project is replacing upland and riprap lost to scour and is not considered a loss of waters. As the project will comply with standards established under SLOPES for the installation of vegetated riprap and riprap with large wood, the project will not require compensatory mitigation or a mitigation plan for NMFS.

i. **New dredging projects shall not be allowed in areas where insufficient data are available to assess the relative biological value. Under these circumstances, the applicant may arrange to provide the necessary information with the technical assistance of State and Federal resource agencies.**

Response: The project is located in a site with sufficient data to assess relative biological value.

j. **When dredging for the purpose of on-site maintenance of existing facilities is proposed, evidence shall be presented by the applicant and findings made by the County that:**

   i. **The dredging is necessary to maintain proper operation of the facility.**

   ii. **The amount of dredging proposed is confined to the geographic area of the existing facility, and is the minimum amount necessary to fulfill the need.**

Response: Area of dredging is limited to the excavation necessary for construction of the proposed revetment, which is needed to protect the existing bridge. No dredging outside of that area is proposed. The limits of dredging are depicted Attachment 1, Appendix 3, plan sheet HD01.

In cases where dredging or ditching for the purpose of tidegate or land drainage network maintenance is proposed, this findings requirement may be met by a brief statement from the local Soil and Water Conservation Service stating that:

(1) **Dredging or ditching is necessary to maintain proper operation of the tidegate and/or the associated land drainage network behind the dike.**

(2) **The amount of dredging or ditching proposed is confined to the geographic area of the tidegate or drainage new work, and is the minimum amount necessary to fulfill the need.**

Response: This standard does not apply to this project because the project is not dredging to maintain operations of tidegates or land drainage networks.

k. Excavation to create new water surface area shall be subject to the standards listed above and to the following standards:

i. Provision shall be made for stabilization of new bank lines prior to the connection of the new water body to existing water bodies. Excavation of as much as is practical of the new water body shall be completed before it is connected to existing water bodies.

ii. Toxic substances or other pollutants shall not leak into the water as a result of the excavation.

iii. Erosion of adjacent shoreland areas and excessive sedimentation and turbidity in adjacent aquatic areas shall be avoided.

iv. Excavation shall occur at a time that will minimize its impact on aquatic life.

v. Excavated materials shall not be disposed of in estuarine waters, intertidal areas, or tidal wetlands, except as part of an approved fill project subject to fill standards.

Response: This standard does not apply to this project because this project is not creating new water surface area.

l. Dredging for the purpose of bankline or stream alteration (i.e. realignment of a stream bank or the entire stream, either within or without its normal high water boundaries) shall be subject to the standards listed above and to following standards:

i. Alignments should make maximum use of natural or existing deep water channels provided that pockets of stagnant water are not created.

ii. Erosion of adjacent shoreland areas and excessive sedimentation and turbidity in adjacent aquatic areas shall be avoided.

iii. Temporary stabilization (mulching or sodding), sediment

basins or other performance equivalent structures may be required at the discretion of the Planning Department.

iv. **Provision shall be made for stabilization of new banklines. Shoreline Stabilization standards shall apply.**

v. **Adverse impacts on fish spawning, feeding, migration and transit routes and wildlife habitat shall be evaluated and minimized.**

Response: The project will stabilize a portion of the southern bank as part of the scour repairs of the southern bridge abutment. The project will comply with the Shoreline Stabilization standards, included below.

m. **An impact assessment shall be conducted during local, State and Federal review of permit applications for dredging in estuarine waters, intertidal areas or tidal wetlands. The impact assessment shall follow the procedures outlined in Section 3.120. Identified adverse impacts shall be minimized to be consistent with the resource capabilities and purposes of the area.**

Response: See the impact assessment in Section 3.120(5). No adverse impacts are anticipated.

Because the project will require more than 50 cubic yards of fill within the Estuary Zone waterway and will be required to obtain a Section 10 and Section 404 permit from the USACE, the following standards apply [TCLUO 3.140(7)].

(7) **FILL IN ESTUARINE WATERS, INTERTIDAL AREAS AND TIDAL WETLANDS: These standards shall apply only to fill in excess of 50 c.y. or fill of less than 50 c.y. which requires a Section 10 or 404 Permit from the U.S. Army Corps of Engineers.**

a. **When fill in estuarine waters, intertidal areas or tidal wetlands is proposed, evidence shall be provided by the applicant and findings made by the County that:**

i. **The fill is necessary for navigation or other water dependent uses that require an estuarine location, or is specifically allowed by the management unit or zone; and**

Response: The placement of 815 cubic yards of riprap below the OHWM is required to repair the scour located at the southern abutment to protect the US 101 bridge across the Trask River. This activity will require a Section 10 permit from the USACE. As such, it is a regulated activity allowed in the Estuary Conservation 1 Zone (EC1) listed in Section 3.106(4)(2) *Fill or riprap for on-site maintenance of:* (b) *bridge crossing support structures or other land transportation facilities.*

ii. A need (i.e. a substantial public benefit) is demonstrated and the use or alteration does not unreasonably interfere with public trust rights; and,

Response: The project will provide a substantial public benefit by protecting the structural integrity of the US 101 bridge. The project will not unreasonably interfere with public trust rights.

iii. If no feasible alternative upland locations exist; and,

Response: Because this is a scour repair project requiring work below the OHWM, no feasible upland alternative location exists.

iv. If adverse impacts are minimized.

Response: Impacts within the EC1 zone have been minimized to the maximum extent practicable by installing the minimum amount of riprap required to protect the abutment.

b. When fill for the purpose of on-site maintenance of existing facilities is proposed, evidence shall be provided by the applicant and findings made by the County that:

i. There are no alternatives to fill to maintain proper operation of the facility.

Response: This is a maintenance project to repair a scour hole along the southern bridge abutment. There are no alternatives to fill that would address the scour issues. The scour repair to the bridge abutment is replacing an existing riprap revetment and upland area that has been scoured away. The scour hole on the southern bridge abutment could threaten the structural integrity of the US 101 bridge if not repaired.

ii. **The amount of fill proposed is confined to the geographic area of the existing facility, and is the minimum amount necessary to fulfill the need.**

Response: Impacts within the EC1 zone have been minimized to the maximum extent practicable by installing the minimum amount of riprap required to protect the abutment.

c. **Where existing public access is reduced, suitable access as part of the development project shall be provided.**

Response: This standard does not apply to this project. There are no public access points to Trask River within the project area.

d. **The fill shall be placed at a time that will minimize sedimentation and turbidity. The work periods specified in the Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources (ODFW, 1976) shall be followed unless approval of alternative work periods has been obtained from the ODFW.**

Response: All in-water construction activities will occur during the ODFW-prescribed IWWP for the Trask River of July 1 to September 15 when water levels are lowest. Erosion control BMPs will be in place prior to any ground disturbance to prevent sediment from leaving the construction site.

e. **Only non-polluted materials may be used for fill. Materials which would create water quality problems are not permitted.**

Response: Proposed permanent fill materials include the following: clean riprap; clean streambed material that will be redeposited over the riprap; clean fill from off-site; and clean sandbags and plastic sheeting. These materials will not create water quality problems. A 401 Certification from the DEQ will be acquired prior to beginning construction.

f. **The perimeters of the fill shall be provided with erosion prevention measures, consistent with Shoreline Stabilization standards.**

Response: Prior to in-water construction activities, the contractor will isolate the work areas to minimize downstream turbidity. Appropriate BMPs will be installed prior to any site grading or earthwork for access into the work site. Anticipated erosion and sediment control BMPs to be used on this project include but are not limited to compost filter berm, bio-filter bags, straw wattles, compost erosion

blanket, permanent seeding, construction entrances, and the use of a temporary access road for construction access.

g. **Fills shall be placed so that adjacent or nearby property is not adversely impacted by increased erosion, shoaling or flooding produced by changes in littoral drift or other changes in water circulation patterns. An affidavit from a professional registered engineer or hydrologist may impact assessment required in Section 3.120.**

Response: The fill for scour repair along the southern bridge abutment will benefit the adjacent landowner by reducing or halting additional erosion to the property. The scour repair project will not impede flow or floodwaters. Refer to the Hydraulic Report in Attachment 2.

h. **Fill proposals requiring mitigation shall include a mitigation plan consistent with Mitigation standards.**

Response: This project will not require compensatory mitigation for DSL or USACE as the project is replacing upland and riprap lost to scour and is not considered a loss of waters. As the project will comply with standards established under SLOPES for the installation of vegetated riprap and riprap with large wood, the project will not require compensatory mitigation or a mitigation plan for NMFS.

i. **Fill in estuarine waters, intertidal areas and tidal wetlands shall be subject to the requirements of the State Fill and Removal Law (ORS 541.605 - 541.665), The Rivers and Harbors Act of 1899, the Clean Water Act of 1977 (PL 95-217) and other applicable State and Federal laws. These requirements shall be enforced by State and Federal agencies with regulatory authority over fill projects.**

Response: The project will receive authorization from DSL and USACE pending review of the Joint Permit Application for impacts to jurisdictional waterways. The Oregon DEQ will issue a 401 Certification. NMFS will approve the use of the SLOPES to cover the Endangered Species Act (ESA)-listed fish within Trask River. All in-water work will take place within the ODFW-prescribed IWWP of July 1 to September 15. No other state or federal permits are required for this project.

j. **An impact assessment shall be conducted during the local, State,**

and Federal review of permit applications for fill in estuarine waters, intertidal areas, or tidal wetlands according to the provisions outlined in Section 3.120. Identified adverse impacts shall be minimized to be consistent with the resource capabilities and purposes of the area.

Response: See the impact assessment in Section 3.120(5). No adverse impacts are anticipated.

Because this project includes the maintenance of a bridge in an estuary zone, it is subject to the standards outlined in TCLUO Subsection 3.140(10). Because a new road or railroad is not proposed as a component of this Project, only Subsections 3.140(10)(b) through (i) need to be addressed. The Project has been designed consistent with the applicable standards as follows.

(10) LAND TRANSPORTATION FACILITIES: Siting, design, construction and maintenance of bridges, roads or railroads in estuary zones shall be subject to the following standards:

a. Proposals for new County or State highways, or for railroads, shall provide an evaluation of the proposed project on the following:

i. Land use patterns.

ii. Energy use.

iii. Air and water quality.

iv. Estuarine habitat, functions and processes.

v. Existing transportation facilities.

vi. Physical and visual access to estuaries and shorelands.

Response: This standard does not apply to this project because there are no new County or State highways or railroads proposed.

b. Evidence shall be provided by the applicant and findings made by the County that the siting, design, construction and maintenance of land transportation facilities will be conducted to avoid mass soil

wasting or excessive surface erosion.

Response: The scour repair will require the removal of riparian vegetation limited to only those areas necessary to construct or access the project. The project will include vegetating the riprap revetments on the southern bridge abutment, and all temporary construction access to the work site will be revegetated upon project completion. See Attachment 1, Appendix 3, plan sheets FB01 through FB04 for a list of proposed erosion/sediment control plans for the project and Sheet FA01 for the planting plan.

c. **Land transportation facility proposals shall include a rehabilitation plan specifying the method and timing of necessary site rehabilitation. Site rehabilitation plans shall provide for replacement of riparian vegetation.**

Response: The riprap revetment at the southern bridge abutment will be seeded with herbaceous species and planted with willow stakes in riprap areas outside of the bridge footprint. Construction access areas will be reseeded after construction has been completed. The conceptual planting plan is included in Attachment 1, Appendix 3.

d. **Vegetated buffer strips shall be maintained, whenever practicable, along roadways to manage storm drainage runoff.**

Response: Temporary access roads constructed within the US 101 ROW will disturb roadside vegetation during construction activities. All disturbed roadside areas will be seeded to reestablish vegetative cover.

e. **When culverts are used in association with bridge crossings, spring line natural bottom culverts are preferred over box culverts.**

Response: This standard does not apply to this project because there are no culverts proposed.

f. **All bridge crossings and culverts shall be positioned and maintained to allow fish passage, avoid interference with anadromous fish runs and to prevent any constriction of natural streams which would result in increases in flood or erosion potential. When culverts are used, no fill shall be allowed in streams, rivers or estuaries.**

Response: Temporary work isolation will occur during the ODFW-approved

IWWP, and the channel will not be blocked during construction activities.

g. When new bridge crossing support structures are proposed in Estuary Natural (EN) zones, evidence shall be provided by the applicant and findings made by the County that the proposed use is consistent with the resource capabilities and purposes of the area.

Response: This standard does not apply to this project because the project is not located in an EN Zone.

h. When land transportation facilities are proposed in Estuary Development (ED) zones, evidence shall be presented by the applicant and findings made by the County that the proposed use will not preclude the provision or maintenance of navigation and other needed public, commercial and industrial water-dependent uses.

Response: This standard does not apply to this project because the project is not located in an ED zone.

i. Dredging, fill, piling/dolphin installation, shoreline stabilization, dredged material disposal or other activities in conjunction with land transportation facilities shall be subject to the respective standards for these activities.

Response: The project has been designed consistent with all applicable land use standards.

Because this project includes stabilizing the shoreline of the Trask River in an estuary zone (EC1), the standards outlined in TCLUO Subsection 3.140(17) will apply. The project has been designed consistent with the applicable standards as follows.

(17) SHORELINE STABILIZATION: Shoreline stabilization projects in estuary zones, Water-Dependent Development (WDD) shoreland zones or other areas within the Shoreland Overlay Zone shall be subject to the following standards:

a. Within estuarine waters, intertidal areas and tidal wetlands, and along Water- Dependent Development Zones and other shoreland areas, general priorities for shoreline stabilization for erosion control are, from highest to lowest:

i. **Proper maintenance of existing riparian vegetation.**

Response: Tree and vegetation removal will be limited to the extent practicable. Other existing vegetation will be preserved.

ii. **Planting of riparian vegetation.**

Response: Six trees will be planted above the riprap to replace upland trees at a 2:1 ratio.

iii. **Vegetated riprap.**

Response: 60 willow stakes will be planted, six feet on center, along the lower portion of the riprap revetment near the HMT line. The newly installed riprap revetments will also be seeded with a riparian seed mix above the HMT line (approximately 7 feet).

iv. **Non-vegetated riprap.**

Response: Non-vegetated riprap will be installed below the HMT line.

v. **Groins, bulkheads or other structural methods. Shoreline protection proposals shall include justification for the use of a lower priority method over a higher priority method.**

Response: The project will not employ groins, bulkheads, or other structural stabilization methods.

b. **Vegetative shoreline stabilization shall utilize native species, or non-native species approved by the Soil Conservation Service. Reference shall be made to the Inter-Agency Seeding Manual prepared by the Soil Conservation Service.**

Response: Native willow species and native seed mix will be used for vegetating the riprap.

c. **When structural shoreline stabilization methods are proposed, evidence shall be presented by the applicant and findings made by the County that:**

i. **Flooding or erosion is threatening an established use on a subject property or a need (i.e. a substantial public benefit) is**

demonstrated in conjunction with navigation or a water dependent use, and

Response: Scour is undermining the southern bridge abutment of the US 101 bridge over the Trask River.

ii. **Land use management practices or nonstructural solutions are inappropriate or will not meet the need, and**

Response: Scour protection (riprap) needs to be installed at southern bridge abutment.

iii. **The proposed structural stabilization method is the minimum size needed to accomplish the desired stabilization, and**

Response: The scour protection repairs have been designed to install the minimum amount of riprap needed to repair the scour.

iv. **The proposed project will not restrict existing public access to publicly- owned lands or interfere with navigation or the normal public use of fishery, recreation or water resources, and**

Response: The project will not obstruct boaters or anglers from passing underneath the US 101 Highway bridge during active construction activities during the IWWP of July 1 – September 15. While a portion of the riverbed will be isolated for construction, the river channel will otherwise be open within the project area.

v. **The proposed project will not adversely impact adjacent aquatic areas or nearby property through increased erosion, sedimentation, shoaling or flooding produced by changes in littoral drift or other changes in water circulation patterns. An affidavit from a professional registered engineer, hydrologist, or geologist may be required by the Planning Department as a result of the impact assessment required in Section 3.120.**

vi. **A brief statement from the local Soil and Water Conservation Service may serve as evidence that standards (c) (2) and (c) (3) have been met.**

Response: The fill for scour repair along the southern bridge abutment will benefit the adjacent landowner by reducing or halting additional erosion to the property. The scour repair project will not impede flow or

floodwaters. Refer to the Hydraulic Report in Attachment 2.

d. **Shoreline stabilization projects shall be timed to minimize impacts on aquatic life.**

Response: The work will occur during the ODFW recommended IWWP of July 1 to September 15 when water levels are lowest.

e. **Proposals for riprap shall include evidence that the rock to be used will be effective, and provide justification for use of a slope steeper than 1 1/2 feet horizontal to one foot vertical.**

Response: The existing riprap abutment protection at the southern bridge abutment will be extended upstream and keyed into bank. Launched riprap protection will be placed at the toe of the slope between elevation -3 feet and -7 feet, and a 2-foot-thick riprap blanket will be extended up the bank at a 1.5H:1V slope to elevation 25 feet.

f. **When bulkheads are proposed, evidence shall be provided by the applicant and findings made by the County that the other forms of structural stabilization are inappropriate or will not meet the need. Bulkheads should be designed to be permeable to ground water and runoff. Fill policies and standards shall apply to bulkhead projects which involve fill within estuarine waters, intertidal areas or tidal wetlands.**

Response: This standard does not apply to this project because there are no bulkheads proposed.

g. **When riprap is proposed in Estuary Natural (EN) zones, a resource capability determination shall be required for purposes other than the protection of unique natural resources, historical and archaeological values, public facilities and uses existing as of October 7, 1977.**

Response: The project area is not located within an EN zone. This standard does not apply to this project.

h. **When structural shoreline stabilization is proposed in Estuary Conservation Aquaculture (ECA), Conservation 1 (EC1) and Estuary Conservation 2 (EC2) zones, evidence shall be presented by the applicant and findings made by the County that the project is consistent with the resource capabilities of the area and the long-**

term use of renewable resources, and does not cause a major alteration of the estuary.

Response: The scour repair on the bridge abutment includes installing riprap to fill in upland areas and existing riprap that were lost to scour. The riprap revetment will also include three pieces of large wood that will enhance aquatic habitat. The project is not anticipated to cause a major alteration of the estuary as the scour repair will have minimal impact to the Trask River channel. Post-project water elevations have been modeled to increase by a maximum of 0.1 feet, while velocities through the bridge will decrease between 0.1 and 0.3 ft/s; these slight changes are not anticipated to cause a major alteration of the estuary.

i. **When structural shoreline stabilization is proposed in Estuary Development (ED) zones, evidence shall be presented by the applicant and findings made by the County that the project is consistent with the maintenance of navigation and other needed public, commercial and industrial water-dependent uses.**

Response: The project area is not located within an ED zone. This standard does not apply to this project.

j. **Structural stabilization along ocean shorelands west of the Beach Zone Line shall be subject to the requirements of the Oregon Department of Transportation ocean shore permit and regulatory program.**

Response: The project is not located west of the Beach Zone Line. This standard does not apply to this project.

k. **An impact assessment shall be conducted during local, state and federal review of permit applications for structural shoreline stabilization seaward of the line of non-aquatic vegetation or the Mean Higher High Water (MHHW) line. The impact assessment shall follow the procedure outlined in Section 3.120. Identified adverse impacts shall be avoided or minimized to be consistent with the resource capabilities and purposes of the area.**

Response: See the Impact Assessment section above.

SECTION 3.510: FLOOD HAZARD OVERLAY ZONE (FH)

The project area is mapped within a Zone AE Special Flood Hazard Area with no floodway mapped in the project area. Because there is no floodway mapped, the project is consistent with TCLUO Subsections 3.510(9)(e)(f). Submittal of a Development Permit application for floodplain development requires consistency with the permit procedure outlined in TCLUO Subsection 3.510(14).

(9) SPECIFIC STANDARDS FOR FLOODWAYS: Located within areas of special flood hazard established in Section 3.510(2) are areas designated as regulatory floodways. Since the floodway is an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles, and erosion potential, the following provisions apply:

(e) Before a Regulatory Floodway is determined in an A1-A30 or AE Zone: In areas where a regulatory floodway has not been designated, no new construction, substantial improvements or other development (including fill) shall occur within an AE Zone designated on the community's Flood Insurance Rate Map, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

(f) As noted in "The Flood Insurance Study for Tillamook County" as revised on September 28, 2018, certain areas of Tillamook County are subject to heavy tidal influence and sheet flows. Floodways are not applicable in this type of flooding. Thus, the following areas are not subject to the requirement of Section (9)(e) above:

(1) Nehalem River downstream of cross-section A

(2) Nestucca River where it joins Nestucca Bay

(3) Tillamook River

(4) Wilson River from cross-sections A to Y

(5) Trask River from cross-sections A to AF

(6) Kilchis River downstream of cross-section C

Response: According to FEMA Firm panel 41057C0578F, effective September 28, 2018, the project is partially located within the Zone AE special flood hazard area. Through coordination with Tillamook County Land Use Planning Department and the National Flood Insurance Program (NFIP) Coordinator of the Oregon Department of Land Conservation and Development, it was determined that this project is not subject to the requirements of Section 9e above because the bridge is located in an area not subject to the requirements listed in 9(f)(5). A no rise/floodway analysis will not be required as the project area is tidally influenced.

(14) DEVELOPMENT PERMIT PROCEDURES: A development permit shall be obtained before construction or development begins within any area of special flood hazard zone. The permit shall be for all structures including manufactured dwellings, and for all development including fill and other development activities, as set forth in the Definitions contained in this Section of the Land Use Ordinance.

(b) Development Permit Review Criteria

(1) The fill is not within a Coastal High Hazard Area.

Response: The project is not located within a Coastal High Hazard Area.

(2) Fill placed within the Regulatory Floodway shall not result in any increase in flood levels during the occurrence of the base flood discharge.

Response: The project is not located within a regulated floodway and therefore floodway analysis is not applicable; thus, this criterion does not apply.

(3) The fill is necessary for an approved use on the property.

Response: The fill is necessary to provide scour protection for the southern bridge abutment to preserve the structural integrity of the bridge. The project will submit a Joint Permit Application to USACE and DSL for approval.

(4) The fill is the minimum amount necessary to achieve the

approved use.

Response: The scour repair has been designed with the minimum amount of riprap necessary to protect the structure.

(5) No feasible alternative upland locations exist on the property.

Response: The scour repair that is required is below the ordinary high water of the Trask River, so no feasible upland alternative exists for this project.

(6) The fill does not impede or alter drainage or the flow of floodwaters.

Response: The proposed fill will not impede or alter drainage of flow of floodwaters. See Hydraulic Report in Attachment 2.

(7) If the proposal is for a new critical facility, no feasible alternative site is available.

Response: This project is not for a new critical facility; thus, this criterion does not apply.

(8) For creation of new, and modification of, Flood Refuge Platforms, the following apply, in addition to (14)(a)(1-4) and (b)(1-5):

- **(a) The fill is not within a floodway, wetland, riparian area or other sensitive area regulated by the Tillamook County Land Use Ordinance.**
- **(b) The property is actively used for livestock and/or farm purposes,**
- **(c) Maximum platform size = 10 sq ft of platform surface per acre of pasture in use, or 30 sq ft per animal, with a 10-ft wide buffer around the outside of the platform,**
- **(d) Platform surface shall be at least 1 ft above base flood elevation,**

(e) **Slope of fill shall be no steeper than 1.5 horizontal to 1 vertical,**

(f) **Slope shall be constructed and/or fenced in a manner so as to prevent and avoid erosion.**

Response: This project is not for the creation of a new or modification of a Flood Refuge Platform; thus, this criterion does not apply.

3.0 CONCLUSIONS

The proposed scour repair activities proposed by the applicant at the US 101 Bridge over Trask River meet all relevant standards and criteria outlined for FH zones and EC1 zones in Tillamook County per the TCLUO. The information provided in this application narrative, along with the appendices, is complete and accurate in documenting the project's compliance with all applicable provisions of the current TCLUO.

Attachment 1 – Hydraulic Report

US101: TRASK RIVER SCOUR REPAIR

Draft Hydraulic Report

K20448

Prepared for:

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April 2025

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DISCLOSURES

Prepared by	Reviewed by
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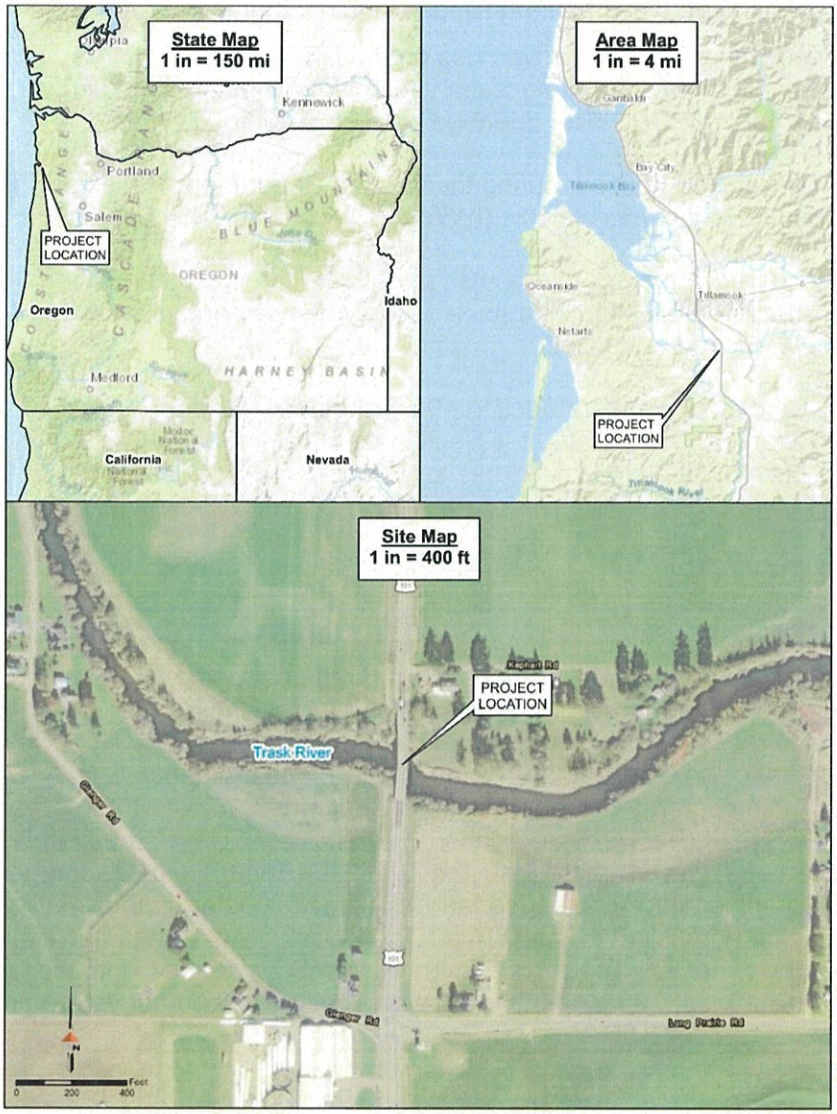
EXHIBITS

APPENDICES

1.0 INTRODUCTION

This report summarizes the hydraulic analysis for the scour repairs proposed for the US Highway 101 bridge over Trask River (No. 07147), just south of the City of Tillamook, in Oregon. A location map showing the project location is provided in this report as Figure 1. A scour repair and mitigation plan has been developed for this bridge, which includes the installation of riprap protection at the southern abutment (Bent 1). The bridge structure will remain in place and will not be modified otherwise. The ordinary high water (OHW) elevation is 17.0 ft. All proposed and surveyed elevations are in feet and referenced to the North American Vertical Datum of 1988 (NAVD88) unless noted otherwise.

Figure 1: Project Location



DOWL

This report presents the results of a scour analysis conducted for the US 101 crossing at Trask River, and summarizes the results of a hydraulic analysis conducted to determine the water surface elevations resulting from the construction of the proposed scour repair, as well as the existing water surface elevation.

2.0 REGULATORY STANDARDS

The US 101 crossing over Trask River is within the limits of the Federal Emergency Management Agency (FEMA) floodplain. The crossing is located within a Zone AE floodplain where a floodway is not designated on the Flood Insurance Rate Map (FIRM). The FIRM for the US 101 crossing at Trask River has an effective date of September 28, 2018. The panel number for the site is 410196-0587. A copy of the FIRM is attached to this report as Exhibit 1.

Tillamook County Land Use Ordinance (LUO) Section 3.510(14)(b) applies to the project, which for the purpose of this hydraulic report, principally requires that:

(3) the fill is necessary for an approved use on the property
(4) the fill is the minimum amount necessary to achieve the approved use
(6) the fill does not impede or alter drainage or the flow of floodwaters.

All in-water work is required to occur during the Oregon Department of Fish and Wildlife (ODFW) prescribed in-water work window (IWWW), which is July 1 – September 15.

Additional applicable regulatory requirements / permits for the project are listed below. The listed regulations require evaluation of impacts to the waterway and prescribe conditions for mitigation of vegetation and/or habitat.

- US Army Corps of Engineers Section 404 Dredge/Fill Permit
- Oregon Department of State Lands Section 401 Water Quality Certification
- Standard Local Operating Procedures for Endangered Species Biological Opinion (SLOPES V)

3.0 HYDROLOGY

Trask River flows east to west, from the Coast Range mountains east of the City of Tillamook, to Tillamook Bay and the Pacific Ocean. The drainage area upstream of the project is 164 square miles. The majority of the drainage area upstream of the crossing is composed of mountainous areas and agricultural areas immediately surrounding the site. Peak flows for Trask River at the US 101 bridge crossing were collected from the FEMA Flood Insurance Study, for Tillamook County, Oregon and Incorporated Areas, Effective September 28, 2018 (FIS); and the U.S. Geological Survey StreamStats web application (StreamStats). Discharges for the 10, 50, 100, and 500-year storm events were taken from the Table 10 (Summary of Discharges) of the FIS, specifically at the confluence of Trask River and Mill Creek, located approximately 1.1 miles upstream of the US101 crossing at Trask River. The 2-year event discharge was obtained from StreamStats. A copy of the FIS Table 10, and the StreamStats report is included in Appendix 1. Peak flows for the 2, 10, 50, 100, and 500-year storms as described above are provided in Table 1.

Table 1: Trask River Flow Rates by Recurrence Interval

Storm Event	Flow Rate (cfs)
2-yr.	12,500
10-yr.	21,800
50-yr.	29,400
100-yr.	32,200
500-yr.	39,000

4.0 HYDRAULIC ANALYSIS

A two-dimensional (2D) hydraulic analysis was completed for the project using SMS Version 13.0.14. The complexity of the floodplain in the vicinity of the bridge and the presence of an abrupt flow direction change immediately upstream of the bridge warranted a more elaborate analysis than the more common one-dimensional analysis used for bridge hydraulics.

The hydraulic analysis is composed of two scenarios: Existing Conditions and Proposed Conditions. The proposed model layout is identical to the Existing Conditions model, except the existing channel geometry is replaced with the proposed channel geometry that includes the scour repair. The following sections provide details of the conditions within the modeled extent and the results from the scenarios analyzed.

4.1 Channel Geometry and Roughness

The 2D model extent was established by evaluating confining topographical features and existing FIS floodplain mapping for the area. The model domain extends well beyond the immediate vicinity of the bridge to avoid significant influence from the established boundary conditions discussed in Section 4.2. An overview of the hydraulic model layout is provided in Exhibit 2, and a detail of the model layout at the bridge crossing is provided in Exhibit 3.

The digital terrain model (DTM) for the Existing Condition hydraulic analysis was developed using hydraulic survey data collected by DOWL on April 1 and April 7 of 2020, supplemented by digital elevation model (DEM) information collected from Oregon Department of Geology and Mineral Industries (DOGAMI).

Channel and floodplain roughness information were developed using hydraulic site investigation data collected on April 29, 2020, environmental site investigation data collected on March 25 of 2020 and July 8 of 2021, the 2016 National Land Cover Dataset (NLCD), and ERSI aerial imagery. During the site investigation a channel with a gravelly bottom was identified in the vicinity of the US 101 crossing. The southern bank is heavily vegetated with trees and brush upstream and downstream of the crossing. Existing riprap armoring is present on the southern bridge abutment. The northern bank is also heavily vegetated with trees and brush downstream of the bridge, with grass and brush underneath and upstream of the bridge. Photographs of the existing bridge and channel are provided in Appendix 2. The areas beyond the river banks are primarily agricultural land, with pockets of developed areas, buildings, woody areas, and roads. Manning's roughness values were assigned to different land use types in the model as shown in Exhibit 4. A depth-varying roughness approach was used for all land types (except for buildings), using roughness values shown in Table 2. Roughness values were interpolated linearly for depths between 0.0 ft and 0.5 ft using the values provided in Table 2; constant values were used for depths equal to or greater than 0.5 ft.

Table 2: Depth-varying Manning's Roughness Values

Land Use Type	0.0' >= Depth< 0.5'	Depth >= 0.5'
Channel	0.040 to 0.020	0.020
Crops	0.070 to 0.035	0.035
Developed Area	0.100 to 0.050	0.050
Woody Area	0.120 to 0.080	0.080
Road	0.040 to 0.020	0.020
Buildings	0.100 to 0.100	0.100

4.2 Model Boundary Conditions

The US 101 Trask River Bridge is located at the head of tide in a relatively flat area as the Coastal Range transitions to the estuarine setting of Tillamook Bay. The topography and hydrologic complexity of the site necessitated the use multiple boundary conditions to accurately simulate flow through the system and remain consistent with previous FIS studies of the area.

Flow was inserted into the system along a single boundary approximately 1.15 river miles upstream of the US 101 bridge. The flows from Table 1 were used for the various events considered for both the existing and proposed scenarios.

A total of five downstream boundary conditions were used to allow water to leave the model through the various overflow paths created by the flat topography. Exhibit 2 provides a schematic of the boundary condition locations and the elevations associated with each event.

A single internal boundary condition was established in the model to consider the possibility for pressure flow conditions at the bridge.

4.3 Existing Conditions

The existing 336-foot long, 39-foot wide, 11-span bridge was built in 1949. The existing bridge deck is composed of concrete with an asphalt concrete pavement (ACP) wearing surface and supported on concrete pilings with concrete pile caps. The lowest soffit elevation identified during the site survey was 29.4 ft. Riprap slope protection was installed sometime after 1972 based on a review of as-built drawings. Evaluation of historical aerial imagery indicated that the channel has been gradually migrating to the south just upstream of the US 101 crossing. Substantial erosion was observed at the southern embankment upstream of the crossing during the hydraulic site investigation. A large scour hole was also observed on the south side of Bent 5, with a large depositional mound located between Bents 5 and 6.

Analysis of the existing bridge shows that the bridge does not undergo pressure flow during any of the storm events considered. The hydraulic data table for the existing bridge is presented in Table 7. The results from the hydraulic analysis of the existing bridge are summarized in Table 3. Exhibit 5 shows the extent of the flooding during the 100-year event. Additional results from the Existing Condition are provided in Appendix 4.

Table 3: Existing Condition Hydraulic Results

Event	Max. Upstream Water Surface Elevation (ft, NAVD88)[1]	Minimum Clearance (ft)	Max. Velocity through Bridge (ft/s)
2-Year Storm	26.5	2.9	6.0
10-Year Storm	26.5	2.9	5.6
50-Year Storm	26.7	2.7	5.8
100-Year Storm	26.8	2.6	6.1
500-Year Storm	26.9	2.5	6.2

[1] Observed within the main channel immediately upstream of the bridge

The model results show a modest increase in water surface elevation for events that exceed the 2-year flow rate. Discharges for all simulations exceeded the bankfull capacity of the channel, flow through overland paths are conveyed away from Trask River channel, and generally do not return to the modeled extent. A summary of the flow rates in the channel, and flow rates leaving the channel to left and right overbanks is provided in Exhibit 2.

Flow vector results in the immediate vicinity of the bridge are reflective of conditions that would cause the observed bridge scour. Figure 2 shows eddy current and flow directions that attack the channel bank. These conditions can be expected to result in erosion of banks that are not protected by dense / woody vegetation and/or riprap.

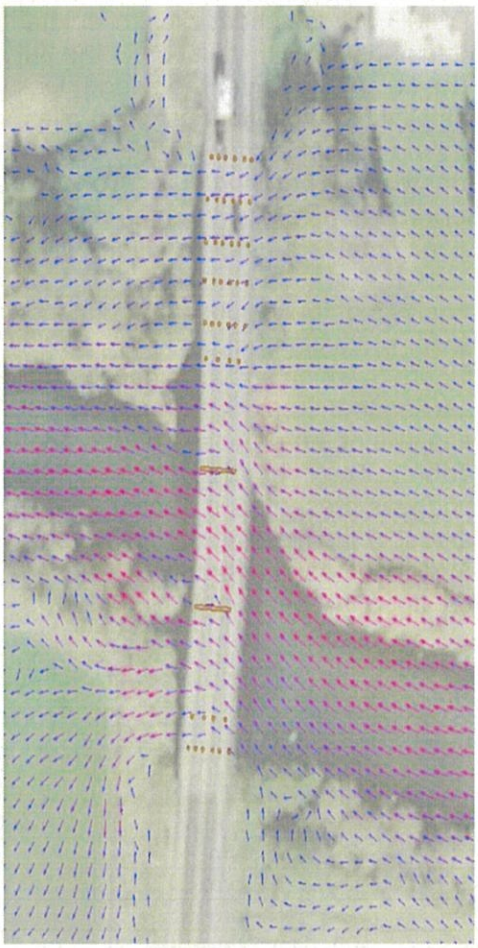


Figure 2: Existing Condition Flow Vectors at Bridge

4.4 Proposed Conditions

Drawings for the proposed scour repair are provided in Appendix 3. The existing riprap abutment protection at the southern bridge abutment will be extended upstream and keyed into the bank. A riprap toe will be placed at the toe of the slope, with a 2-foot-thick riprap blanket extending up the bank at a 1.5H:1V slope to the top of the slope. Large woody material will be installed just above the toe to help redirect the flow toward the center bridge span, as well as to provide in-channel habitat. Willow stakes will be installed at the bottom of the slope to further increase the scour resistance and roughness of the bank. The length of the outside bank of the meander upstream of the bridge precludes the ability to extend the protection to a location that should remain stable for the anticipated life of the existing bridge. A secondary riprap protection of the abutment is incorporated into the design behind the riprap toe and slope protection. A launching riprap trench is proposed to run parallel and immediately adjacent to the road embankment. Should the primary riprap protection fail, the launching riprap would delay or potentially arrest further erosion and damage to the abutment.

All new riprap will be Class 200; riprap geotextile will be provided under all newly installed riprap. No changes to the existing bridge structure are proposed.

Temporary water management will be required during construction. Temporary water management will be the responsibility of the Contractor, but a Temporary Water Management Plan (TWMP) must be approved by ODOT prior to Construction. A proposed TWMP has been developed and includes partial isolation of the waterway for work at the south abutment. The proposed TWMP will use sheet piles to isolate the work area for dewatering and installation of the below water riprap. The clearance under the bridge deck will inhibit the installation of continuous sheet piles, necessitating driving the sheets in ~10-foot segments that are welded together. Dewatering of the work area may be required for proper installation of the riprap, geotextile, large woody material, and plantings.

Analysis of the proposed bridge shows that proposed scour protection helps to realign flows, as shown in Figure 3, which should reduce the erosive forces applied to the banks. The results from the hydraulic analysis of the proposed bridge are summarized in Table 4.The hydraulic data table for the proposed bridge is presented in Table 8. Exhibit 6 shows the extent of the flooding during the 100-year event. Additional results from the Proposed Condition are provided in Appendix 5.

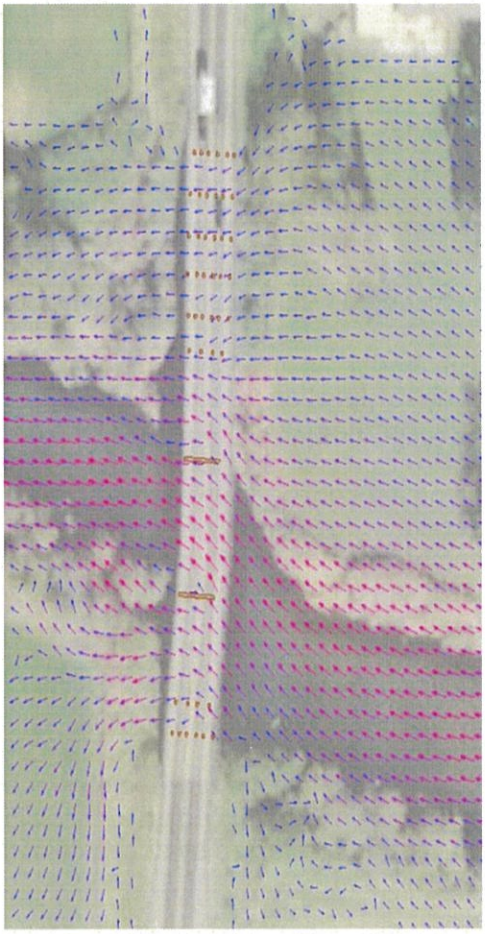


Figure 3: Proposed Condition Flow Vectors at Bridge

Table 4: Proposed Condition Hydraulic Results

Event	Max. Upstream Water Surface Elevation (ft, NAVD88)[1]	Minimum Clearance (ft)	Max. Velocity through Bridge (ft/s)
2-Year Storm	26.6	2.8	5.8
10-Year Storm	26.5	2.9	5.5
50-Year Storm	26.7	2.7	5.8
100-Year Storm	26.8	2.6	5.8
500-Year Storm	26.9	2.5	6.1

[1] Observed within the main channel immediately upstream of the bridge

5.0 ICE AND DEBRIS

Woody debris ranging from branches to whole trees were observed along the banks of the Trask River both upstream and downstream of the existing bridge during the site investigation. Submerged logs were observed in the channel and around Bent 5. The bridge crossing does not provide 3.0 feet of clearance for the debris influenced bridge, as recommended by the ODOT Hydraulics Manual. However, the proposed improvements maintain existing flooding

elevations and the resulting clearance. While the clearance does not meet the recommended clearance, it is only slightly (~0.5 feet) deficient. The ability to provide the recommended clearance should be re-evaluated when the bridge is replaced in the future.

According to the Nation Oceanic and Atmospheric Administration's (NOAA) Nation Centers for Environmental Information (NCIE), the average minimum December temperature in Tillamook, Oregon is 34.5 degrees Fahrenheit. Therefore, it is concluded that ice is not a major concern at this location.

6.0 SCOUR ANALYSIS

A scour analysis was performed for the proposed bridge following procedures presented in the Federal Highway Administration (FHWA) publication Hydraulic Engineering Circular (HEC) 18, *Evaluating Scour at Bridges 5th Edition,* published April 2012. The bridge consists of 2 bents in the main channel, 8 bents in the overbanks as well as abutments at the ends of the bridge. The scour analysis was performed for the 100-year (design) and 500-year (check flood) storms. The median diameter (D_{50}) of the streambed material was determined to be 10.0 mm by samples collected during the site investigation. Southward lateral migration of the channel has been an on-going issue at the crossing, as discussed in Section 4.3. No signs of long-term degradation of the channel bed were noted during the site investigation.

Contraction and pier scour calculations were performed. The maximum channel velocity very nearly exceeds the streambed material critical velocity, as a result, the more conservative result between clear-water and live-bed contraction was used. No contraction scour is calculated for the 100-year event. The calculated contraction scour depth is 2.52 ft for the 500-year storm.

Pier scour is calculated for each bent and summarized in Table 5. All piers are assumed to be 2 feet wide. Pier scour analyses and conditions are grouped into three areas, the south abutment, channel bents, and the north overbank and abutment. Bents 1-3 are located on the south bank of the river and are protected by existing and proposed riprap revetment. Scour calculations for these three bents assume the abutment riprap protects the bents from flows within the channel. Scour is considered local scour only for these bents.

Scour analysis for the Bent 4 and Bent 5, the two bents in the river, indicates that scour is a concern. Bent 4 is protected by the south bank abutment riprap, limiting the expected contraction and pier scour.

Bent 5 does not have any existing scour protection. Scour calculations for Bent 5 using the general scour equation presented in HEC-18 indicate 16.56 feet of scour under a 100-year event and 17.44 feet of scour under a 500-year event. These depths are expected to be conservative. Data from FHWA's *Updating HEC-18 Pier Scour Equations for Noncohesive Soils* shows that the general pier scour equation overpredicts scour for piers by a magnitude of 2 or greater about 2/3 of the time and the measured scour was equal to or less than the width of the pier approximately 80% of the time with greater than 50% of the time the scour depth is under 2/3 of the pier width.

Review of historic aerial photos from 1953 through 2024 shows that the Trask River channel hasn't experienced any large planform changes. There have been some localized scour conditions and small shifts in channel alignment. Review of the aerial photos shows that the angle at which the flow approaches Bents 4 and 5 has remained relatively constant throughout

the bridge's life. The bridge has also experienced flood events in 1964, 1972, 1996, 1998, 2006, 2007 and 2015 without failure at the bents.

Based on the conservative nature of the general scour equation, the stable history of the bridge during the previous flood events, we would estimate the pier scour component of the total scour for Bents 4 and 5 to be 8.5 feet. This puts the total scour depth at Bent 5 at 11.02 feet.

The north overbank piers are pile-supported and not expected to be subject to channel migration over the engineering life of the bridge structure. No local scour protection is present for these bents. Flows and velocities in the overbank provide minimal scour impacts to these bents.

Table 5 shows a summary of the channel, water surface, and structure elevations at each bent and the calculated scour depth results. The complete table with the 100-year scour calculation summary is included in Appendix 5.

Table 5. 500-year Scour Summary and Elevations (NAVD88)

Bent[1]	Existing Ground Elev.[2]	Pile Tip Elev.[1]	Flow Depth at Pier[3]	Contraction Scour[4]	Pier Scour	Total Calculated Scour Depth	Total Calculated Scour Elev.	Embedment[5]
#	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
1	34.50	-9.97	0	2.52	4.8	7.32	27.18	37.15
2	26.02	-8.27	1.22	2.52	5.48	8.00	18.02	26.29
3	23.96	-12.67	2.50	2.52	5.78	8.30	15.66	28.33
4	2.16	-30.47	28.76	2.52	8.50	11.02	-8.86	21.61
5	4.39	-30.77	28.76	2.52	8.50	11.02	-6.63	24.14
6	15.93	-22.67	12.40	2.52	2.53	5.05	10.88	33.55
7	22.16	-6.57	4.82	2.52	3.48	6.00	16.16	22.73
8	21.89	-6.77	4.84	2.52	3.69	6.21	15.68	22.45
9	20.52	-9.67	5.93	2.52	4.17	6.69	13.83	23.50
10	21.38	-8.27	5.36	2.52	4.55	7.07	14.31	22.58
11	25.10	-6.67	2.20	2.52	4.15	6.67	18.43	25.10
12	33.01	-5.97	0	2.52	4.8	7.32	25.69	31.66

[1] Bent numbering and Pile Tip elevations taken from As-constructed plan dated 12-19-1972 and converted to NAVD88
[2] Existing ground elevation taken from survey and averaged from ground shots at both sides of the upstream pier face, except Bent 5 which was taken from channel shot just upstream of pier
[3] Flow Depth at Pier is taken just upstream of each pier
[4] Contraction Scour calculated across the opening per scour calculations
[5] Total Calculated Scour Elevation minus the Pile Tip Elevation. Negative numbers are fully undermined

Figure 4 shows a graphical representation of the total scour depth across the section.

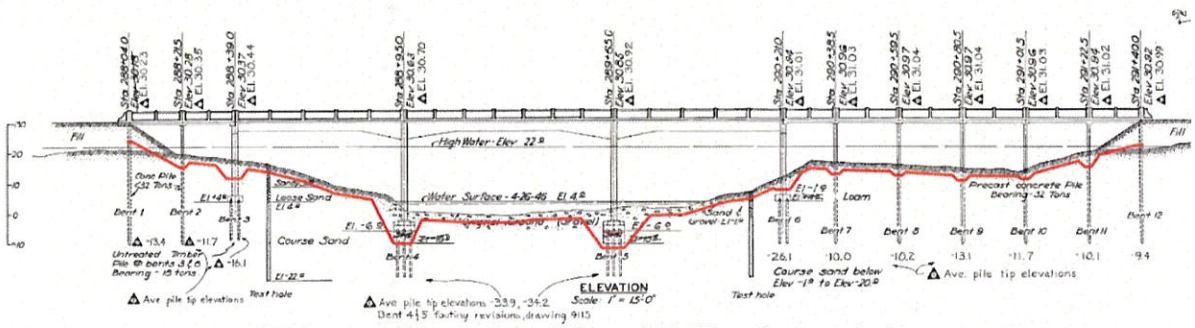


Figure 4. Maximum (500-year) Scour Condition at Bridge Supports in Existing Condition (Datum - NGVD29)

Countermeasures and mitigation measures for the bridge are recommended per Hydraulic Engineering Circular No. 23 *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance – Third Edition*, published September 2009.

The minimum scour elevation for the south bank revetment protecting Bents 1 – 3 was determined by assuming that the thalweg of the stream was adjacent to the bank and subtracting the anticipated contraction scour during the check flood. The proposed south bank revetment is constructed with ODOT Class 200 riprap underlain by Type 2 riprap geotextile as a filter.

Table 6: Scour Protection vs. Anticipated Minimum Scour Elevations

Location	Minimum Scour Elevation	Minimum Scour Protection Elevation	
		Installed[1]	Launched[2]
South Abutment (Bent 1) (Primary protection)	-4.69	-7.2	-9.2
South Abutment (Bent 1) (Secondary protection)	-4.69	15	-4.70

[1] Scour protection provided by riprap section as shown on the drawings.
[2] Scour protection provided by riprap section in the launched condition (See Fig. 15-5 in ODOT Hydraulics Manual)

The secondary riprap protection adjacent to Bent 1 is intended to arrest rapid scour prior to loss of the roadway embankment and subsequent flanking of Bent 1. This countermeasure also constructed of ODOT Class 200 loose riprap underlain by Type 2 riprap geotextile. The secondary countermeasure is not intended to provide standalone protection from the abutment scour that could begin to form if the primary scour protection becomes compromised by lateral stream migration.

The proposed riprap protection extends below the minimum scour elevation due to the minimum thickness of the riprap toe and the need to install the riprap at or below the existing channel bed. Having an additional factor of safety against scour is also a benefit for this particular crossing given the orientation of the channel to the main bridge opening.

Bent 4 is protected by the existing riprap beneath the bridge. No additional countermeasure is proposed as a part of this project.

Bents 5 through 11 are recommended to have monitoring for each of the bents as the selected countermeasure from HEC-23. Bent 5 by virtue of being in the channel and unprotected, is the most susceptible to scour. With the total scour being estimated at 2.06 feet below the bottom of the seal, fixed instrumentation is the recommended countermeasure for Bent 5. As noted in HEC-23, monitoring doesn't fix the scour problem at a scour critical bridge but it allows for action to be taken before the safety of the public is threatened.

Bents 6 – 11 are recommended to have visual monitoring as the expected scour depths are less and they become progressively farther removed from the channel.

Since monitoring is recommended as the countermeasure for Bents 5 through 11, the stability of each bent was reviewed. The seal for Bent 5 would be undermined in the 100-year and 500-year events. If the scour progressed significantly below the bottom of the seal, it could allow the pier to collect debris below the seal and potentially damage the pier. This potential for damage increases the need for fixed instrumentation to inform ODOT when scour or thalweg movement endangers the pier.

Bents 6 through 11 receive minimal scour depths and don't impact the stability of the bent. If the channel were to start to migrate, then additional measures would need to be take to address the stability of Bents 6 through 11.

Another consideration in the approach to the selection of the countermeasures for Bents 5 through 11 is the age of the structure. The bridge is 77 years old and nearing the end of its service life. Continued visual monitoring and fixed instrumentation will allow ODOT to respond to protect the travelling public if necessary until the bridge is able to be replaced in the upcoming years.

The bridge has an existing scour plan of action, it is recommended that it be updated to match the above recommendations.

7.0 CONCLUSION

The US Highway 101 Bridge over Trask River includes the installation of riprap protection at the southern abutment. Scour and riprap sizing calculations were completed. The proposed riprap protection is expected to prevent damage to the bridge resulting from scour. All in-water work is anticipated to be constructable within the specified IWWW.

The fill and revetment added to the bridge meet Tillamook Land Use Ordinance. The amount of fill is the minimum required to reestablish and protect the eroded channel bank. The distribution of flow in the channel and overbank areas is maintained.

The crossing does not meet the recommended 3 feet of clearance for a debris influenced bridge; however, the minor clearance deficiency is not worsened by the project. The ability to provide the recommended clearance should be re-evaluated when the bridge is replaced in the future. Ice is not anticipated to be an issue at the crossing.

8.0 HYDRAULIC DATA TABLES

Table 7: Hydraulic Data Table – Existing Conditions

PROJECT: US 101, Trask River
Bridge #07147
Tillamook County, Oregon

COMPILED BY: Jeff Tolentino

DATE: December 2021

	HYDRAULIC DATA		
EXISTING BRIDGE	**BASE FLOOD**	**DESIGN FLOOD**	**CHECK FLOOD**
Discharge (cubic feet/second)	32,200	32,200	39,000
Recurrence Interval (years)	100	100	500
Approach Section H.W. Elevation w/Bridge[1] (feet)	27.08	27.08	27.21
H.W. Elevations at Upstream Face of Bridge (feet)	26.78	26.78	26.90
H.W. Elevations at Downstream Face of Bridge (feet)	26.68	26.68	26.79
Average Velocity at Downstream Face of Bridge (feet per second)	2.71	2.71	2.84

1. Approach section is approximately 555 ft upstream from upstream face of bridge.

Remarks:
Structure Type: Concrete/Pile/Pile Cap Bridge
Length: 336 feet
Width: 39 feet
The Ordinary High Water elevation was observed at 17.0 (ft, NAVD88) while collecting field survey data by DOWL on the dates March 25, 2020 and July 8, 2021.

Table 8: Hydraulic Data Table – Proposed Condtions

PROJECT: US 101, Trask River
Bridge #07147
Tillamook County, Oregon

COMPILED BY: Jeff Tolentino

DATE: December 2021

	HYDRAULIC DATA		
EXISTING BRIDGE	**BASE FLOOD**	**DESIGN FLOOD**	**CHECK FLOOD**
Discharge (cubic feet/second)	32,200	32,200	39,000
Recurrence Interval (years)	100	100	500
Approach Section H.W. Elevation w/Bridge[1] (feet)	27.10	27.10	27.23
H.W. Elevations at Upstream Face of Bridge (feet)	26.81	26.81	26.97
H.W. Elevations at Downstream Face of Bridge (feet)	26.72	26.72	26.83
Average Velocity at Downstream Face of Bridge (feet per second)	2.73	2.73	2.86

2. Approach section is approximately 555 ft upstream from upstream face of bridge.

Remarks:
Structure Type: Concrete/Pile/Pile Cap Bridge
Length: 336 feet
Width: 39 feet
The Ordinary High Water elevation was observed at 17.0 (ft, NAVD88) while collecting field survey data by DOWL on the dates March 25, 2020 and July 8, 2021.

EXHIBITS

123°50'37.98"W 45°26'21.61"N

123°48'44.62"W 45°24'15.93"N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) Zone A, V, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee See Notes Zone X
- Area with Flood Risk due to Levee Zone D

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to 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.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **8/10/2021 2:11 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88

For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

1 inch = 500 feet 1:6,000

0 250 500 1,000 1,500 2,000 Feet

N

0 50 100 200 300 400 Meters

FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

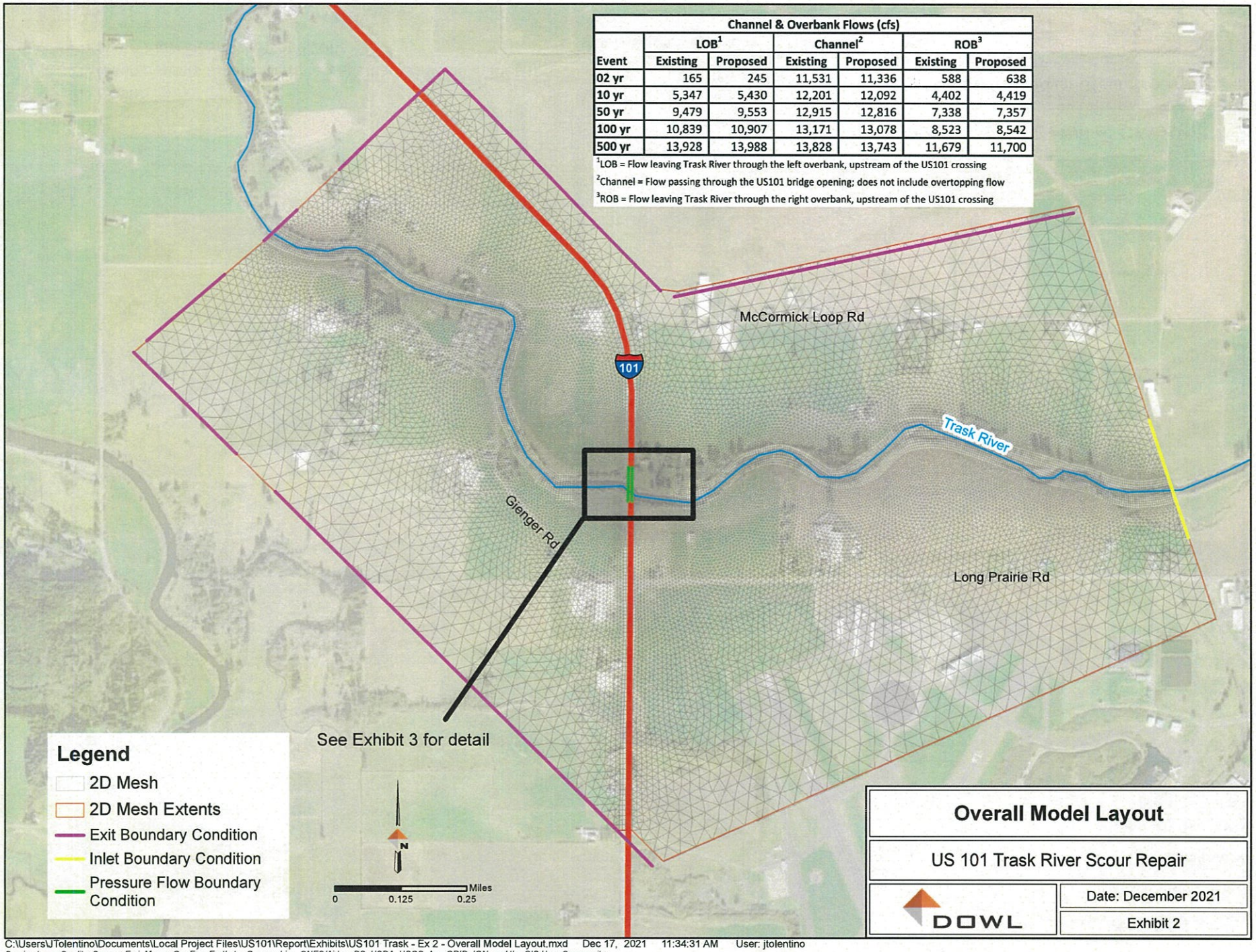
TILLAMOOK COUNTY, OREGON AND INCORPORATED AREAS
PANEL 587 OF 1025

Panel Contains:

COMMUNITY	NUMBER	PANEL
TILLAMOOK COUNTY	410196	0587

MAP NUMBER
41057C0587F
EFFECTIVE DATE
September 28, 2018

Exhibit 1: Flood Insurance Rate Map



C:\Users\JTolentino\Documents\Local Project Files\US101\Report\Exhibits\US101 Trask - Ex 2 - Overall Model Layout.mxd Dec 17, 2021 11:34:31 AM User: jtolentino

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Model Layout Detail at Crossing

US 101 Trask River Scour Repair

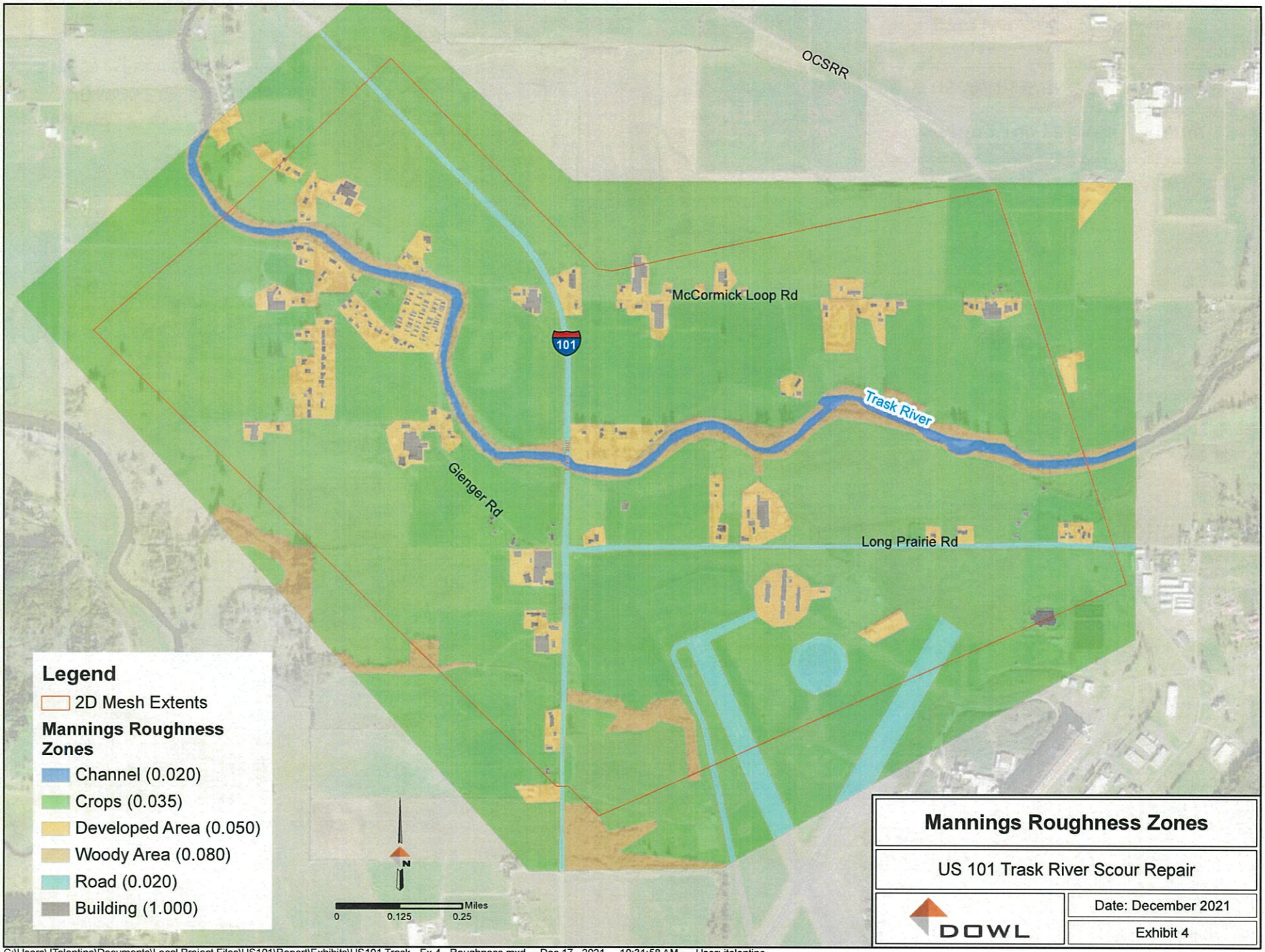
DOWL

Date: December 2021

Exhibit 3

C:\Users\JTolentino\Documents\Local Project Files\US101\Report\Exhibits\US101 Trask - Ex 3 - Layout Detail.mxd Dec 20, 2021 9:23:10 AM User: jtolentino

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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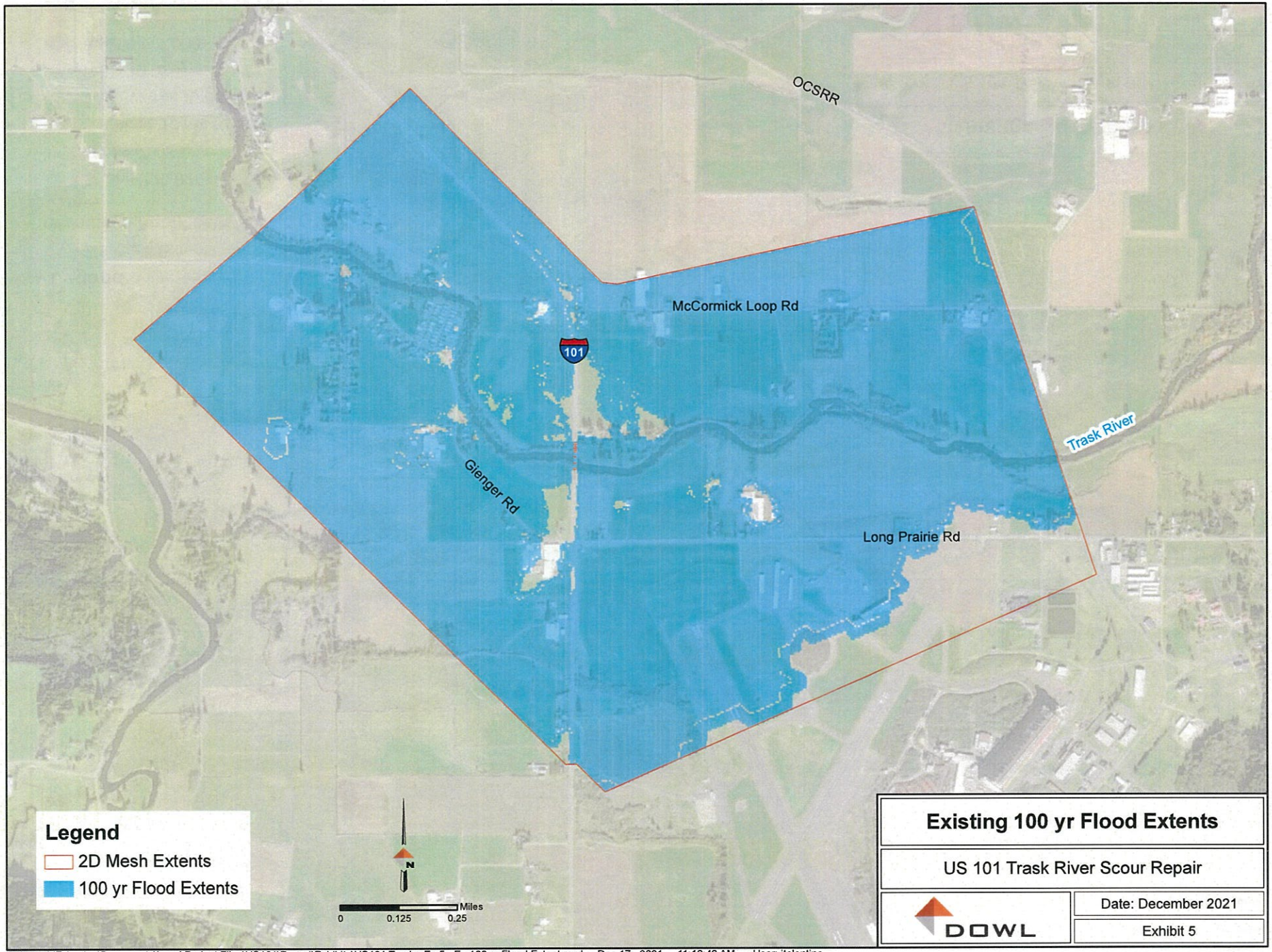
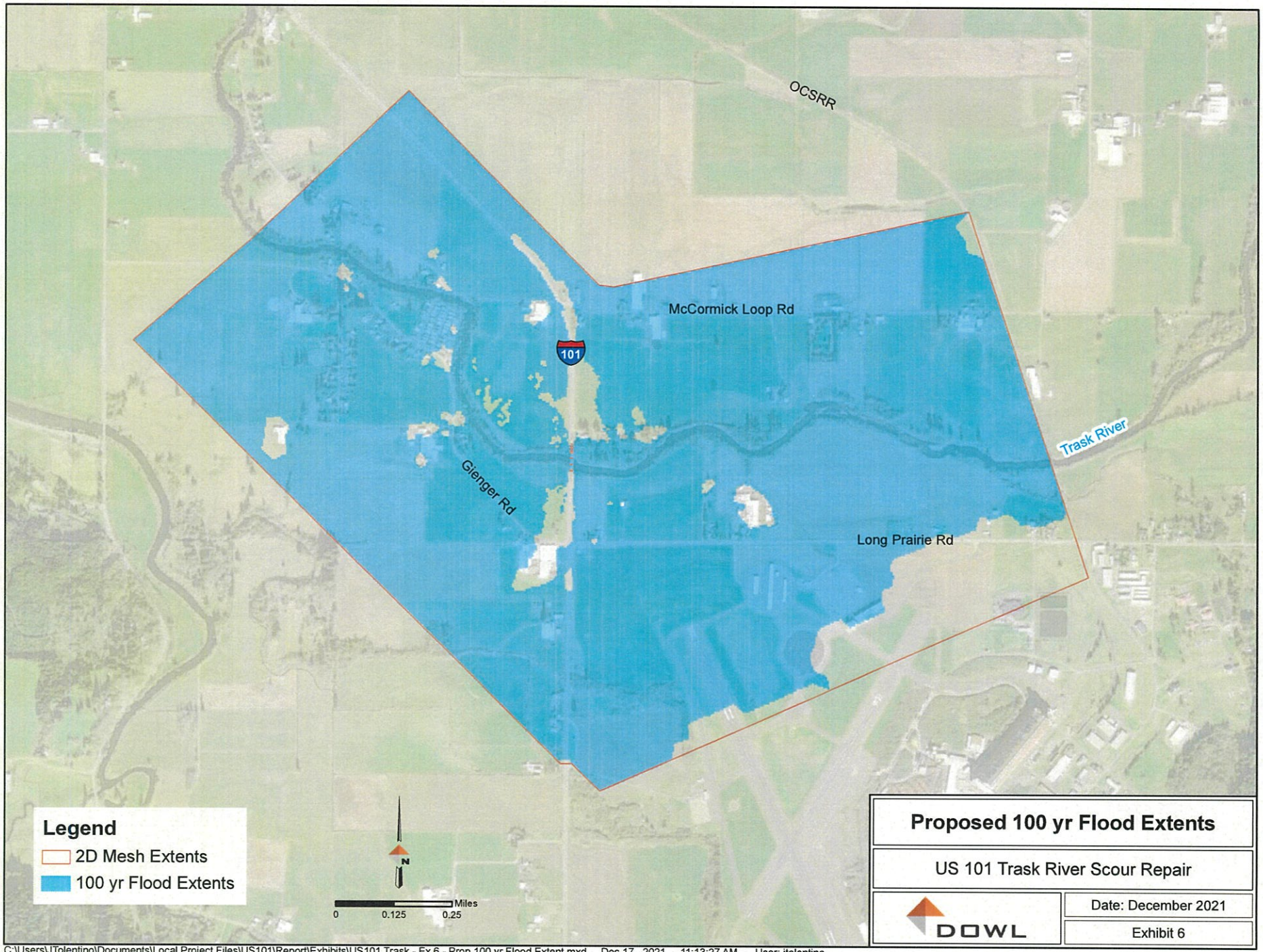
Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



C:\Users\JTolentino\Documents\Local Project Files\US101\Report\Exhibits\US101 Trask - Ex 5 - Ex 100 yr Flood Extent.mxd Dec 17, 2021 11:12:43 AM User: jtolentino

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



C:\Users\JTolentino\Documents\Local Project Files\US101\Report\Exhibits\US101 Trask - Ex 6 - Prop 100 yr Flood Extent.mxd Dec 17, 2021 11:13:27 AM User: jtolentino

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

APPENDIX 1: PEAK DISCHARGES

SECTION 5.0 – ENGINEERING METHODS

For the flooding sources in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded at least once on the average during any 10-, 25-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 25-, 50-, 100-, and 500-year floods, have a 10-, 4-, 2-, 1-, and 0.2% annual chance, respectively, of being equaled or exceeded during any year.

Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedance) during the term of a 30-year mortgage is approximately 26 percent (about 3 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

The engineering analyses described here incorporate the results of previously issued Letters of Map Change (LOMCs) listed in Table 27, "Incorporated Letters of Map Change", which include Letters of Map Revision (LOMRs). For more information about LOMRs, refer to Section 6.5, "FIRM Revisions."

5.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for each flooding source studied. Hydrologic analyses are typically performed at the watershed level. Depending on factors such as watershed size and shape, land use and urbanization, and natural or man-made storage, various models or methodologies may be applied. A summary of the hydrologic methods applied to develop the discharges used in the hydraulic analyses for each stream is provided in Table 13. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation. A summary of the discharges is provided in Table 10. Frequency Discharge-Drainage Area Curves used to develop the hydrologic models may also be shown in Figure 7 for selected flooding sources. A summary of stillwater elevations developed for non-coastal flooding sources is provided in Table 11. (Coastal stillwater elevations are discussed in Section 5.3 and shown in Table 17.) Stream gage information is provided in Table 12.

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Nehalem River	At mouth	847.0	57,300	*	66,200	74,000	*	87,400
	Confluence with North Fork Nehalem River	746.0	37,950	*	48,050	52,900	*	63,350
	Necanicum Hwy	743.2	39,250	*	49,700	54,700	*	62,650
	Gage No. 3010, near Foss	667.0	39,500	*	50,100	55,800	*	66,000
North Fork Nehalem River	At mouth	96.0	6,600	*	13,100	14,800	*	18,500
	County Road Bridge at Aldervale	75.1	8,780	*	12,400	14,100	*	17,900
	Confluence with Grassy Lake Creek	62.0	7,970	*	11,700	13,400	*	17,300
Miami River	Mouth at Miami Cove	36.4	6,880	*	10,000	11,460	*	15,220
	Downstream of Moss Creek	33.1	6,360	*	9,250	10,610	*	14,100
	At Longview Fibre Road	22.5	4,440	*	6,480	7,450	*	9,930
	Above Peterson Creek	19.1	3,810	*	5,570	6,410	*	8,500
Kilchis River	Mouth at Tillamook Bay	67.3	11,180	*	15,190	16,795	*	20,770

Table 10: Summary of Discharges (Continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
	Confluence with Mapes Creek	60.6	10,240	*	13,895	15,360	*	18,965
Trask River	Confluence with Old Trask River	169.5	16,500	*	19,200	20,700	*	22,500
	Confluence with Mill Creek	162.8	21,800	*	29,400	32,200	*	39,000
	Confluence with Cedar Creek	155.0	21,500	*	29,700	33,500	*	43,600
Wilson River	Near mouth at Tillamook Bay	192.2	9,300	*	9,950	10,200	*	11,300
	Confluence with Beaver Creek	187.3	15,900	*	18,700	19,900	*	22,200
	Confluence with Little North Fork	162.1	28,600	*	37,700	41,500	*	50,300
	Gage No. 3015, near Tillamook	161.0	28,400	*	37,500	41,400	*	50,100
	Confluence with Fall Creek	145.4	23,600	*	30,600	33,700	*	40,300
Tillamook River	At Bewley Creek Road	52.8	7,840	*	11,000	12,400	*	16,200
Nestucca River	Mouth at Nestucca Bay	259.0	30,200	*	43,600	49,700	*	64,800
	Confluence with Hartney Creek	232.5	28,100	*	40,600	46,300	*	60,300

Table 10: Summary of Discharges (Continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
	Gage No. 3036 near Beaver	180.0	23,500	*	34,000	38,750	*	50,500
Three Rivers	Mouth at Nestucca River	38.1	5,550	*	7,540	8,370	*	10,250
	Confluence with Cedar Creek	30.5	4,500	*	6,100	6,770	*	8,300
	Cross section BD	25.0	3,580	*	4,860	5,390	*	6,700
Johnson Creek	Mouth at Tillamook Bay	0.249	48	*	61	63	*	82
School Creek	Mouth at Tillamook Bay	0.126	27	*	34	38	*	46
Whitney Brook	Mouth at Tillamook Bay	0.335	62	*	78	87	*	105
Hill Creek	Mouth at Tillamook Bay	0.065	15	*	20	22	*	27
Rock Creek	At South C St.	0.8	132	*	175	191	*	231
Patterson Creek	Fifth St.	1.9	246	*	338	388	*	506
	US Hwy 101	2.0	1,601	*	2,101	2,501	*	3,401
Unnamed Creek (Bay City)	Near the corner of McCoy Avenue and Warren Street in Bay City.	0.19	25	30.8	35.1	39.6	*	49.7
	US Hwy 101	0.5	58	*	73	81	*	99
Tillamook Bay	At Limit of study	*	*	*	*	*	*	*

*Not calculated for this FIS project

US 101 Trask River StreamStats Report

Region ID:	OR
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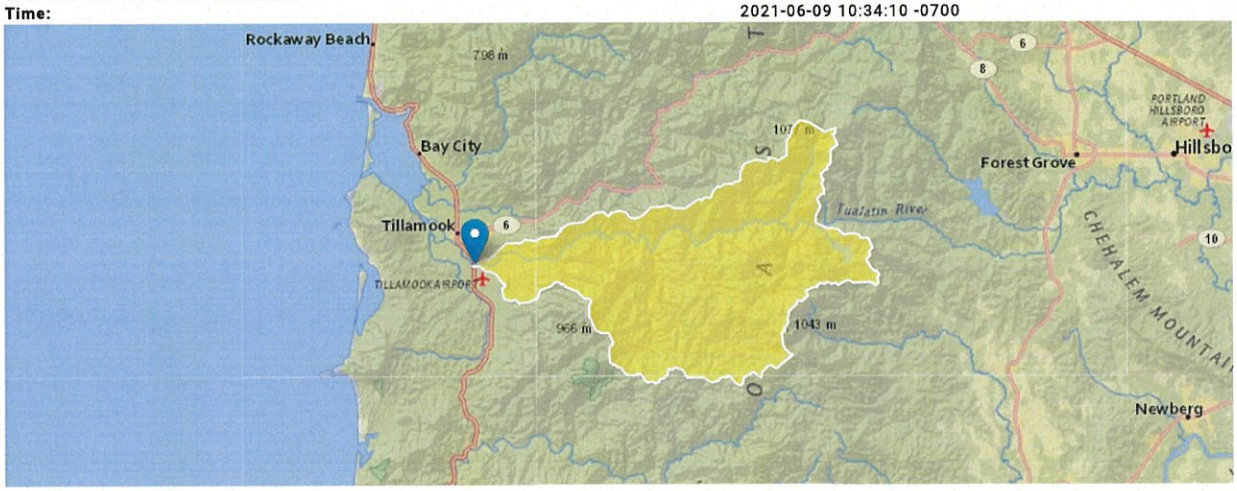
Time:	2021-06-09 10:34:10 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	164	square miles
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	4.16	inches
SOILPERM	Average Soil Permeability	1.52	inches per hour
JANMAXT2K	Mean Maximum January Temperature from 2K resolution PRISM 1961-1990 data	45.7	degrees F
WATCAPORC	Available water capacity from STATSGO data using methods from SIR 2005-5116	0.16	inches
ORREG2	Oregon Region Number	729	dimensionless
PRECIP	Mean Annual Precipitation	122	inches
WATCAPORR	Available water capacity from STATSGO data using methods from SIR 2008-5126	0.16	inch per inch

Peak-Flow Statistics Parameters [Reg 1 Coastal Cooper]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	164	square miles	0.28	673
I24H2Y	24 Hour 2 Year Precipitation	4.16	inches	2.52	5.79
SOILPERM	Average Soil Permeability	1.52	inches per hour	0.72	4.76
JANMAXT2K	Mean Maximum January Temperature from 2K resolution PRISM 1961-1990 data	45.7	degrees F	42.4	53.9
WATCAPORC	Available_Water_Capacity_OR_Cooper	0.16	inches	0.1	0.23
ORREG2	Oregon Region Number	729	dimensionless		

Peak-Flow Statistics Flow Report [Reg 1 Coastal Cooper]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	SE	SEp	Equiv. Yrs.
50-percent AEP flood	12500	ft^3/s	8630	18100	26.8	26.8	2.4
20-percent AEP flood	17000	ft^3/s	11100	26000	25.3	25.3	3.7

Statistic	Value	Unit	PII	PIu	SE	SEp	Equiv. Yrs.
10-percent AEP flood	19900	ft^3/s	12600	31400	25.6	25.6	5
4-percent AEP flood	23700	ft^3/s	12900	43700	26.6	26.6	6.4
2-percent AEP flood	26500	ft^3/s	18200	38500	27.8	27.8	7.2
1-percent AEP flood	29300	ft^3/s	23800	36100	29.1	29.1	7.9
0.2-percent AEP flood	35600	ft^3/s	18600	68200	32.6	32.6	8.9

Peak-Flow Statistics Citations

Cooper, R.M.,2005, Estimation of Peak Discharges for Rural, Unregulated Streams in Western Oregon: U.S. Geological Survey Scientific Investigations Report 2005-5116, 76 p. (http://pubs.usgs.gov/sir/2005/5116/pdf/sir2005-5116.pdf)

Flow-Duration Statistics Parameters [LowFlow Ann Region01 2008 5126]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	164	square miles	0.367	590.347
PRECIP	Mean Annual Precipitation	122	inches	65.5923	122.9843
WATCAPORR	Available_Water_Capacity_OR_Risley	0.16	inch per inch	0.12	0.23

Flow-Duration Statistics Flow Report [LowFlow Ann Region01 2008 5126]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu
5 Percent Duration	4170	ft^3/s	2960	5700
10 Percent Duration	2880	ft^3/s	2080	3880
25 Percent Duration	1460	ft^3/s	1030	2000
50 Percent Duration	618	ft^3/s	401	910
95 Percent Duration	96.4	ft^3/s	39.9	198

Flow-Duration Statistics Citations

Risley, John, Stonewall, Adam, and Haluska, Tana,2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p. (http://pubs.usgs.gov/sir/2008/5126/)

Application Version: 4.5.3
StreamStats Services Version: 1.2.22
NSS Services Version: 2.1.2

APPENDIX 2: PHOTO LOG

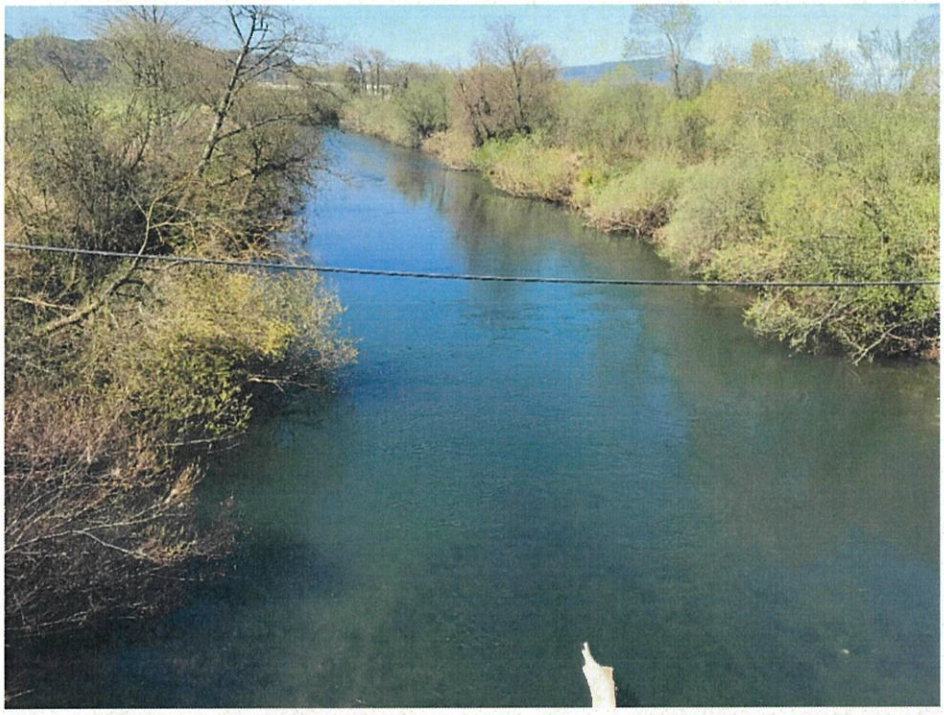


Photo 1: View downstream (west) from bridge deck.

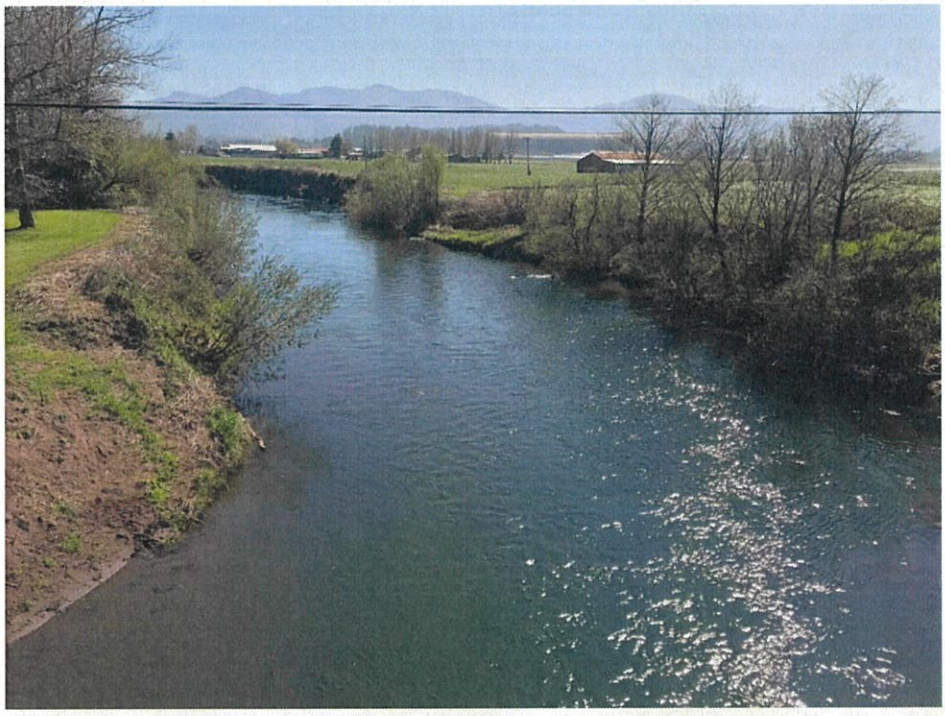


Photo 2: View upstream (east) from bridge deck.

Photo 3: View of the north bank at bridge.

Photo 4: View of the south bank at bridge, with existing riprap armor.

APPENDIX 3: PROPOSED PROJECT DRAWINGS

??V-???

STATE OF OREGON

DEPARTMENT OF TRANSPORTATION

PLANS FOR PROPOSED PROJECT

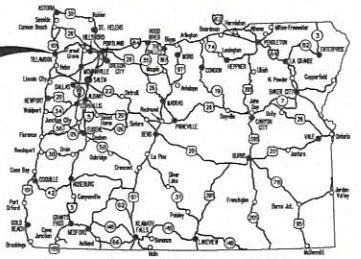
GRADING, DRAINAGE & ROADSIDE DEVELOPMENT

US101: TRASK RIVER BRIDGE PROJ.

OREGON COAST HWY.

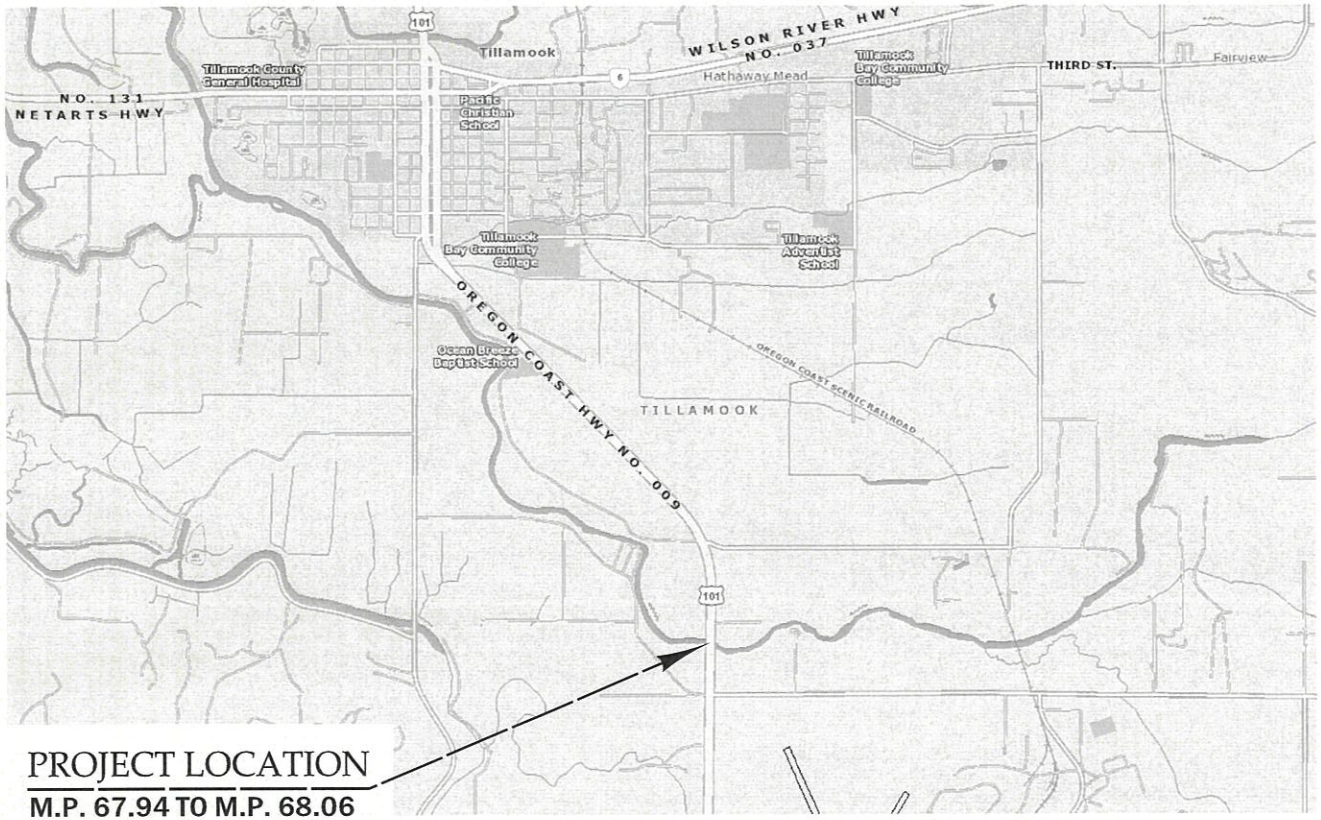
TILLAMOOK COUNTY
DECEMBER 2022

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
A01	Title Sheet
A02	Index Of Sheets Cont. And Std. Dwg. Nos.
A03	Survey Control Data



Overall Length Of Project - 0.12 Miles

SEC. 5, T. 2 S., R. 9 W., W.M.
SEC. 6, T. 2 S., R. 9 W., W.M.



PROJECT LOCATION
M.P. 67.94 TO M.P. 68.06

LET'S ALL WORK TOGETHER TO MAKE THIS JOB SAFE

ATTENTION:
Oregon Law Requires You To Follow Rules Adopted By The Oregon Utility Notification Center. Those Rules Are Set Forth In OAR 952-001-0001 Through OAR 952-001-0090. You May Obtain Copies Of The Rules By Calling The Center (Note: The Telephone Number For The Oregon Utility Notification Center Is (503) 232-1987).

PLANS PREPARED FOR
OREGON DEPARTMENT OF TRANSPORTATION

DOWL
WWW.DOWL.COM

OREGON TRANSPORTATION COMMISSION

Robert Van Brocklin	CHAIR
Alando Simpson	COMMISSIONER
Julie Brown	COMMISSIONER
Sharon Smith	COMMISSIONER
Maurice Henderson	COMMISSIONER
Kristopher W. Strickler	DIRECTOR OF TRANSPORTATION

These plans were developed using ODOT design standards. Exceptions to these standards, If any, have been submitted and approved by the ODOT Chief Engineer or their delegated authority.

Approving Authority: _____
Signature & date

_____
Print name and title

FINAL REVIEW PLANS

_____
Concurrence by ODOT Chief Engineer

US101: TRASK RIVER BRIDGE PROJ.
OREGON COAST HWY.
TILLAMOOK COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	STATE	A01

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FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

Rotation: 0° Scale: 1"=100'

??V-???

INDEX OF SHEETS, CONT.	
SHEET NO.	DESCRIPTION
	ROADWAY DETAILS
BB01, BB02	Details
	ROADWAY CONSTRUCTION
C01, C02	General Construction
	TRAFFIC CONTROL
EB01, EB02	Traffic Control Plan
	ROADSIDE DEVELOPMENT/EROSION CONTROL
FA01, FA02	Roadside Development Restoration Plan
FB01 Thru FB05	Erosion And Sediment Control
	HYDRAULICS
HD01, HD02	Temporary Water Management
HG01 Thru HG03	Details

Std. Dwg. Nos.

RD810 – Barbed And Woven Wire Fences

RD1000 – Construction Entrances
RD1015 – Inlet Protection Type 4
RD1032 – Sediment Barrier Type 8
RD1033 – Sediment Barrier Type 9

TM800 – Tables, Abrupt Edge And PCMS Details
TM820 – Temporary Barricades
TM822 – Temporary Sign Supports
TM850 – 2-Lane, 2-Way Roadways

DET6100 – Tree Planting and Staking Details
DET6101 – Planting Details
DET6103 – Planting Cutting Installation

OREGON DEPARTMENT OF TRANSPORTATION

US101: TRASK RIVER BRIDGE PROJ.
OREGON COAST HWY.
TILLAMOOK COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	SEE SHEET A01	A02

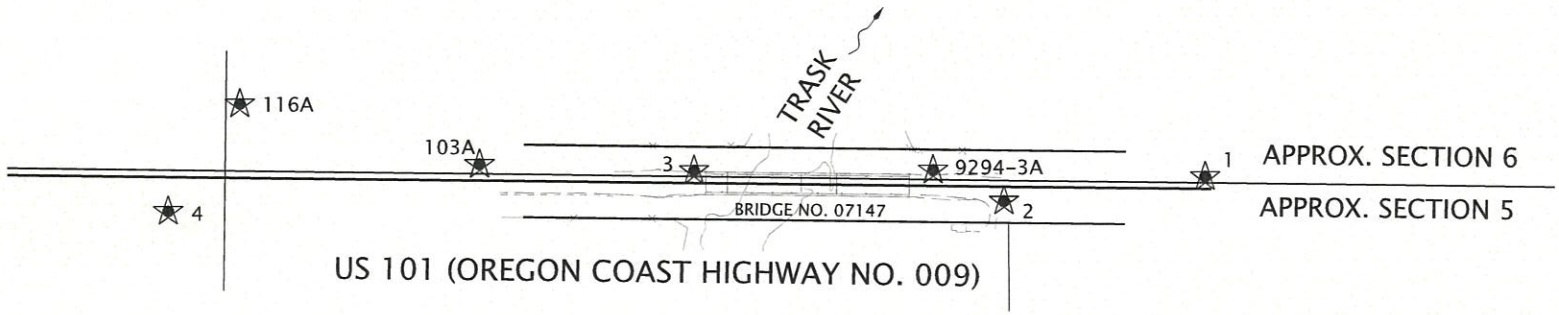
Standard Drawings located on the web at:
http://www.oregon.gov/ODOT/Engineering/Pages/Standards.aspx

??V-???

SECTIONS 5 & 6, T.2S., R.9W., W.M.

NOTES:

COORDINATE SYSTEM: OREGON COORDINATE REFERENCE SYSTEM (OCRS) OREGON COAST ZONE
HORIZONTAL DATUM: NAD83 (2011) (EPOCH 2010.00)
VERTICAL DATUM: NAVD 88
SURVEY OF RECORD: B-4128 TILLAMOOK COUNTY, OR, FILED MARCH 15, 2021
FIELD VERIFY ALL CONTROL BEFORE USE!



LEGEND
GPS STATION

N

200 100 0 200
FEET

OPC = ORANGE PLASTIC CAP
W/ = WITH

CONTROL POINT TABLE

PT. NO.	OCRS NORTHING	OCRS EASTING	NAVD88 ELEVATION	DESCRIPTION
1	1459583.93	500052.35	30.38	5/8" X 30" REBAR W/ OPC "DOWL CONTROL", FLUSH
2	1459249.67	500091.30	33.67	MAGNETIC NAIL W/ WASHER "DOWL CONTROL" FLUSH
3	1458735.21	500039.07	33.42	5/8" X 30" REBAR W/ OPC "DOWL CONTROL", FLUSH
4	1457861.12	500103.14	22.01	5/8" X 30" REBAR W/ OPC "DOWL CONTROL", FLUSH
103A	1458378.94	500027.57	29.44	1-1/2" BRASS DISC IN CONCRETE "ODOT CONTROL 103", FLUSH
116A	1457980.83	499925.65	21.20	1-1/2" BRASS DISC IN CONCRETE "ODOT CONTROL 116", FLUSH
9294-3A	1459132.25	500039.49	33.47	3" BRASS DISC IN CONCRETE "GEODETIC CONTROL 1999 09294-3", DOWN 0.1'

REGISTERED PROFESSIONAL LAND SURVEYOR
OREGON
MAY 27, 2011
ANDREW JOSEPH SILBERNAGEL
#79198
RENEWS: JUNE 30, 2022

FINAL REVIEW PLANS

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

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US101: TRASK RIVER BRIDGE PROJ.
OREGON COAST HWY.
TILLAMOOK COUNTY

Designer: B. Doss | Reviewer: J. Colton
Drafter: S. Gurley | Checker: A. Silbernagel

SURVEY CONTROL DATA

SHEET NO. A03

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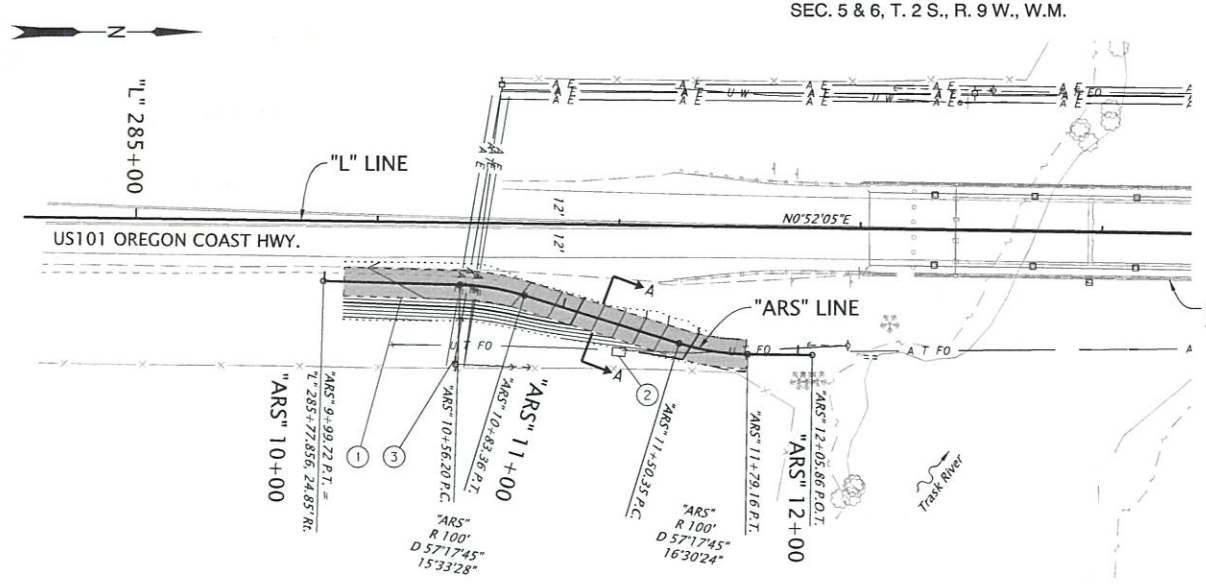
SEC. 5 & 6, T. 2 S., R. 9 W., W.M.

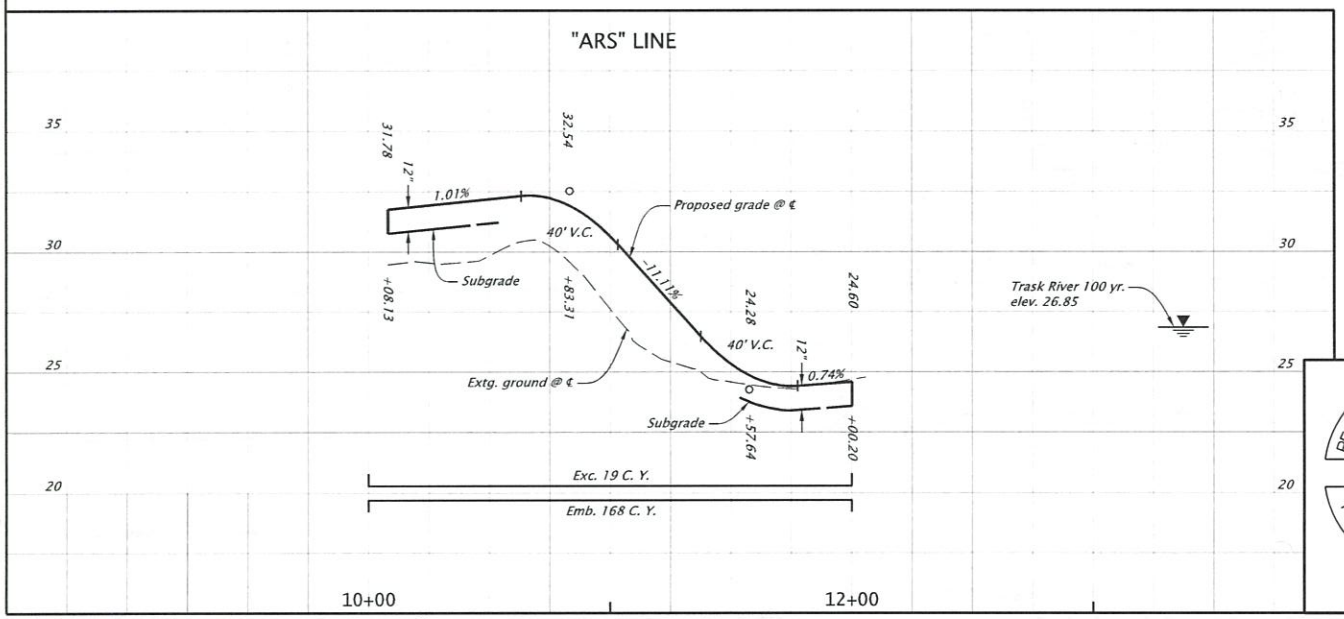
??V-???

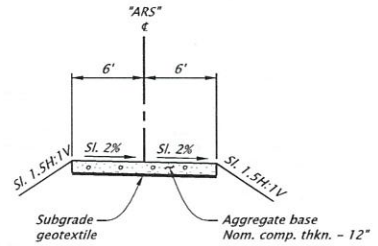


1. Const. and remove temp. access road
2. Preserve and protect extg. comm. line
3. Preserve and protect extg. utility pole

LEGEND

Aggregate base





SECTION A-A

REGISTERED PROFESSIONAL ENGINEER
TYLER WILLIAM KLEIN
FINAL REVIEW PLANS
MAY 12, 2020
EXPIRES: 6/30/

DOWL
WWW.DOWL.COM

US101: TRASK RIVER BRIDGE PROJ.
OREGON COAST HWY.
TILLAMOOK COUNTY

Designer: Tyler Klein	Reviewer: Jared Trowbridge
Drafter: Serban Dinca	Checker: Kyle Farnsworth

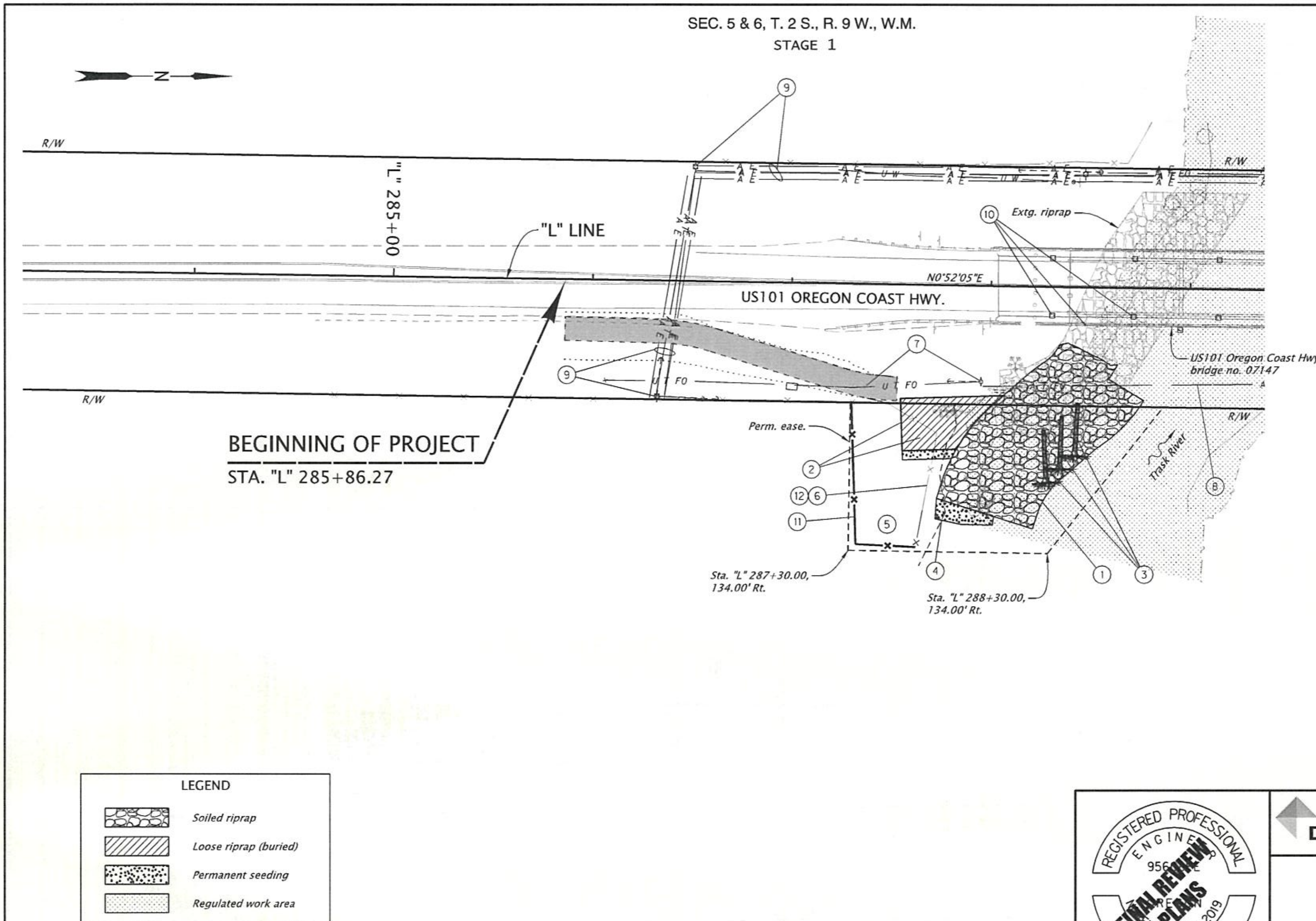
DETAILS

SHEET NO. BB01

R_K20448_dt_01.dgn :: Default 12/15/2021 8:38:40 AM SWolfer

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

Rotation: 90° Scale: 1"=50'



1. *Inst. soiled riprap (Class 200) - 950 cu. yd.*
   Inst. riprap geotextile, type 2 - 530 sq. yd.
   Perform clearing and grubbing - 0.11 ac.
   Perform excavation - 567 cu. yd.
   (For details, see sht. HG01)
2. *Inst. loose riprap (Class 200) - 180 cu. yd.*
   Inst. riprap geotextile, type 2 - 370 sq. yd.
   Perform clearing and grubbing - 0.04 ac.
   Perform excavation - 212 cu. yd.
   Inst. selected top soil - 32 cu. yd.
   Inst. permanent seeding - 0.05 ac.
   (For details, see sht. HG01)
3. *Inst. large woody material with rootwads (18" DBH) - 3*
4. *Perform grading to provide smooth transition between riprap and extg. ground*
   Inst. permanent seeding,
   Mix No. 2 - 0.002 ac.
5. *Sta. "L" 288+59.4, 126.4' Rt. to*
   Sta. "L" 287+96.1, 32.6' Rt.
   Inst. temp. water management facility
   (TWMP graphics omitted for clarity.
   For details, see sht. HD01)
6. *Sta. "L" 287+43.5, 65.1' Rt. to*
   Sta. "L" 287+73.1, 83.1' Rt.
   Remove fence, Type 1,
   w/ metal posts - 105 ft
   (See dwg. no RD810)
7. *Preserve and protect underground fiber optic line and pole*
8. *Preserve and protect overhead fiber optic line*
9. *Preserve and protect extg. electrical and telephone lines and pole*
10. *Preserve and protect extg. bridge structure*
11. *Sta. "L" 287+30.5, 64.8 Rt. to*
    Sta. "L" 287+73.1, 83.1 Rt.
    Const. temporary chainlink fence - 110 ft
    Construct temporary fence prior to removal of existing fence, see const. note 6.
    Do not remove temporary fence until perm. fence is constructed, see const. note 12
12. *Sta. "L" 287+30.5, 64.8 Rt. to*
    Sta. "L" 287+73.1, 83.1 Rt.
    Const. perm. fence, Type 1,
    w metal posts - 105 ft

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OREGON COAST HWY.
TILLAMOOK COUNTY

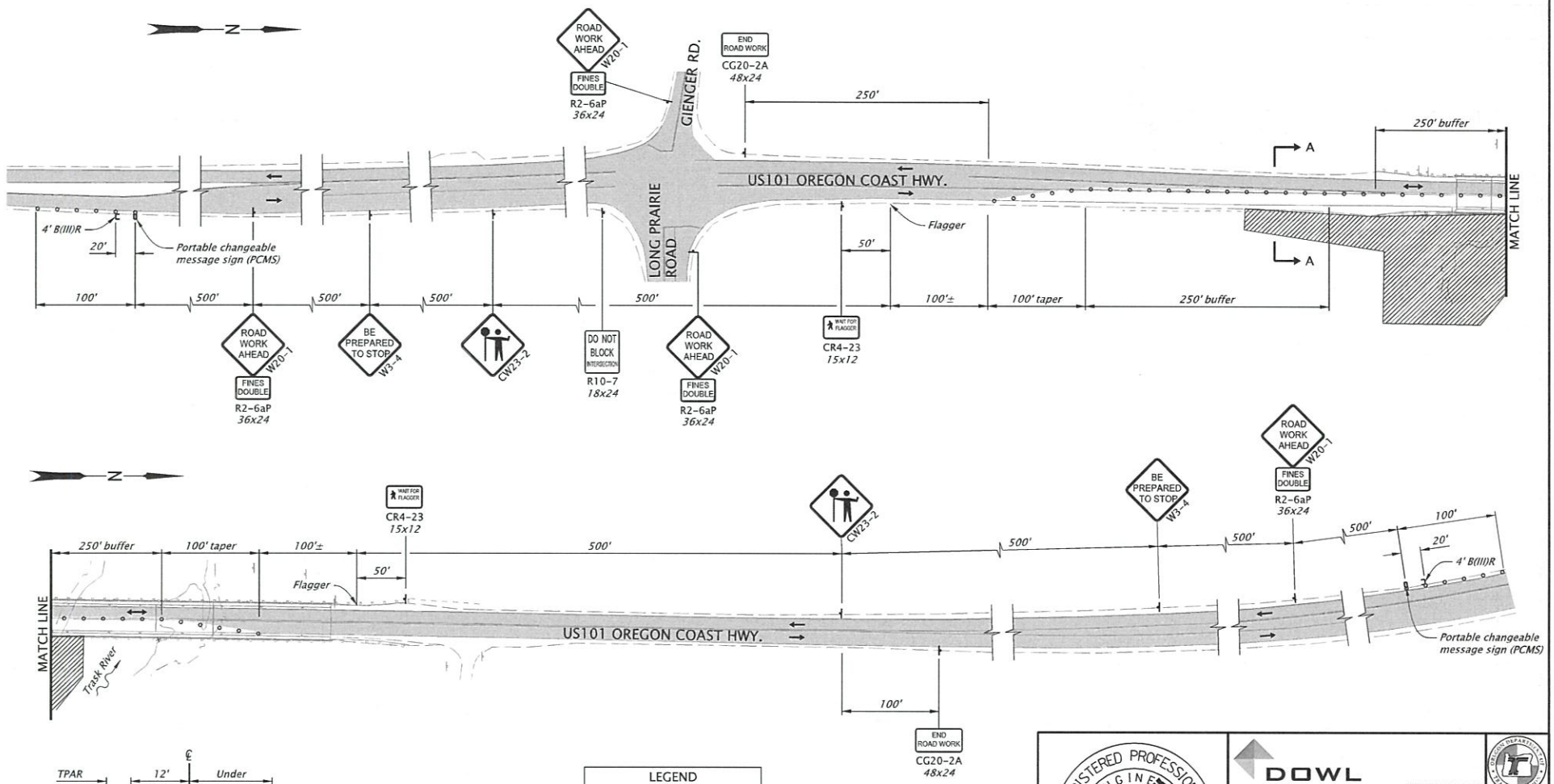
Designer: Jeff Tolentino | Reviewer: Jared Trowbridge
Drafter: Serban Dinca | Checker: Brian Meunier

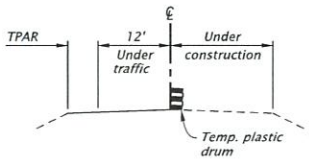
GENERAL CONSTRUCTION

SHEET NO. C01

STAGE 1

To be accompanied by dwg. nos. TM800, TM820, TM822 & TM850. ??V-???





SECTION A-A

Under traffic
Existing ground

LEGEND

- Direction of traffic
- Under traffic
- Under construction
- Temp. plastic drums on 20' max. spacing
- PCMS

CONSTRUCTION SEQUENCING:

1. *Install temporary signs and traffic control devices.*
2. *Construct Stage 1 temporary access road.*
3. *Construct Stage 1 scour repair.*

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Drafter: Serban Dinca — Checker: Kyle Farnsworth

TRAFFIC CONTROL PLAN

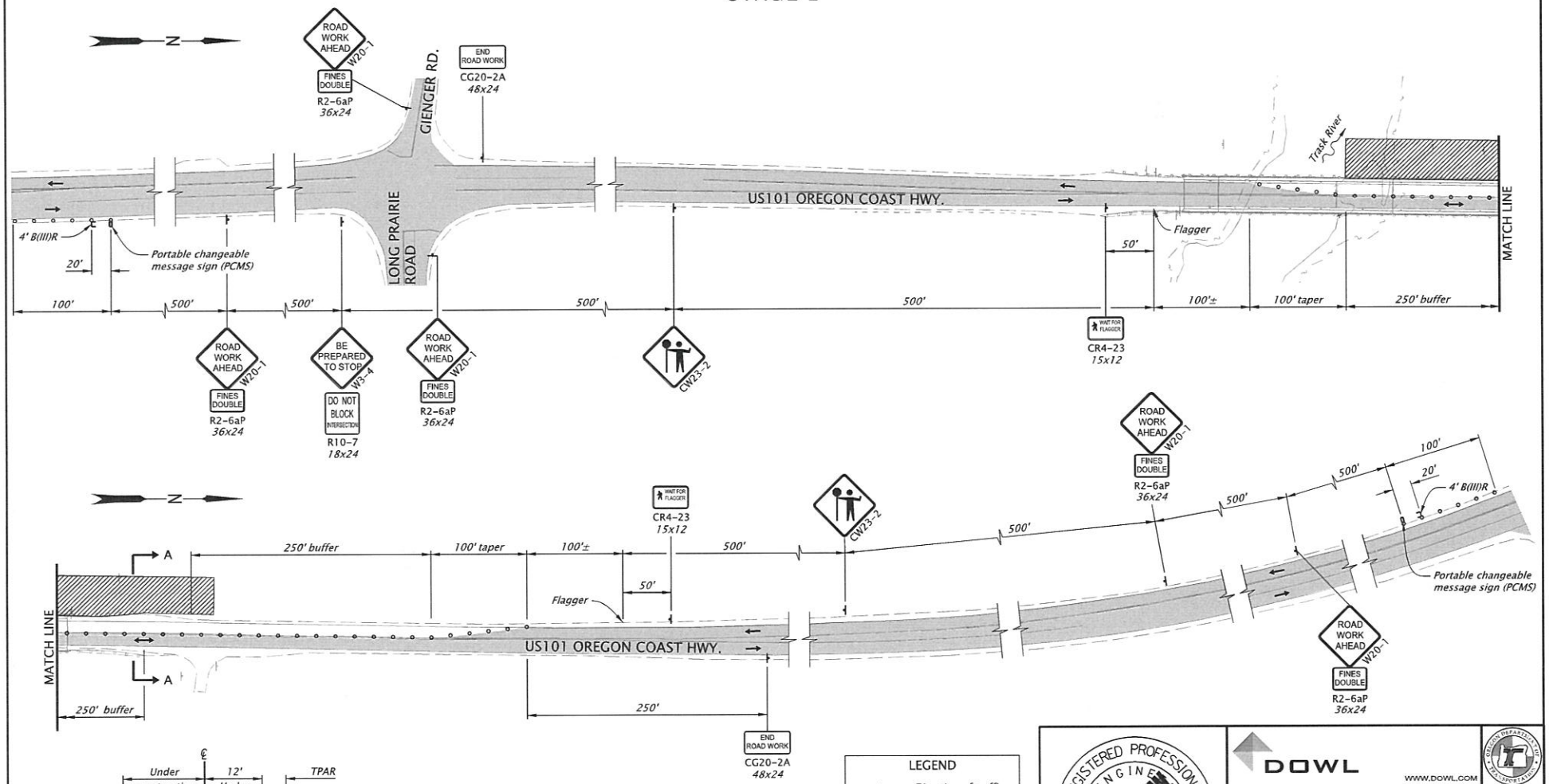
SHEET NO. EB01

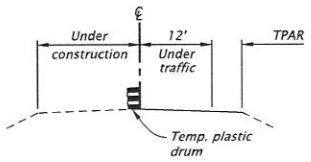
TZ_K20448_tc_01.dgn :: Default 12/15/2021 9:53:09 AM SWolfer

Rotation: 90° Scale: 1"=100'

??V-???

STAGE 2





SECTION A-A

Under traffic

Existing ground

CONSTRUCTION SEQUENCING:

1. *Remove temporary signs and traffic control devices from Stage 1.*
2. *Install temporary signs and traffic control devices for Stage 2.*
3. *Construct Stage 2 temporary access road.*
4. *Construct Stage 2 scour repair.*

LEGEND

- Direction of traffic
- Under traffic
- Under construction
- Temp. plastic drums on 20' max. spacing
- PCMS

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TYLER WILLIAM KLEIN
MAY 12, 2020
FINAL REVIEW PLANS
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TRAFFIC CONTROL PLAN

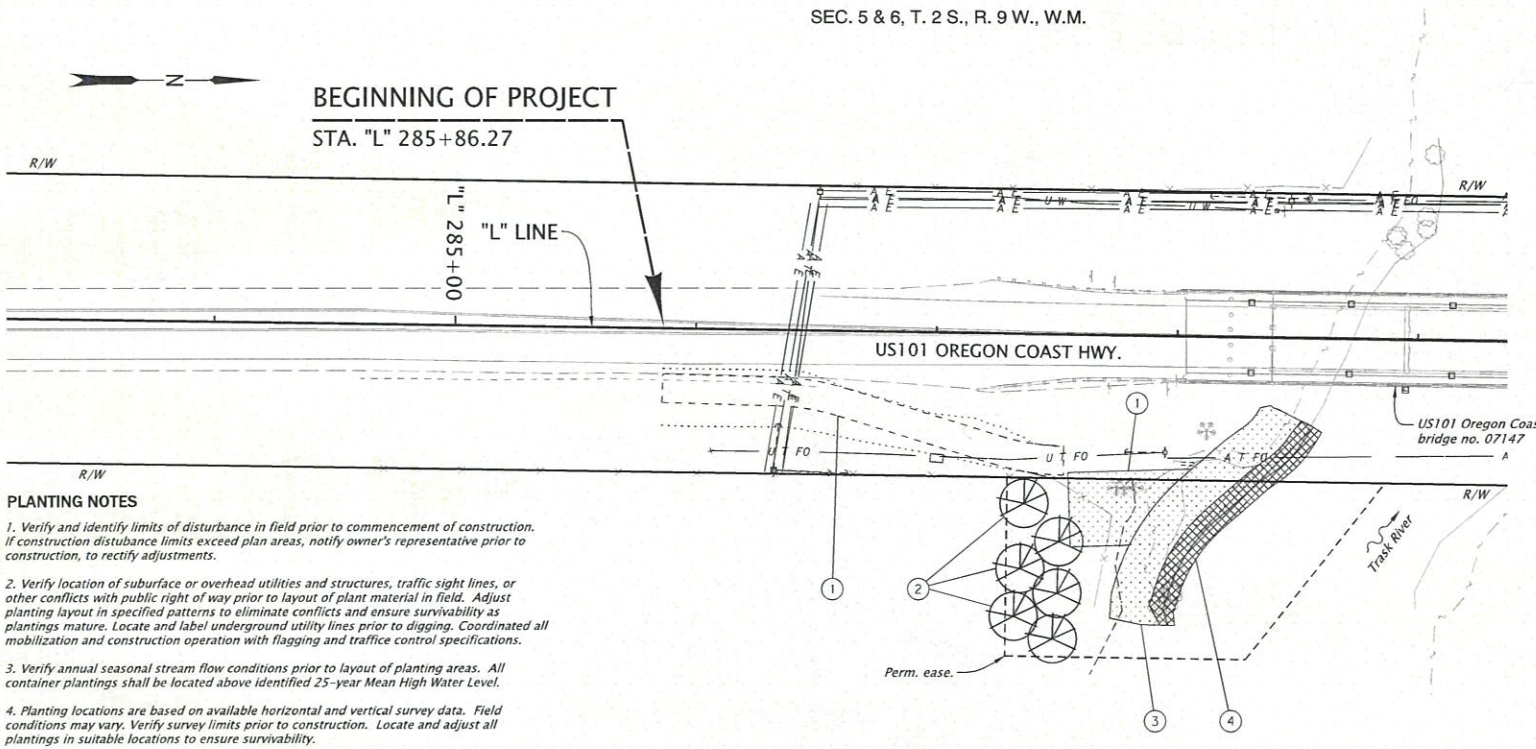
SHEET NO. EB02

TZ_K20448_tc_02.dgn :: Default 12/15/2021 10:27:40 AM SWolfer

Rotation: 90° Scale: 1"=100'

SEC. 5 & 6, T. 2 S., R. 9 W., W.M.

??V-???



1. *Inst. permanent seeding, Mix No. 1 - 0.14 ac.*
2. *Inst. trees - 6 ea.*
3. *Inst. permanent seeding, Mix No. 2- 0.06 ac.*
4. *Inst. willow cuttings - 60 ea.*

PLANTING NOTES

1. Verify and identify limits of disturbance in field prior to commencement of construction. If construction distubance limits exceed plan areas, notify owner's representative prior to construction, to rectify adjustments.

2. Verify location of suburface or overhead utilities and structures, traffic sight lines, or other conflicts with public right of way prior to layout of plant material in field. Adjust planting layout in specified patterns to eliminate conflicts and ensure survivability as plantings mature. Locate and label underground utility lines prior to digging. Coordinated all mobilization and construction operation with flagging and traffice control specifications.

3. Verify annual seasonal stream flow conditions prior to layout of planting areas. All container plantings shall be located above identified 25-year Mean High Water Level.

4. Planting locations are based on available horizontal and vertical survey data. Field conditions may vary. Verify survey limits prior to construction. Locate and adjust all plantings in suitable locations to ensure survivability.

5. Disturbance and impacts to existing native vegetation shall be minimized to the greatest extent practicable. Do not remove native plant species, felled trees, stumps or native detritus.

6. Minimal clearing may be required in order to establish suitable planting locations in areas where existing vegetation will not be disturbed during construction activities.

7. Specified willow cuttings to be coordinated with and installed during placement of riprap material. Verify elevation prior to installation. See Plant Cutting Intallation in Rip-Rap on Std. Dwg. No DET6103.

8. Planting areas shall be prepared in accordance with the ODOT 2018 Oregon Standard Specifications for Construction and the project specific Special Provisions.

9. Contractor shall verify the availability of sufficient existing planting soil on site prior to construction. If imported topsoil is needed, submit topsoil type, source, and quantity for approval before commencement of construction.

10. Plant trees according to the Tree Planting detail on Std. Dwg. No. DET6100. This work does not include wire tree ties.

11. See Sheet FA02 for additional planting details

12. Provided browse protection for all container plants. See Seedling Protection detail on Std. Dwg. No. DET6101.

13. Mulch and tackifier shall be utilized during all seeding applications.

14. Plantings shall be irrigated manually or by other approved method, as necessary, to ensure plant establishment.

SITE RESTORATION PLATING LEGEND

SYMBOL	SCIENTIFIC NAME	COMMON NAME	SIZE	QUANTITY	LOCATION
TREES					
	Pseudotsuga menziesii	*Douglas Fir*	*6-foot*	*6*	*As shown*
PLANT CUTTINGS					
	Salix Lucida	*Pacific Willow*	*2-inch diameter, 48-inch length*	*60*	*As shown, space 4-feet on center*
SEEDING					
	N/A	*Seed Mix No. 1*	*N/A*	*50 Lbs / acre see specifications*	*As shown*
	N/A	*Seed Mix No. 2*	*N/A*	*50 Lbs / acre see specifications*	*As shown*

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ROADSIDE DEVELOPMENT RESTORATION PLAN

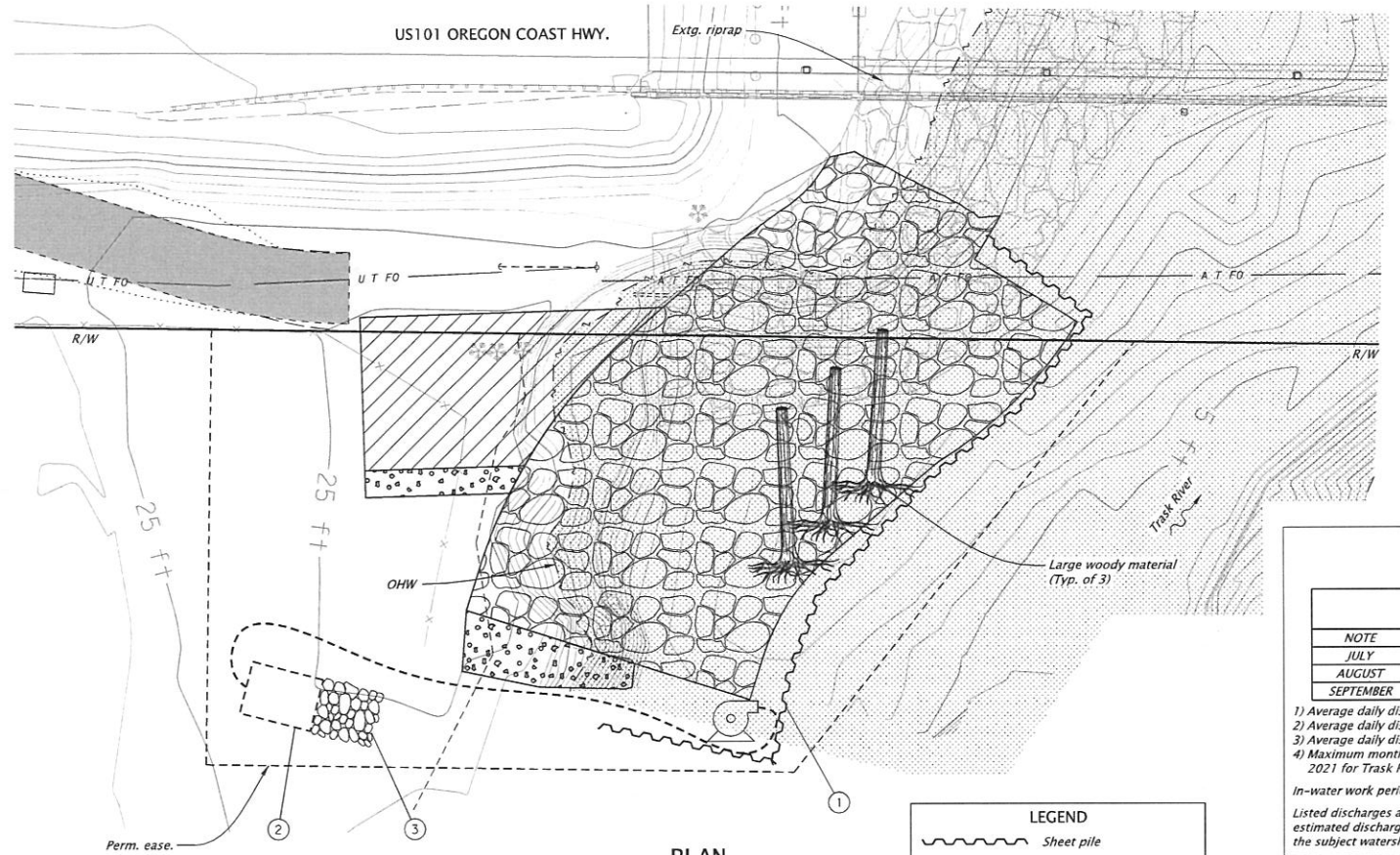
SHEET NO. FA01

EE_K20448_ecdt_01.dgn :: Default 12/20/2021 11:30:19 AM SWolfer

Rotation: 90° Scale: 1"=50'

??V-???

STAGE 1



PLAN

LEGEND

- Sheet pile
- Regulated work zone
- Energy dissipator
- Sediment control facility
- Dewatering sump pump

GENERAL NOTES

The implementation of a Temporary Water Management Plan and the design, construction, maintenance, replacement and upgrading of this facility is the responsibility of the contractor until all construction is completed and approved.

The Temporary Water Management Facility shown on this plan is the minimum requirements for anticipated site conditions. During the construction periods, the facility shall be upgraded for unexpected storm events and to insure that sediment and sediment-laden water does not leave the site.

Turbidity monitoring required, per specification section 00290.

Remove all Temporary Water Management features and restore site as per plans and specifications.

PARTIAL ISOLATION NOTES

1. *Isolating the work site: Install coffer dam along the stream channel. Size the barrier based on site stream flow and tidal conditions. Average daily discharged (USGS StreamStats) and maximum monthly water surface elevation (USGS Trask River gauge at US 101, Gauge No. 452546123492700) are provided in the table below for estimating flow and water surface elevations.*
2. *Provide adequate sediment control measures during dewatering of the work area to insure sediment laden water does not leave the site and/or enter the waters of the state.*
3. *Install energy dissipator pad downstream from sediment control facility. Location to be set based on topography and easements available.*

TRASK RIVER AT HWY 101
ESTIMATED DISCHARGES FOR
TEMPORARY WATER MANAGEMENT

	AVERAGE DAILY DISCHARGE IN CUBIC FEET PER SECOND			MAX. GAUGED WATER ELEVATION
NOTE	1	2	3	4
JULY	418	320	798	9.52
AUGUST	241	161	282	9.77
SEPTEMBER	204	128	147	9.68

1) Average daily discharge expected to be exceeded 2 days each month.
2) Average daily discharge expected to be exceeded 8 days each month.
3) Average daily discharge expected to be exceeded 16 days each month.
4) Maximum monthly water surface elevation between 2018 and 2021 for Trask River at US101 gauge.

In-water work period extends from 1 July through 15 September.

Listed discharges are surface water from the upstream watershed. The estimated discharges are based on nearby gauged basins. Discharges in the subject watershed may differ.

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TEMPORARY WATER MANAGEMENT CONCEPT

SHEET NO. HD01

HY_K20448_hy_01.dgn :: Default 12/20/2021 7:50:32 AM SWolfer

Rotation: 0° Scale: 1"=20'

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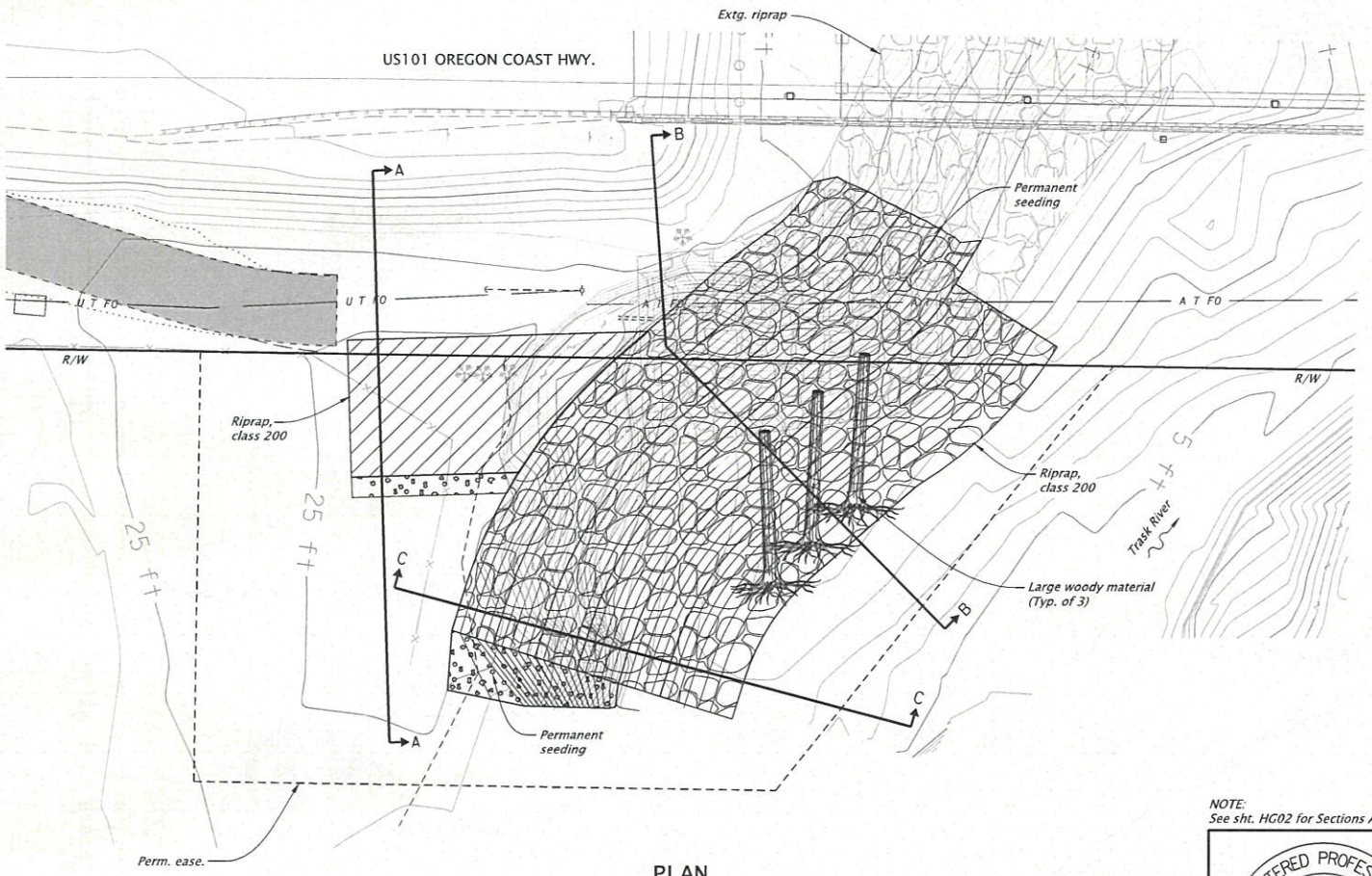

PLAN

NOTE:
See sht. HG02 for Sections A-A, B-B & C-C.

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95604
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DETAILS

SHEET NO.
HG01

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HY_K20448_hy_03.dgn :: Default 12/15/2021 6:35:56 AM SWolfer

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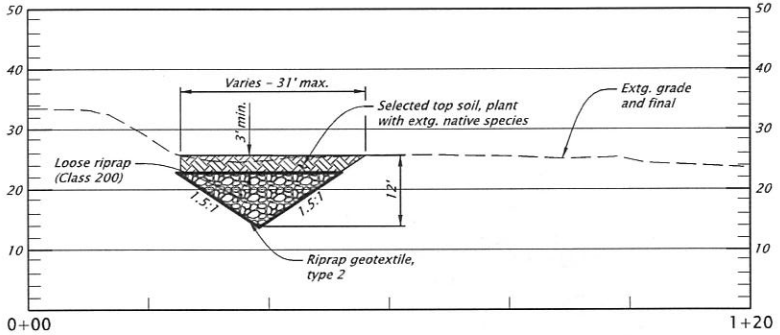
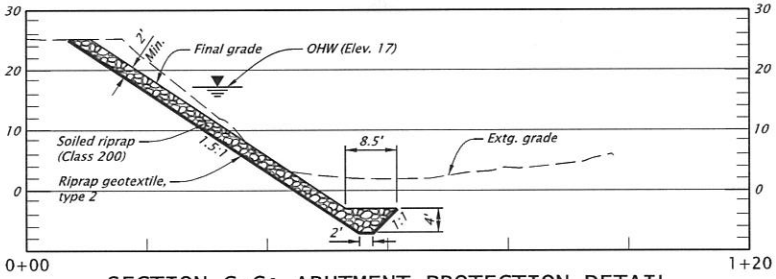
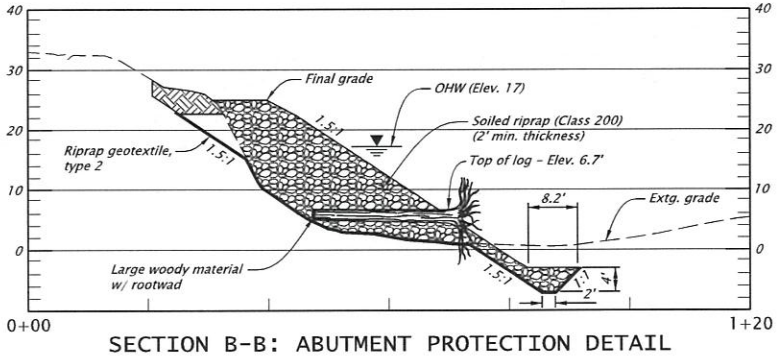


SECTION A-A: ABUTMENT PROTECTION DETAIL



SECTION C-C: ABUTMENT PROTECTION DETAIL



SECTION B-B: ABUTMENT PROTECTION DETAIL

NOTE:
See sht. HG01 for the location of Sections A-A, B-B & C-C.

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N/A
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DETAILS

SHEET NO.
HG02

APPENDIX 4: MODEL RESULTS SUMMARY

SRH-2D Project Summary Report

Project file name: US101 Trask River.sms

Report generation date: 18 November 2021 15:10:24

Contents

Project summary

- Project name: US101 Trask River
- River: Trask River
- Project purpose/focus: 100 year event for existing condition
- Model developer name: DOWL
- Source of terrain data: DOWL Survey & Lidar
- Source of bathymetry: DOWL Survey
- Source of additional survey data:

Version of SMS used

- SMS: 13.1

Project datum

- Horizontal: NAD83_High_Accuracy_Reference_Network

- Vertical:

Terrain data

Summary of scatter sets

No scatter sets.

Mesh summary

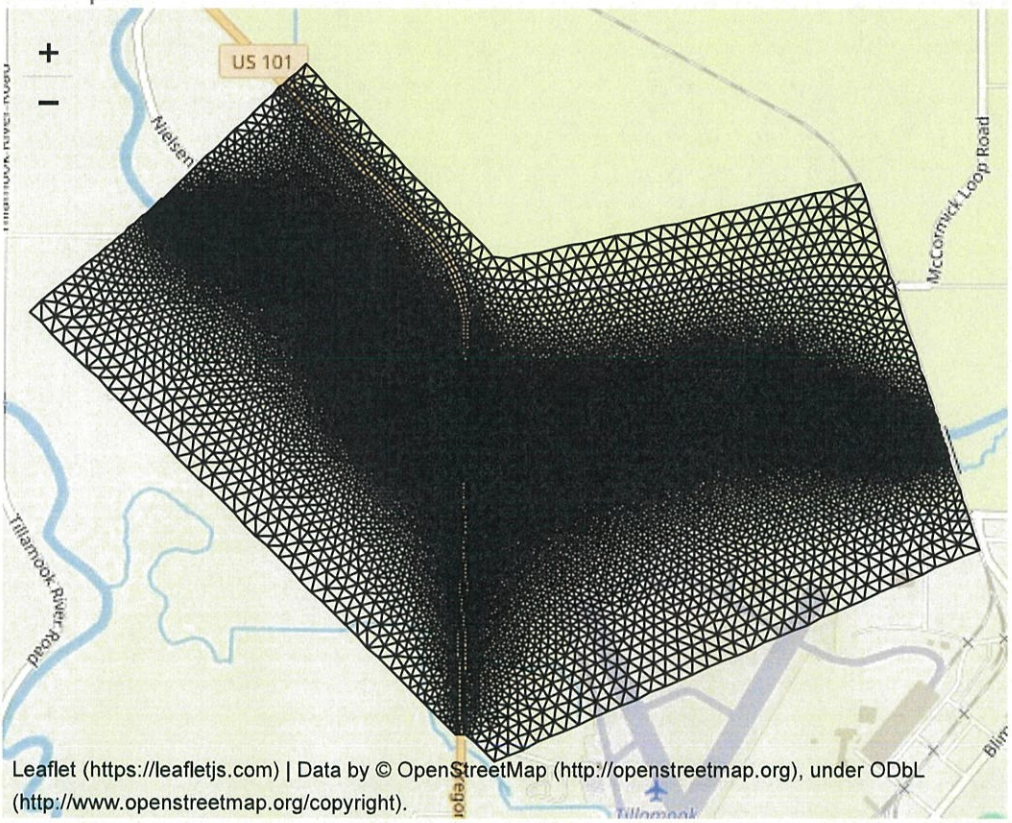
Meshes

Mesh	X size	Y size	Number of nodes	Number of elements	Smallest element size	Largest element size
Trask Mesh Existing	10720.441	8036.2	62441	86138	1.747	221.154
Trask Mesh Proposed	10720.441	8036.2	62441	86137	1.747	221.154

- Mesh name: Trask Mesh Existing
  - Notes

    No notes.

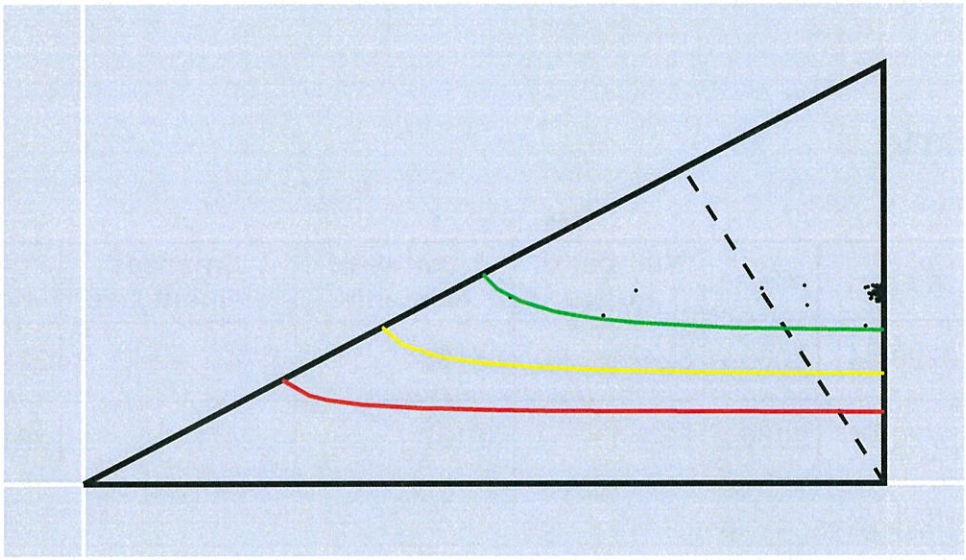
  - Mesh plot



- Mesh quality report

  The data points represent the worst 100 elements. Any points below the red line correspond to poor quality elements.

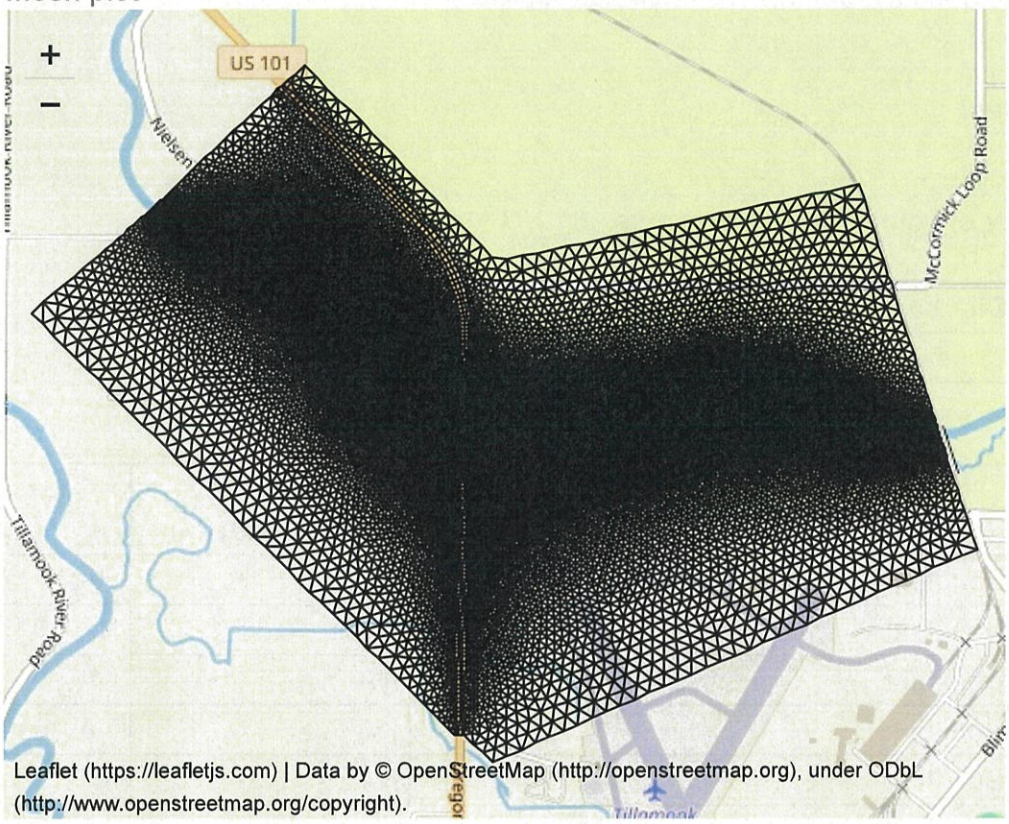
  Q(ALS)



- Mesh name: Trask Mesh Proposed
  - Notes

    No notes.

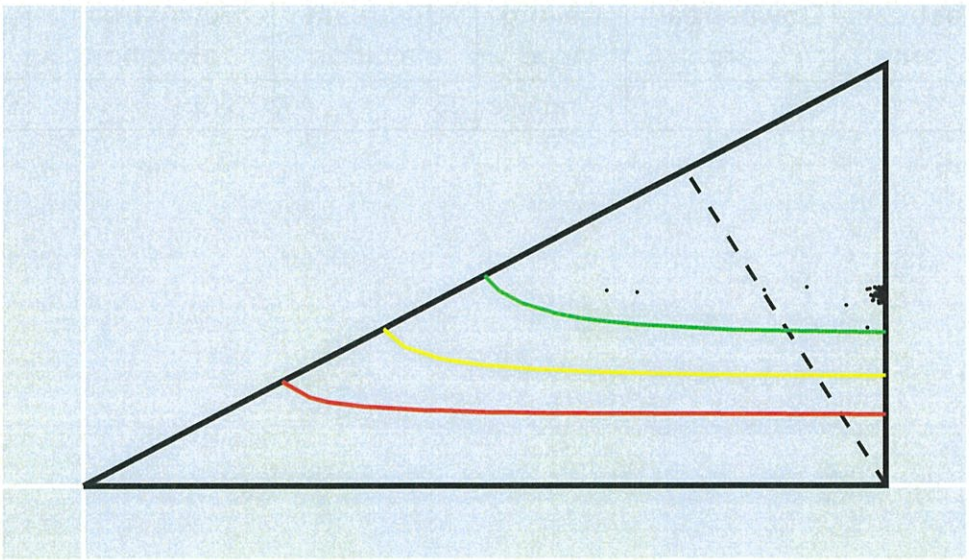
- Mesh plot



- Mesh quality report

The data points represent the worst 100 elements. Any points below the red line correspond to poor quality elements.

Q(ALS)



Summary of boundary conditions

- Coverage: "Boundary Conditions - 2 yr (StreamStats)"
  - Notes

    No notes.

  - Number of boundary condition arcs: 8

Inlet-Q

Arc	Discharge option	Constant Q	Distribution at inlet
1	Constant	12500.0	Conveyance

Exit-H

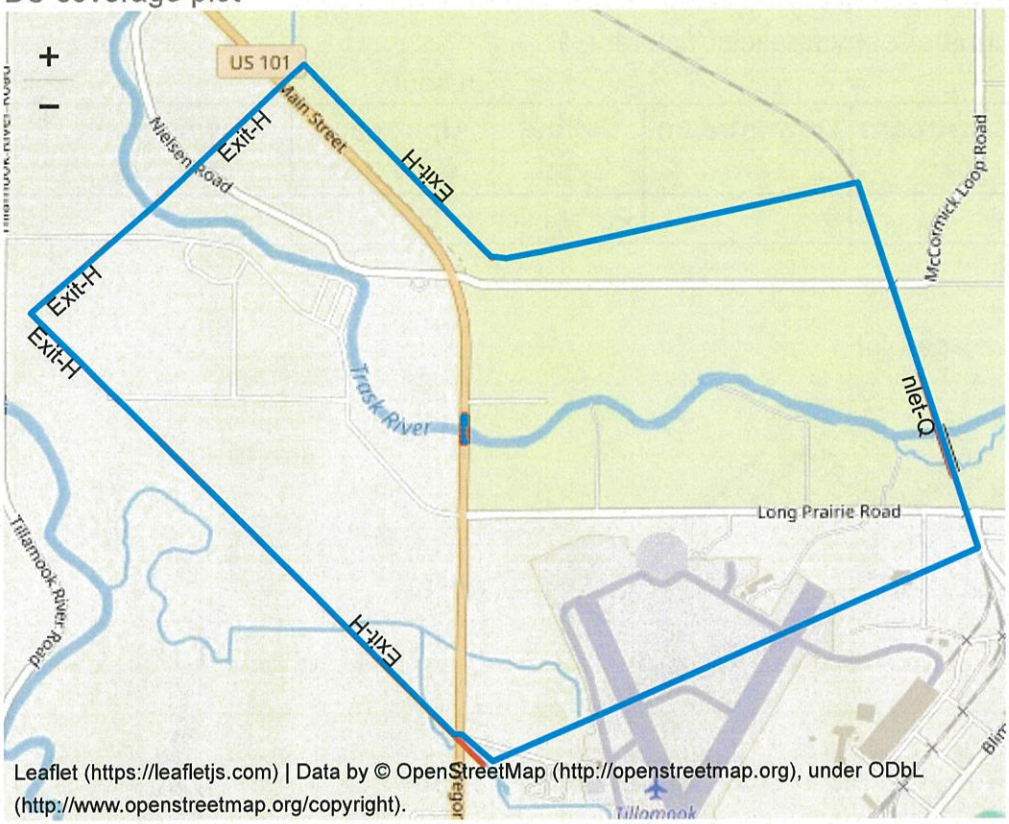
Arc	Water surface (WSE) option	Constant wse	Channel calculator	Cross section plot
2	Constant	19.0	NA	NA
3	Constant	17.0	NA	NA
4	Constant	12.0	NA	NA
5	Constant	17.3	NA	NA
6	Constant	17.0	NA	NA
7	Constant	12.0	NA	NA
10	Constant	22.0	NA	NA

  - Hydraulic structures
    - Number of hydraulic structures: 1

Pressure

Upstream arc	Downstream arc	Ceiling type	Upstream elevation	Downstream elevation	Roughness
9	8	Parabolic	35.3	35.6	0.012

- BC coverage plot



- Coverage: "Boundary Conditions - 10 yr (FIS)"
  - Notes

    No notes.

  - Number of boundary condition arcs: 8

Inlet-Q

Arc	Discharge option	Constant Q	Distribution at inlet
1	Constant	21800.0	Conveyance

Exit-H

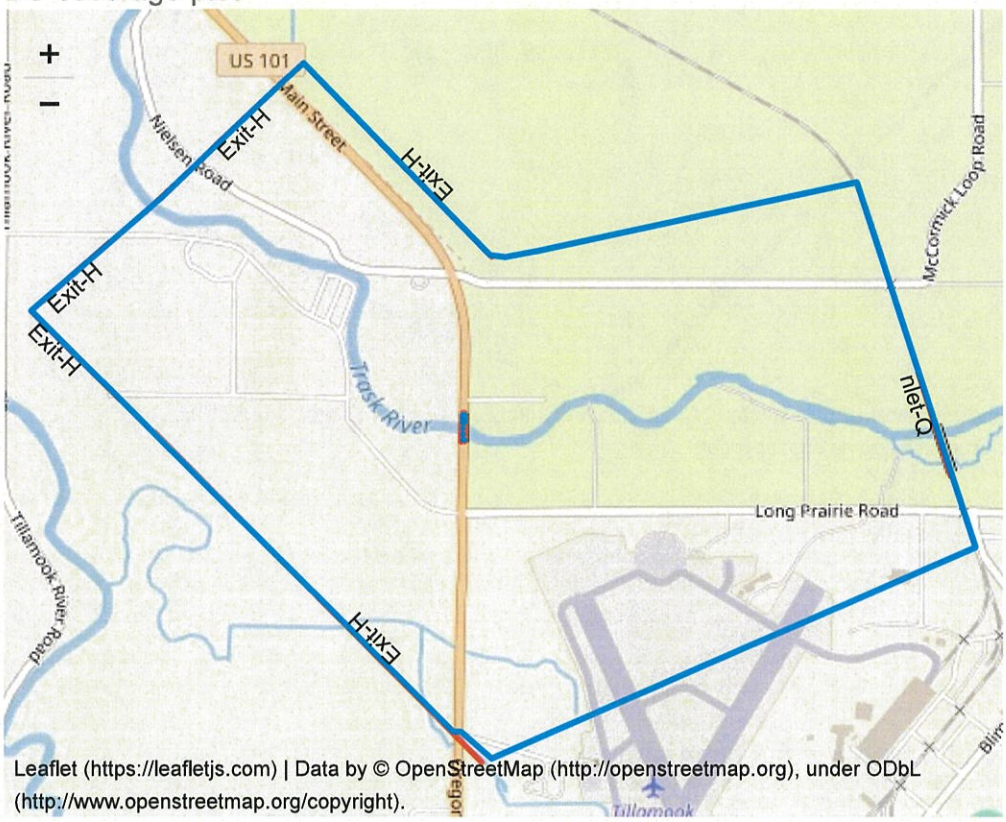
Arc	Water surface (WSE) option	Constant wse	Channel calculator	Cross section plot
2	Constant	19.0	NA	NA
3	Constant	18.0	NA	NA
4	Constant	12.0	NA	NA
5	Constant	22.9	NA	NA
6	Constant	19.0	NA	NA
7	Constant	12.0	NA	NA
10	Constant	22.0	NA	NA

- Hydraulic structures
  - Number of hydraulic structures: 1

Pressure

Upstream arc	Downstream arc	Ceiling type	Upstream elevation	Downstream elevation	Roughness
9	8	Parabolic	35.3	35.6	0.012

- BC coverage plot



- Coverage: "Boundary Conditions - 50 yr (FIS)"
  - Notes

No notes.

  - Number of boundary condition arcs: 8

Inlet-Q

Arc	Discharge option	Constant Q	Distribution at inlet
1	Constant	29400.0	Conveyance

Exit-H

Arc	Water surface (WSE) option	Constant wse	Channel calculator	Cross section plot
2	Constant	19.0	NA	NA

3	Constant	18.0	NA	NA
4	Constant	12.0	NA	NA
5	Constant	23.87	NA	NA
6	Constant	19.0	NA	NA
7	Constant	12.0	NA	NA
10	Constant	22.0	NA	NA

- Hydraulic structures
  - Number of hydraulic structures: 1

Pressure

Upstream arc	Downstream arc	Ceiling type	Upstream elevation	Downstream elevation	Roughness
9	8	Parabolic	35.3	35.6	0.012

- BC coverage plot

- Coverage: "Boundary Conditions - 100 yr (FIS)"
  - Notes

    No notes.

  - Number of boundary condition arcs: 8

Inlet-Q

Arc	Discharge option	Constant Q	Distribution at inlet
1	Constant	32200.0	Conveyance

Exit-H

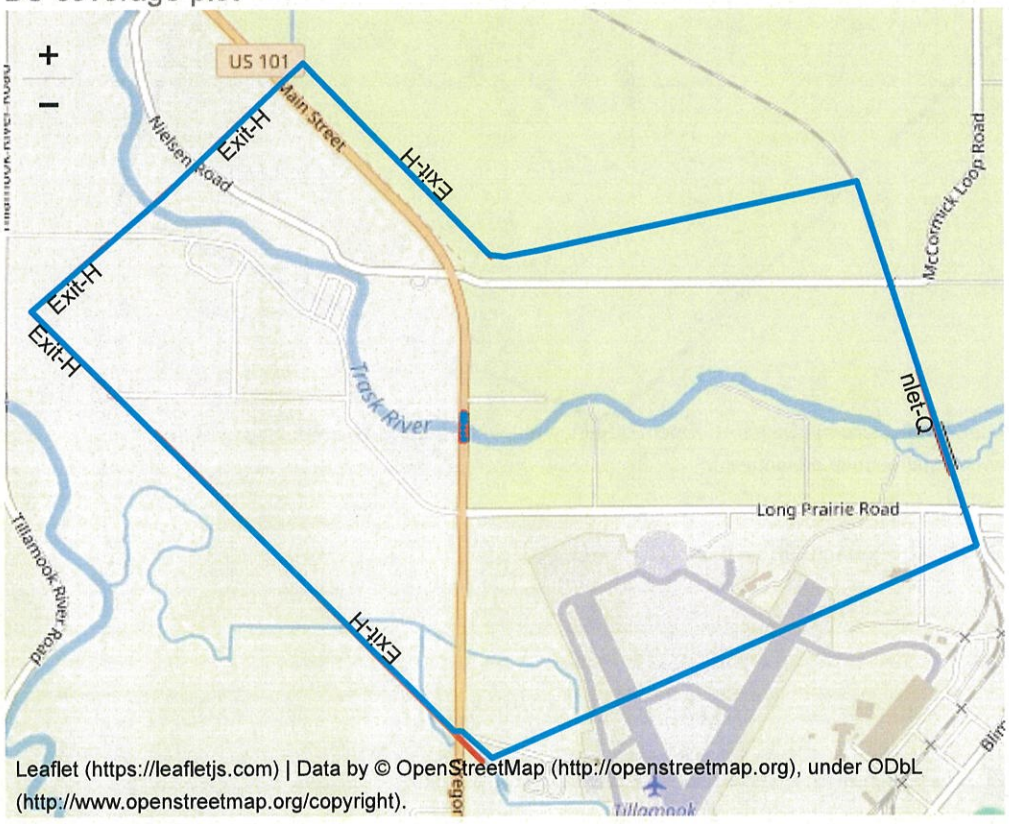
Arc	Water surface (WSE) option	Constant wse	Channel calculator	Cross section plot
2	Constant	19.0	NA	NA
3	Constant	18.0	NA	NA
4	Constant	12.0	NA	NA
5	Constant	24.28	NA	NA
6	Constant	19.0	NA	NA
7	Constant	12.0	NA	NA
10	Constant	22.0	NA	NA

- Hydraulic structures
  - Number of hydraulic structures: 1

Pressure

Upstream arc	Downstream arc	Ceiling type	Upstream elevation	Downstream elevation	Roughness
9	8	Parabolic	35.3	35.6	0.012

- BC coverage plot



- Coverage: "Boundary Conditions - 500 yr (FIS)"
  - Notes

    No notes.

  - Number of boundary condition arcs: 8

Inlet-Q

Arc	Discharge option	Constant Q	Distribution at inlet
1	Constant	39000.0	Conveyance

Exit-H

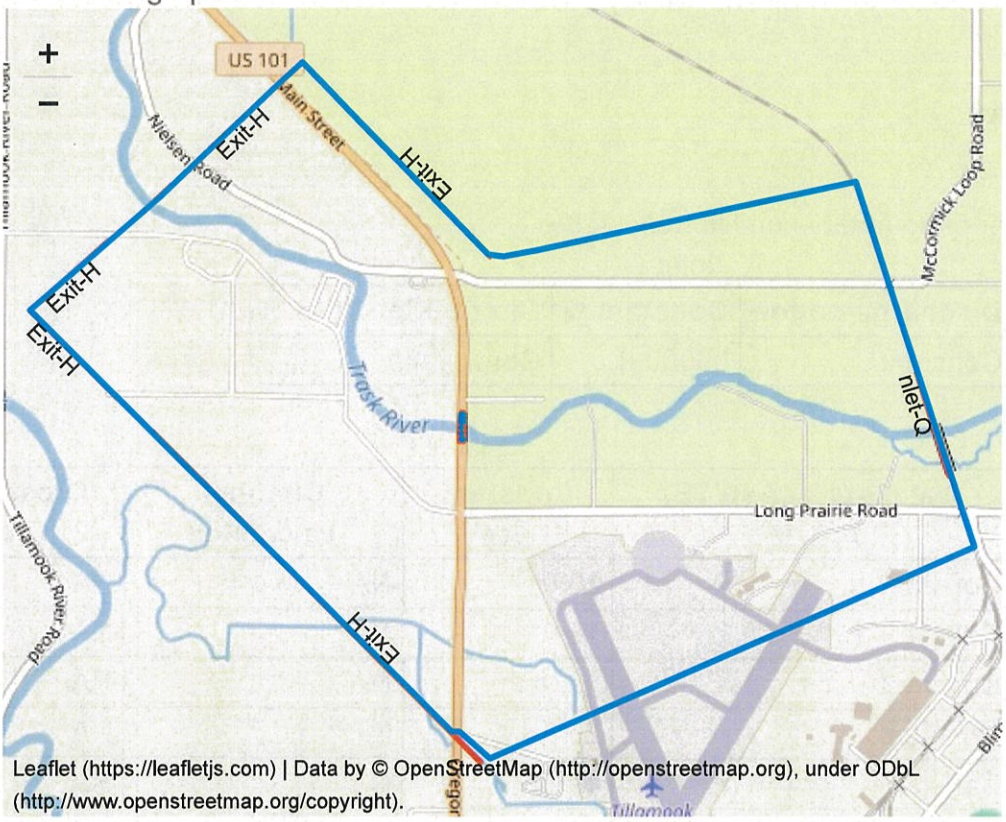
Arc	Water surface (WSE) option	Constant wse	Channel calculator	Cross section plot
2	Constant	19.0	NA	NA
3	Constant	18.0	NA	NA
4	Constant	12.0	NA	NA
5	Constant	25.8	NA	NA
6	Constant	19.0	NA	NA
7	Constant	12.0	NA	NA
10	Constant	22.0	NA	NA

  - Hydraulic structures
    - Number of hydraulic structures: 1

Pressure

Upstream arc	Downstream arc	Ceiling type	Upstream elevation	Downstream elevation	Roughness
9	8	Parabolic	35.3	35.6	0.012

- BC coverage plot



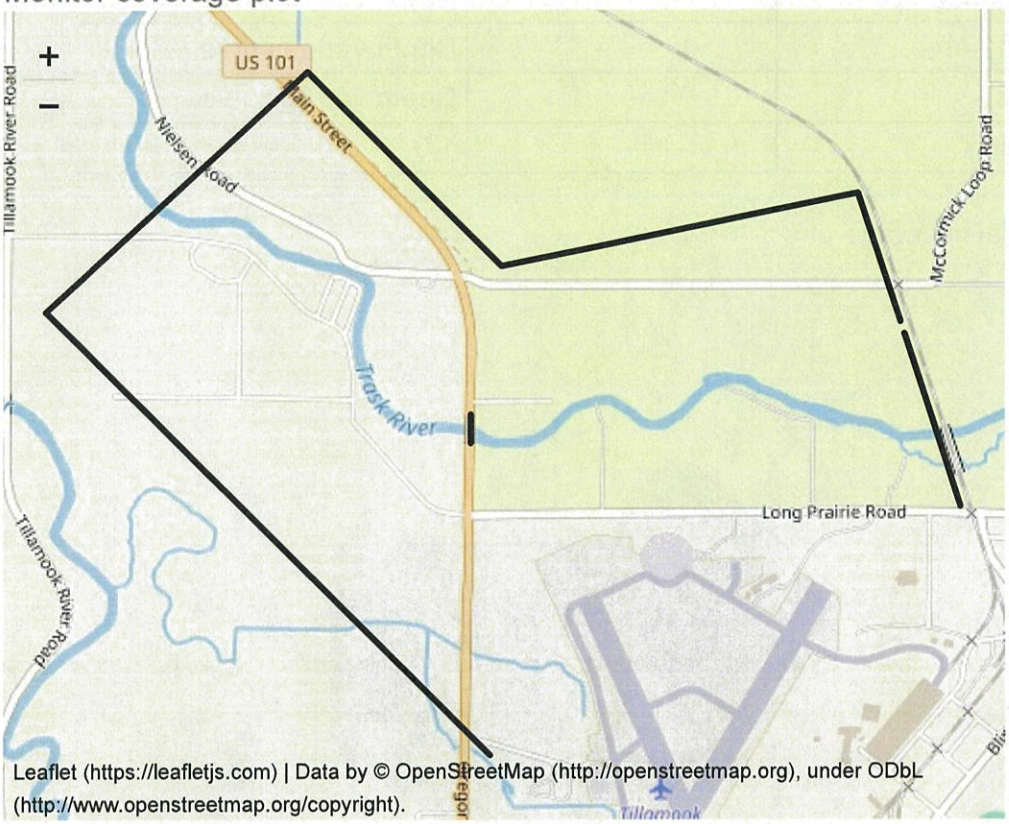
Summary of monitor coverages

- Coverage: "Monitor"
  - Notes

    No notes.

  - Number of points: 0
  - Number of lines: 3

- Monitor coverage plot



Summary of obstructions

No obstruction coverages.

Summary of bridges

No bridge coverages.

Materials roughness summary

- Coverage: "Materials with buildings"
  - Notes

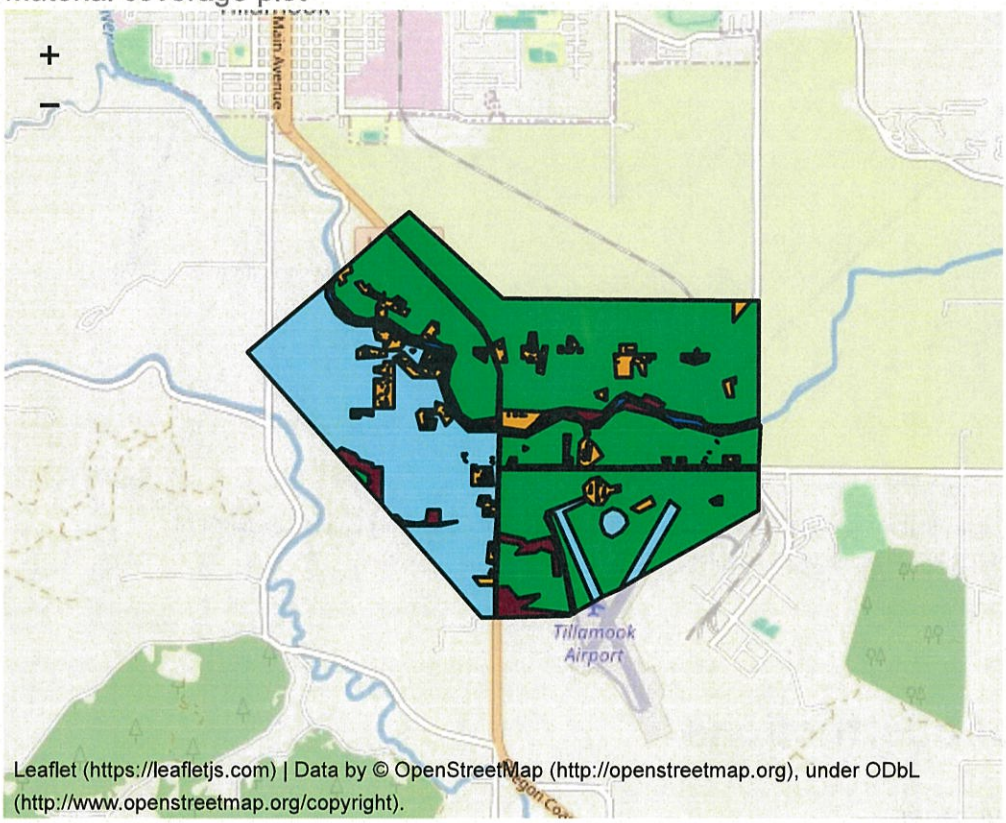
    No notes.

  - Number of materials: 7

Material Name	Color	Manning's N
unassigned		0.02
Channel		Depth varied curve
Crops		Depth varied curve

Developed Area		Depth varied curve
Woody Area		Depth varied curve
Road		Depth varied curve
Building		1.0

- Material coverage plot



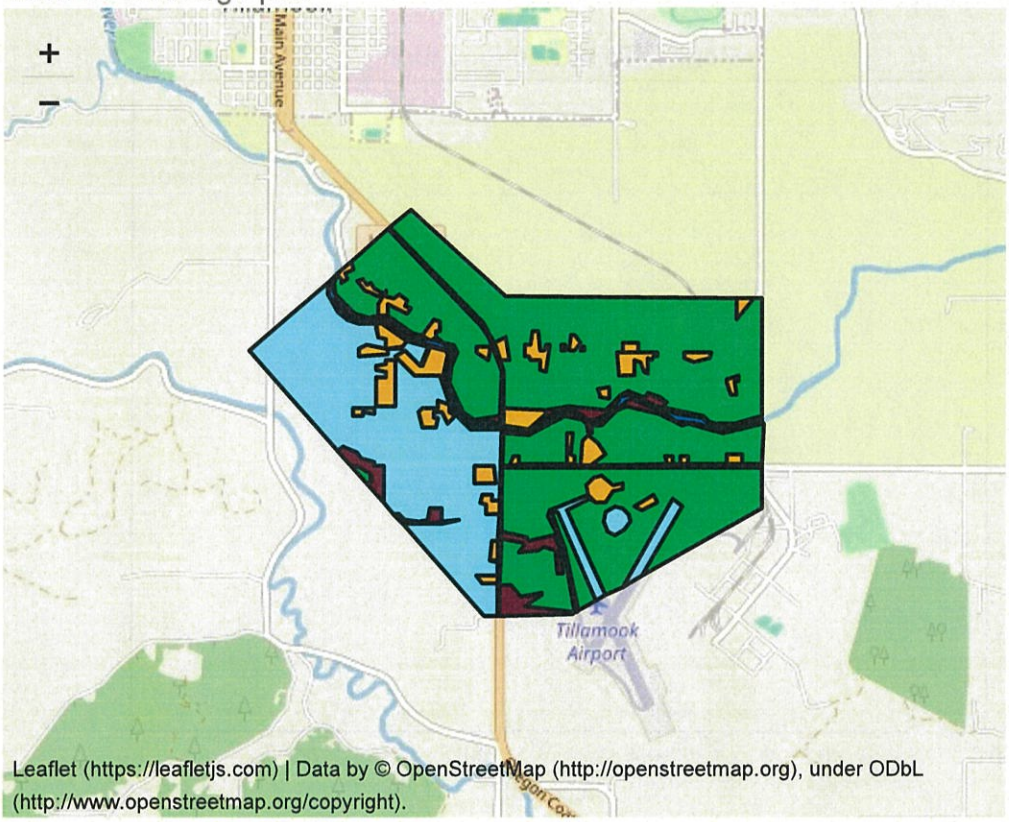
- Coverage: "Materials"
  - Notes

    No notes.

  - Number of materials: 6

Material Name	Color	Manning's N
unassigned		0.02
Channel		Depth varied curve
Crops		Depth varied curve
Developed Area		Depth varied curve
Woody Area		Depth varied curve
Road		Depth varied curve

- Material coverage plot

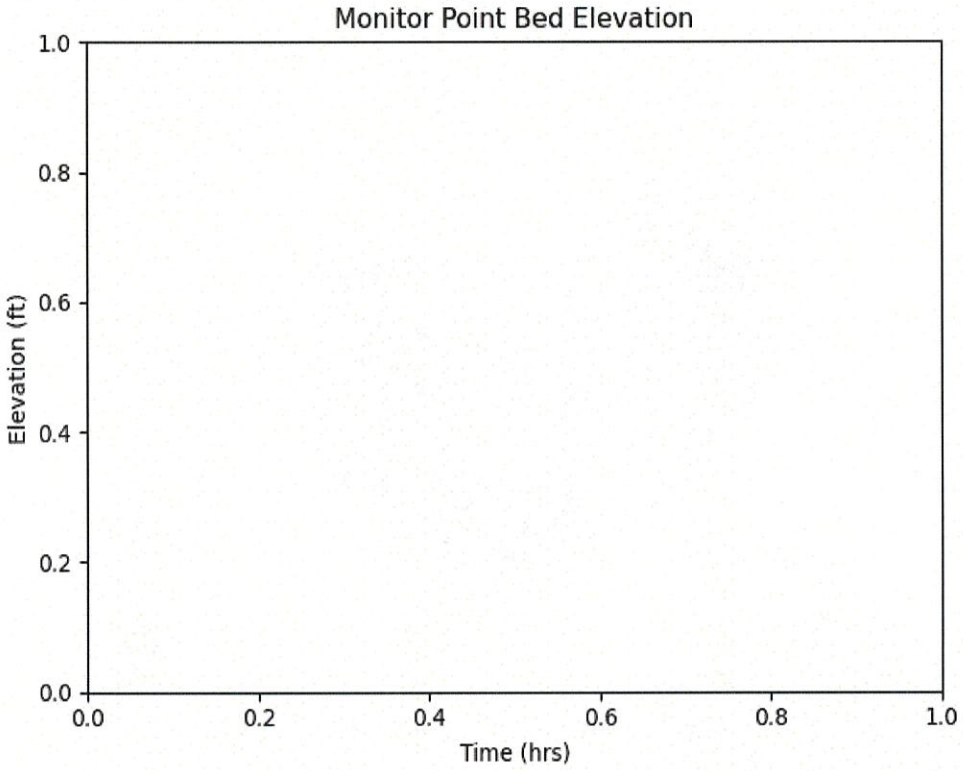


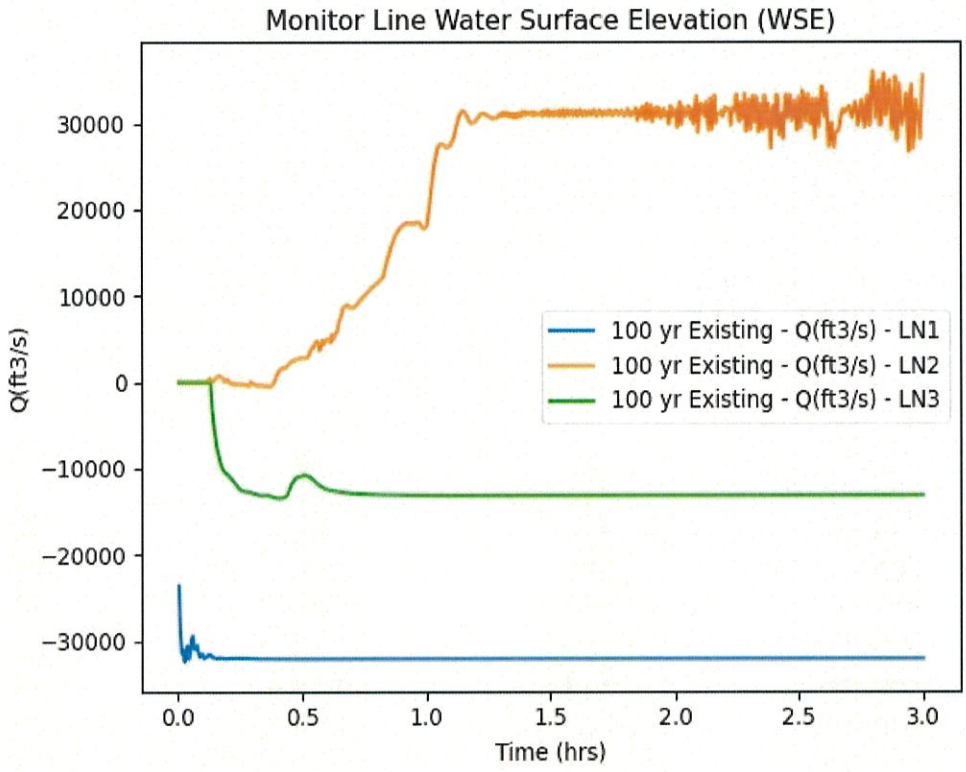
Simulation summary

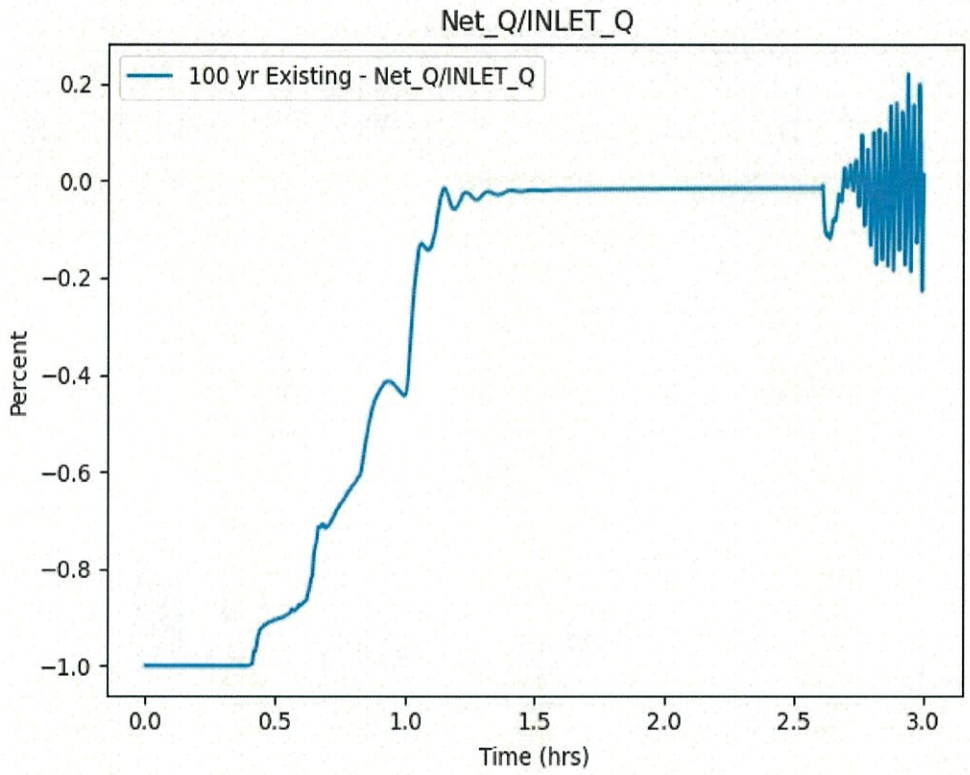
- Simulation name: Trask Simulation (Existing 100 yr)
  - Summary of model controls
    - Simulation type: Flow
    - Start time (hours): 0.0
    - Time step (seconds): 0.2
    - End time (hours): 3.0
    - Initial condition: Dry
    - Initial value: NA
    - Turbulence model: Parabolic
    - Turbulence parameter: 0.7
    - Unsteady output: True
    - Pressure dataset: NA
    - Output method: Specified Frequency
    - Output frequency: 0.5 (Hours)

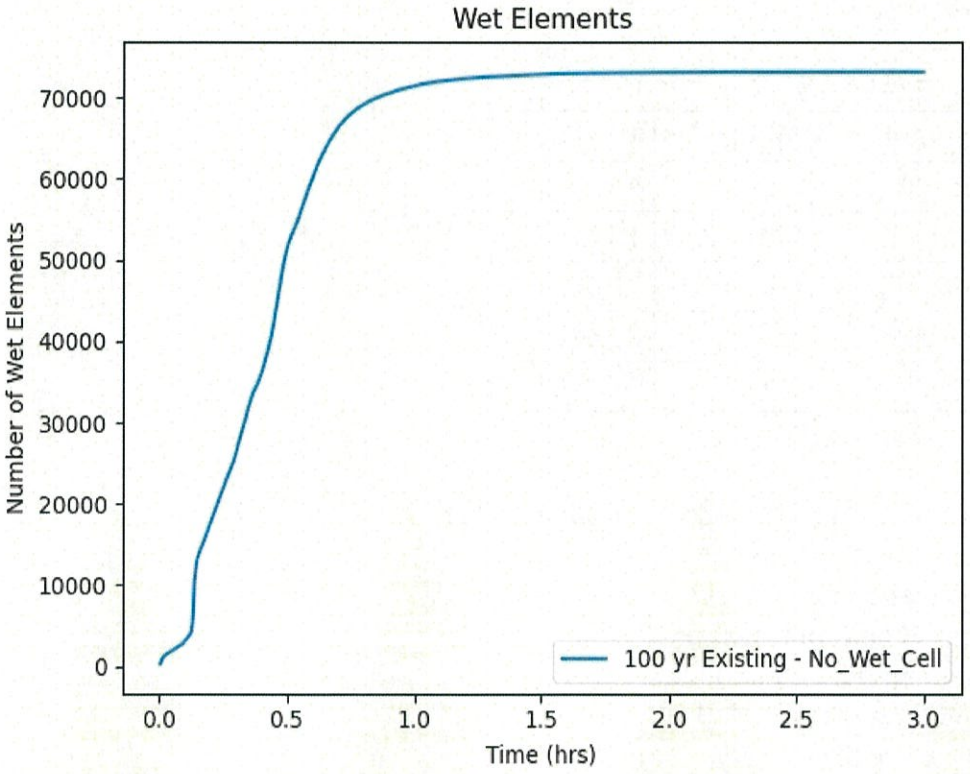
  - Mesh used: "Trask Mesh Existing"
  - Boundary condition coverage used: "Boundary Conditions - 100 yr (FIS)"
  - Obstructions coverage used: None
  - Materials coverage used: "Materials with buildings"
  - Monitor coverage used: "Monitor"

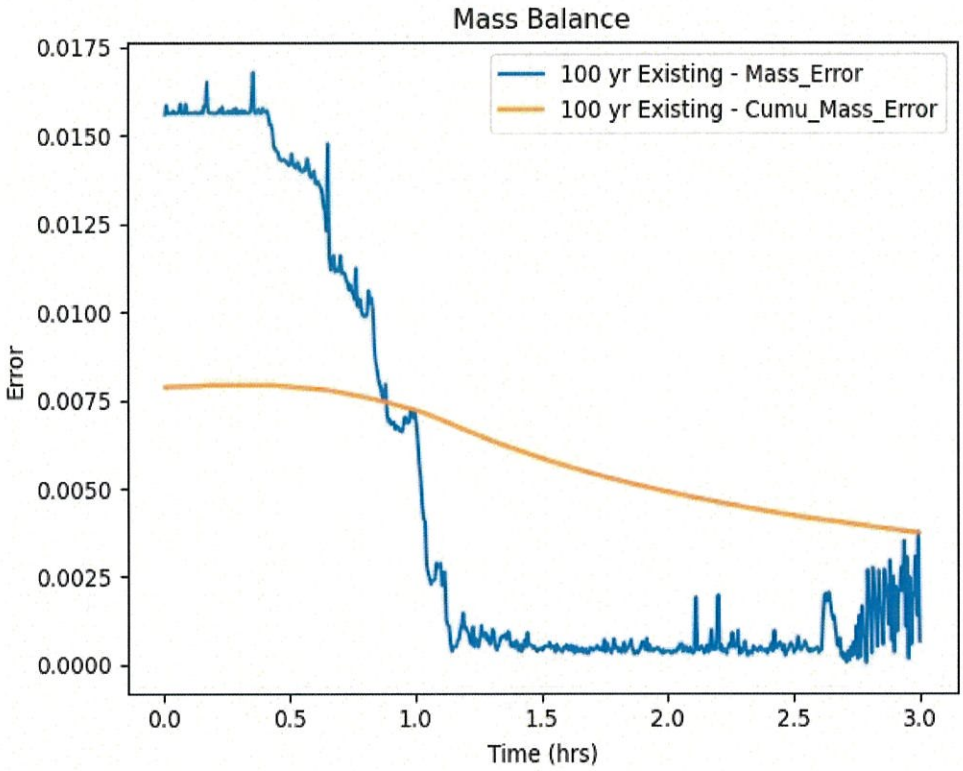
- Solution plots






Net_Q/INLET_Q
100 yr Existing - Net_Q/INLET_Q
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
Percent
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)


Wet Elements
70000
60000
50000
40000
30000
20000
10000
0
Number of Wet Elements
100 yr Existing - No_Wet_Cell
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)



- CPU time (hours): 3.906
- Results:

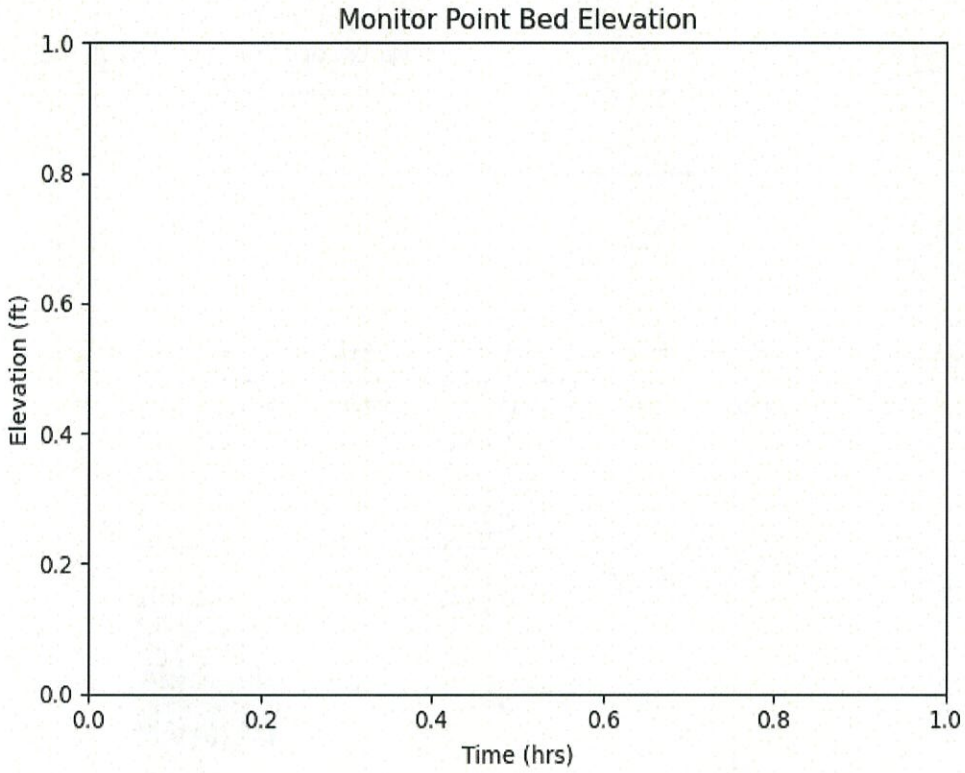
SRH-2D version: 3.3.0

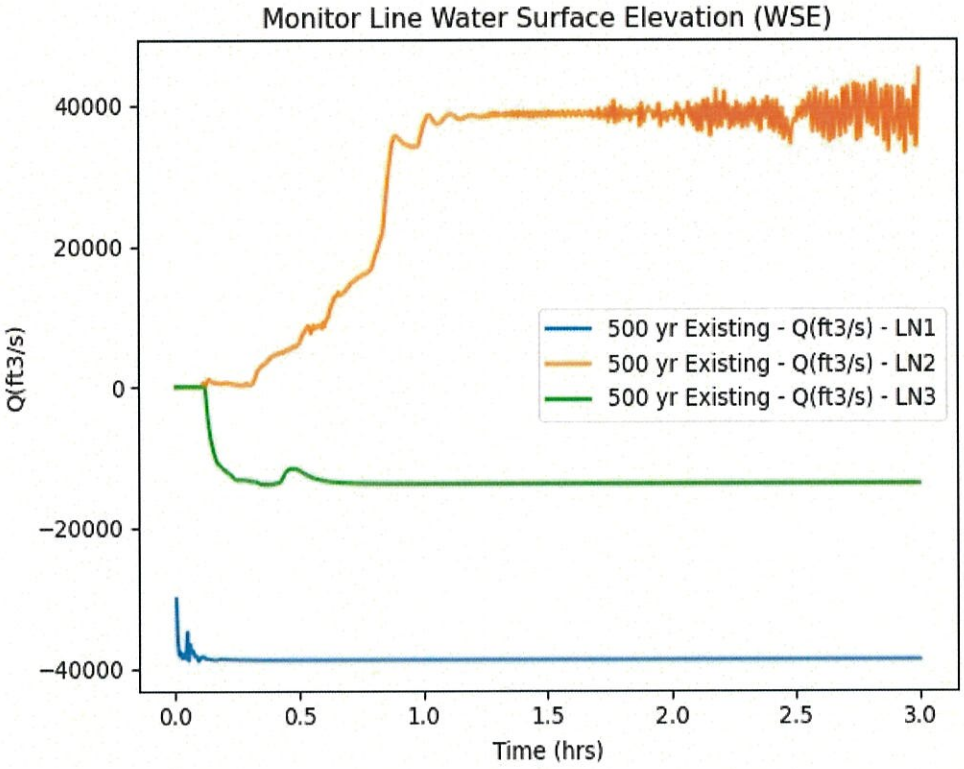
Dataset	Minimum	Maximum
B_Stress_lb_p_ft	0.0	4.41
Froude	0.0	1.787
Vel_Mag_ft_p_s	0.0	11.98
Water_Depth_ft	-5.5	29.454
Water_Elev_ft	9.196	32.173

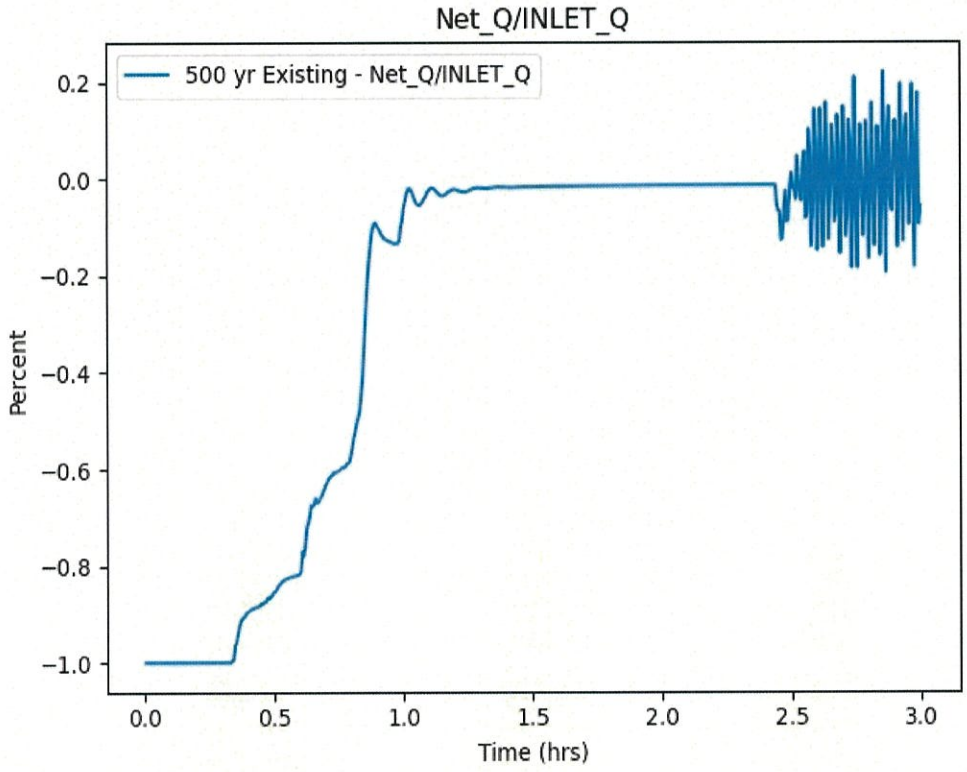
- Simulation name: Trask Simulation (Existing 500 yr)
  - Summary of model controls
    - Simulation type: Flow
    - Start time (hours): 0.0
    - Time step (seconds): 0.2
    - End time (hours): 3.0
    - Initial condition: Dry
    - Initial value: NA
    - Turbulence model: Parabolic
    - Turbulence parameter: 0.7
    - Unsteady output: True
    - Pressure dataset: NA
    - Output method: Specified Frequency

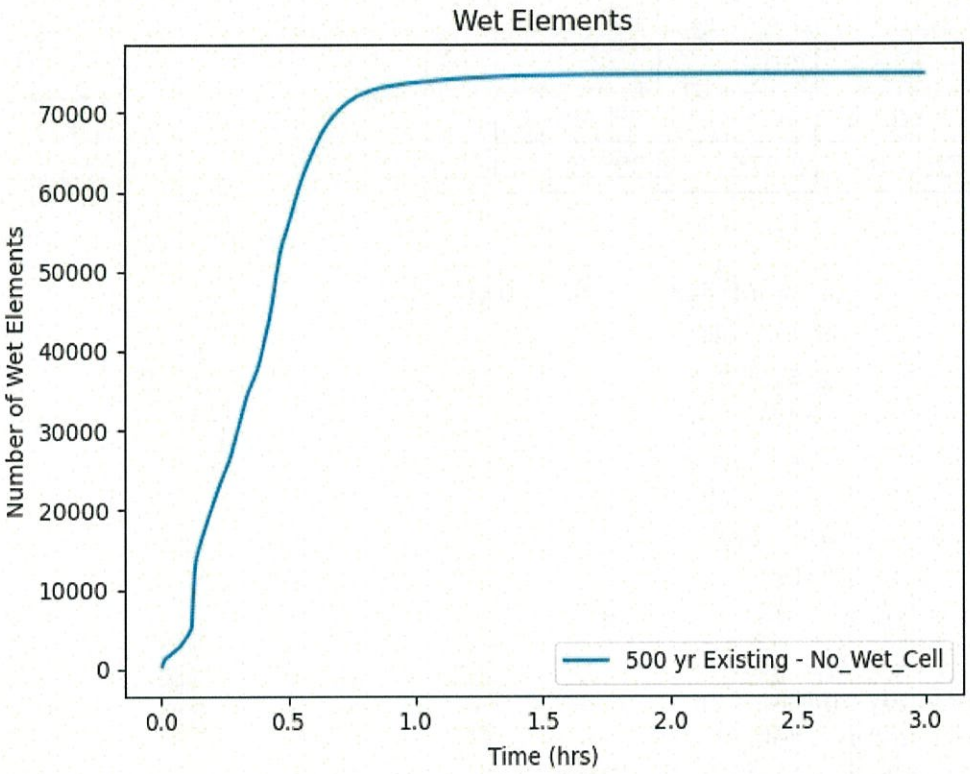
    - Output frequency: 0.5 (Hours)

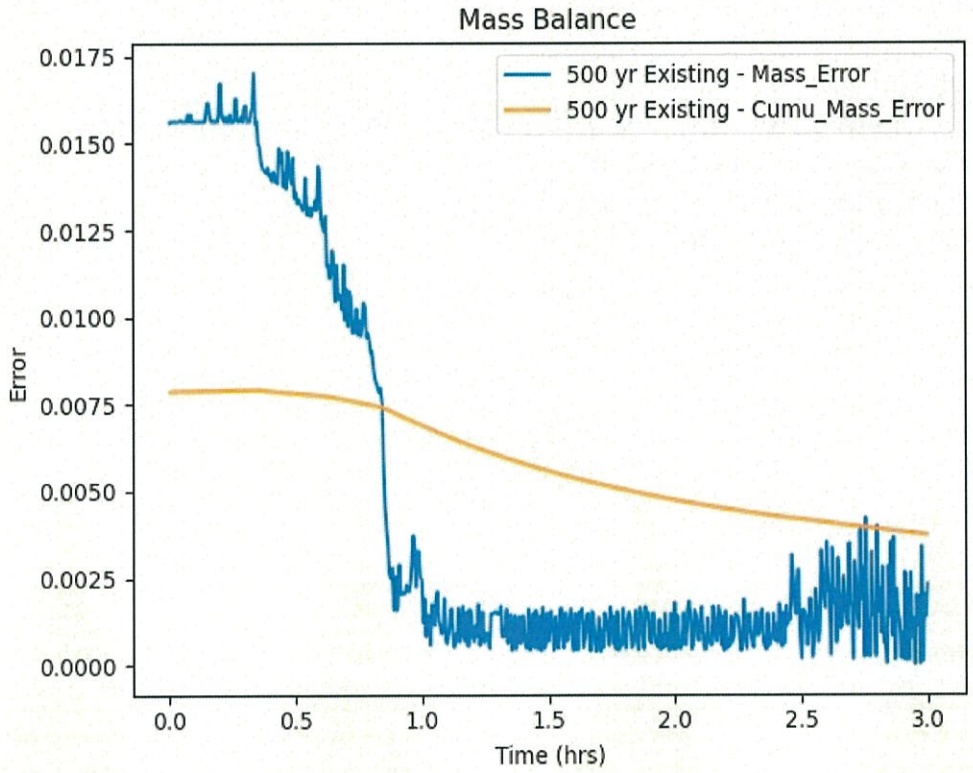
- Mesh used: "Trask Mesh Existing"
- Boundary condition coverage used: "Boundary Conditions - 500 yr (FIS)"
- Obstructions coverage used: None
- Materials coverage used: "Materials with buildings"
- Monitor coverage used: "Monitor"
- Solution plots




Monitor Line Water Surface Elevation (WSE)
40000
20000
0
−20000
−40000
Q(ft3/s)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)
500 yr Existing - Q(ft3/s) - LN1
500 yr Existing - Q(ft3/s) - LN2
500 yr Existing - Q(ft3/s) - LN3


Net_Q/INLET_Q
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
Percent
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)
500 yr Existing - Net_Q/INLET_Q





- CPU time (hours): 2.391
- Results:

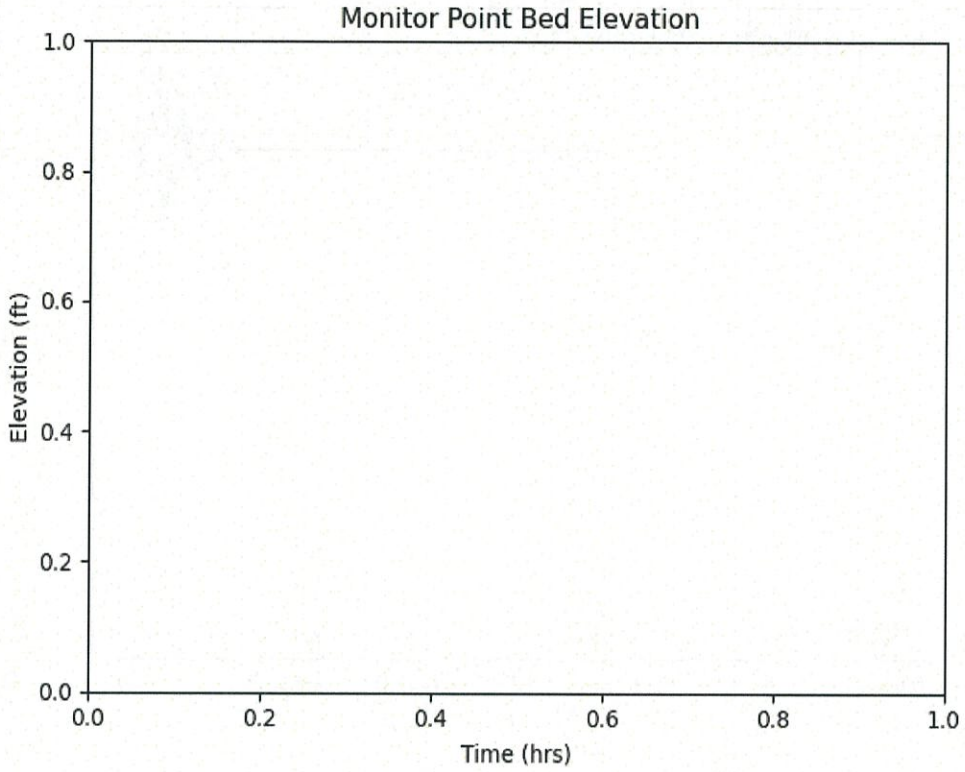
SRH-2D version: 3.3.0

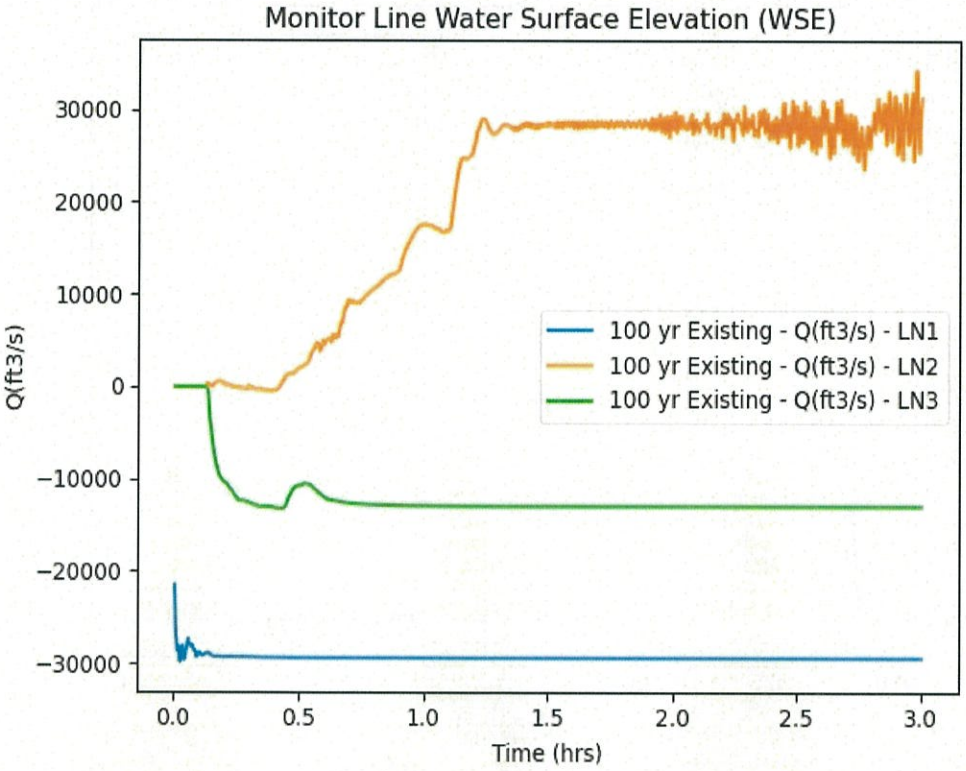
Dataset	Minimum	Maximum
B_Stress_lb_p_ft	0.0	5.187

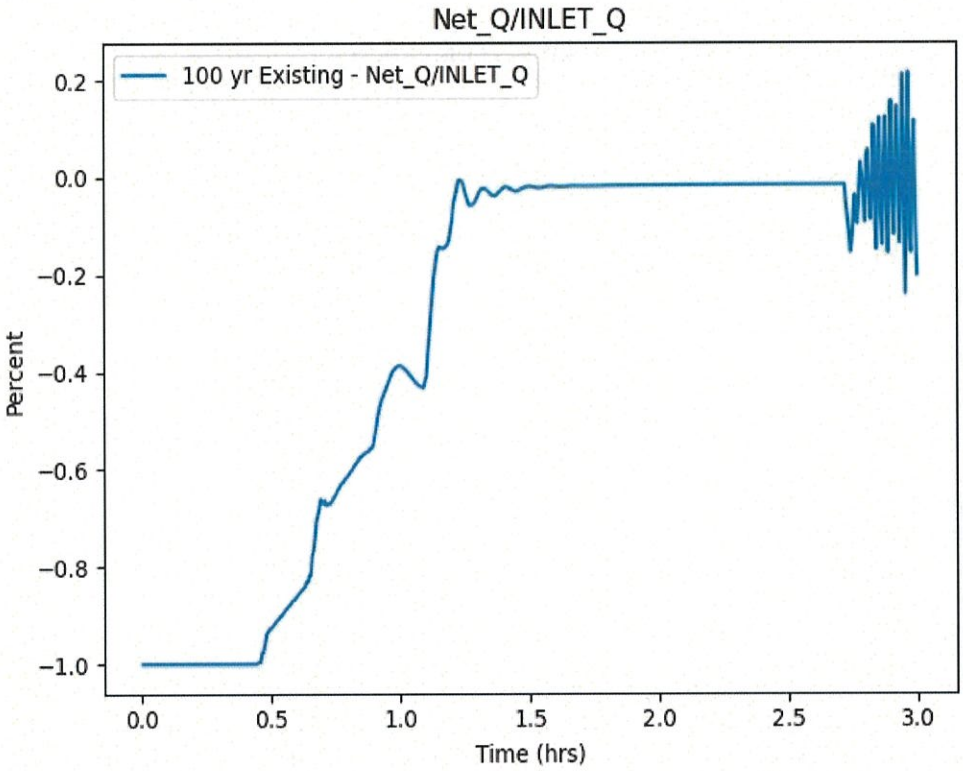
Froude	0.0	1.734
Vel_Mag_ft_p_s	0.0	11.314
Water_Depth_ft	-5.447	29.561
Water_Elev_ft	8.375	32.681

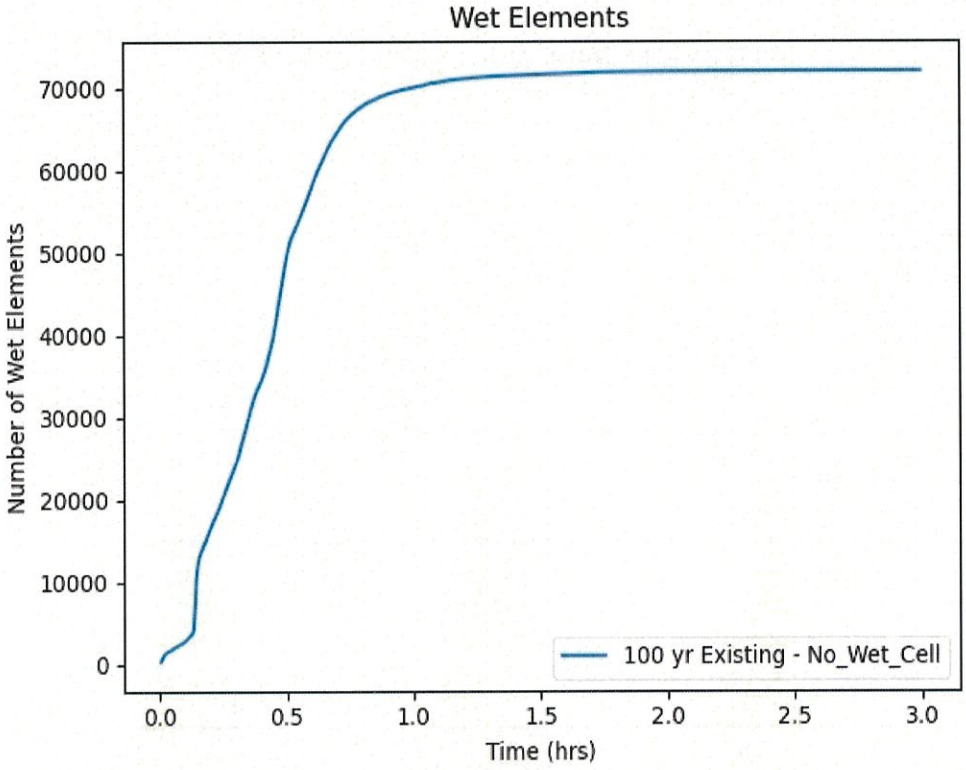
- Simulation name: Trask Simulation (Existing 50 yr)
  - Summary of model controls
    - Simulation type: Flow
    - Start time (hours): 0.0
    - Time step (seconds): 0.2
    - End time (hours): 3.0
    - Initial condition: Dry
    - Initial value: NA
    - Turbulence model: Parabolic
    - Turbulence parameter: 0.7
    - Unsteady output: True
    - Pressure dataset: NA
    - Output method: Specified Frequency
    - Output frequency: 0.5 (Hours)
  - Mesh used: "Trask Mesh Existing"
  - Boundary condition coverage used: "Boundary Conditions - 50 yr (FIS)"
  - Obstructions coverage used: None
  - Materials coverage used: "Materials with buildings"
  - Monitor coverage used: "Monitor"

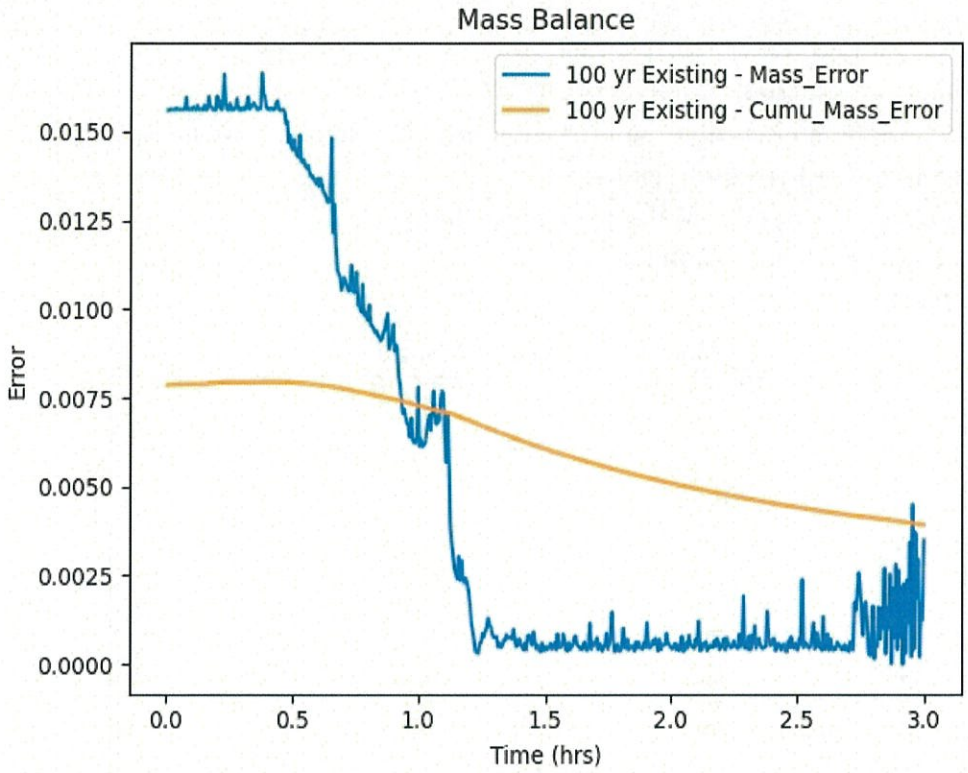
- Solution plots






Net_Q/INLET_Q
100 yr Existing - Net_Q/INLET_Q
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
Percent
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)


Wet Elements
70000
60000
50000
40000
30000
20000
10000
0
Number of Wet Elements
100 yr Existing - No_Wet_Cell
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)



- CPU time (hours): 3.909
- Results:

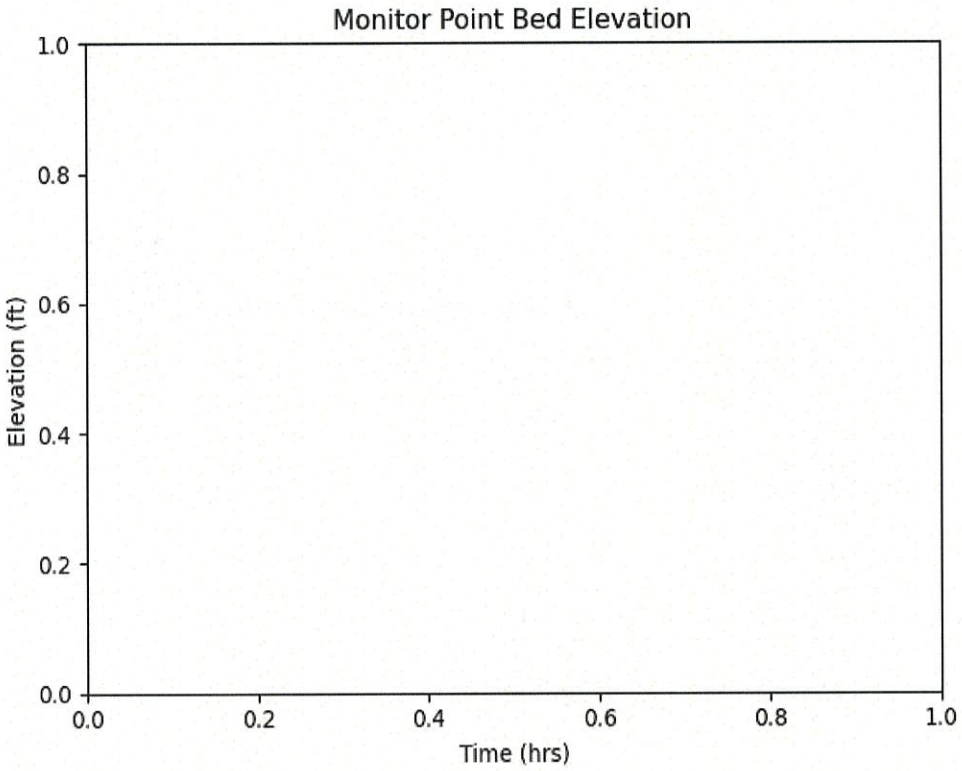
SRH-2D version: 3.3.0

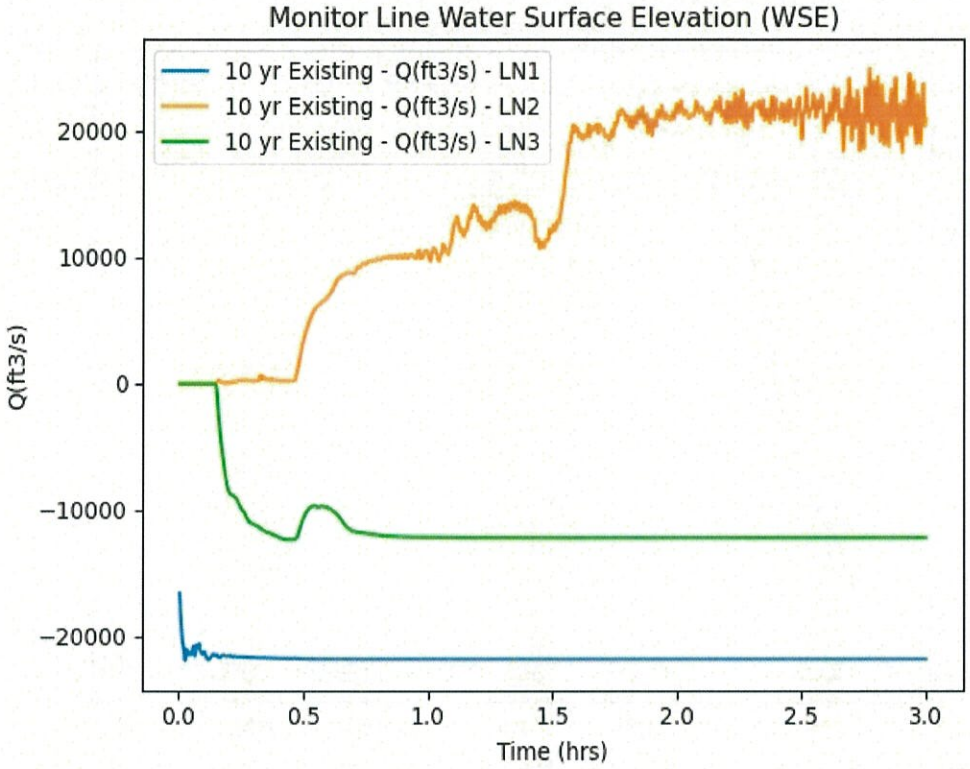
Dataset	Minimum	Maximum
B_Stress_lb_p_ft	0.0	4.106
Froude	0.0	1.686
Vel_Mag_ft_p_s	0.0	11.403
Water_Depth_ft	-5.543	29.397
Water_Elev_ft	9.629	31.951

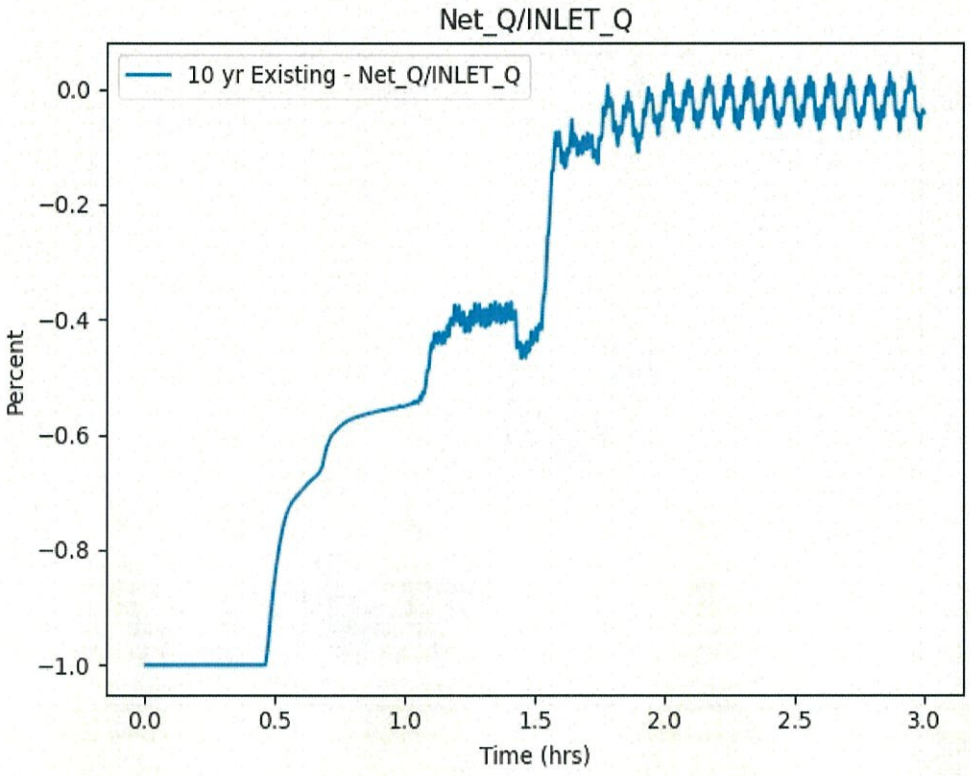
- Simulation name: Trask Simulation (Existing 10 yr)
  - Summary of model controls
    - Simulation type: Flow
    - Start time (hours): 0.0
    - Time step (seconds): 0.2
    - End time (hours): 3.0
    - Initial condition: Dry
    - Initial value: NA
    - Turbulence model: Parabolic
    - Turbulence parameter: 0.7
    - Unsteady output: True
    - Pressure dataset: NA
    - Output method: Specified Frequency

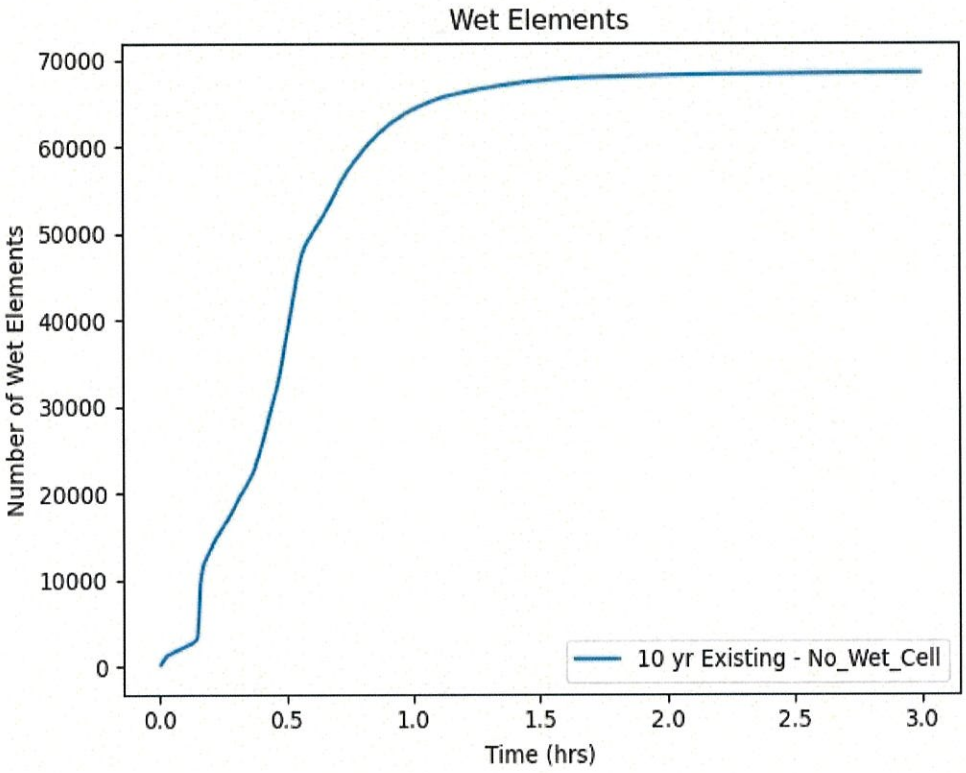
    - Output frequency: 0.5 (Hours)

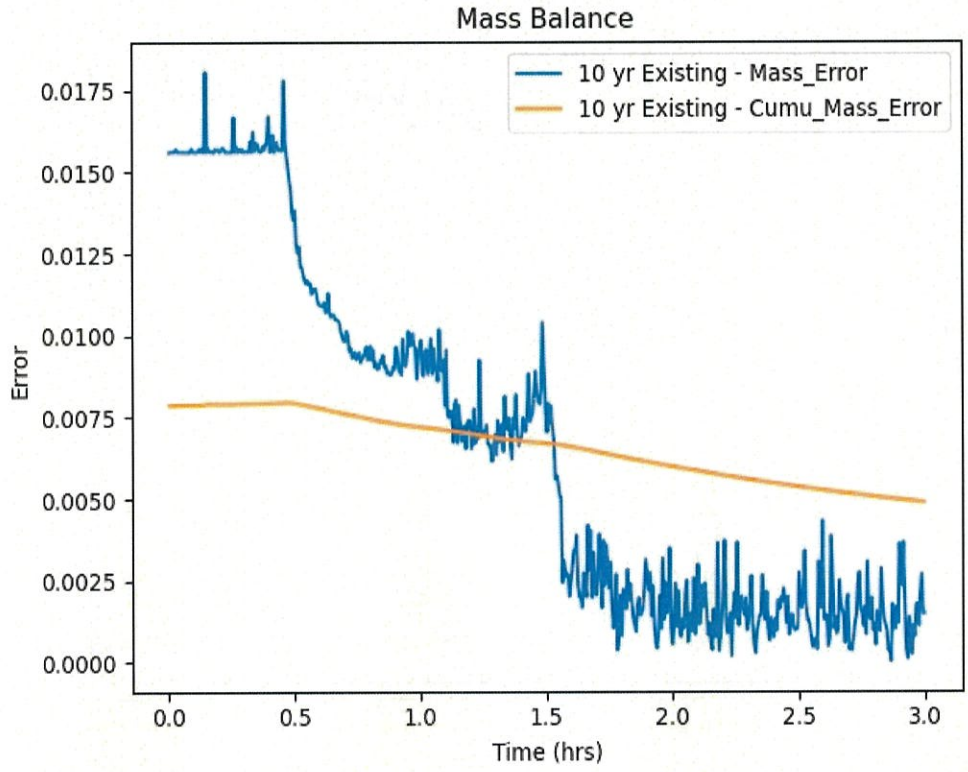
- Mesh used: "Trask Mesh Existing"
- Boundary condition coverage used: "Boundary Conditions - 10 yr (FIS)"
- Obstructions coverage used: None
- Materials coverage used: "Materials with buildings"
- Monitor coverage used: "Monitor"
- Solution plots




Monitor Line Water Surface Elevation (WSE)
10 yr Existing - Q(ft3/s) - LN1
10 yr Existing - Q(ft3/s) - LN2
10 yr Existing - Q(ft3/s) - LN3
Q(ft3/s)
20000
10000
0
−10000
−20000
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)


Net_Q/INLET_Q
10 yr Existing - Net_Q/INLET_Q
Percent
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)





- CPU time (hours): 3.868
- Results:

SRH-2D version: 3.3.0

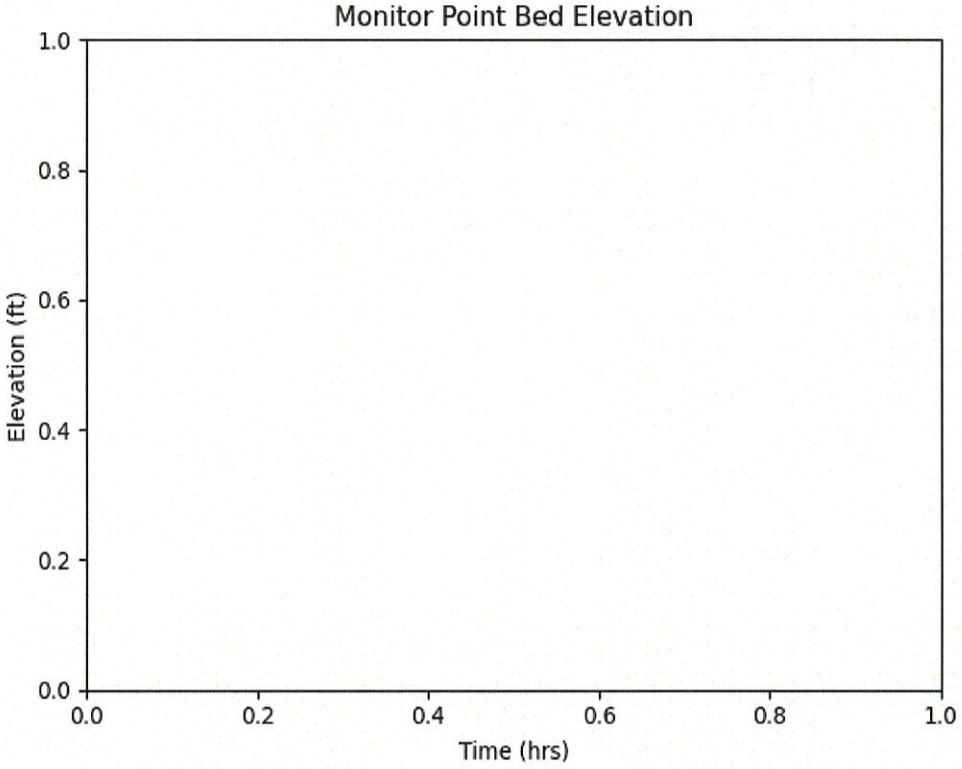
Dataset	Minimum	Maximum
B_Stress_lb_p_ft	0.0	4.992

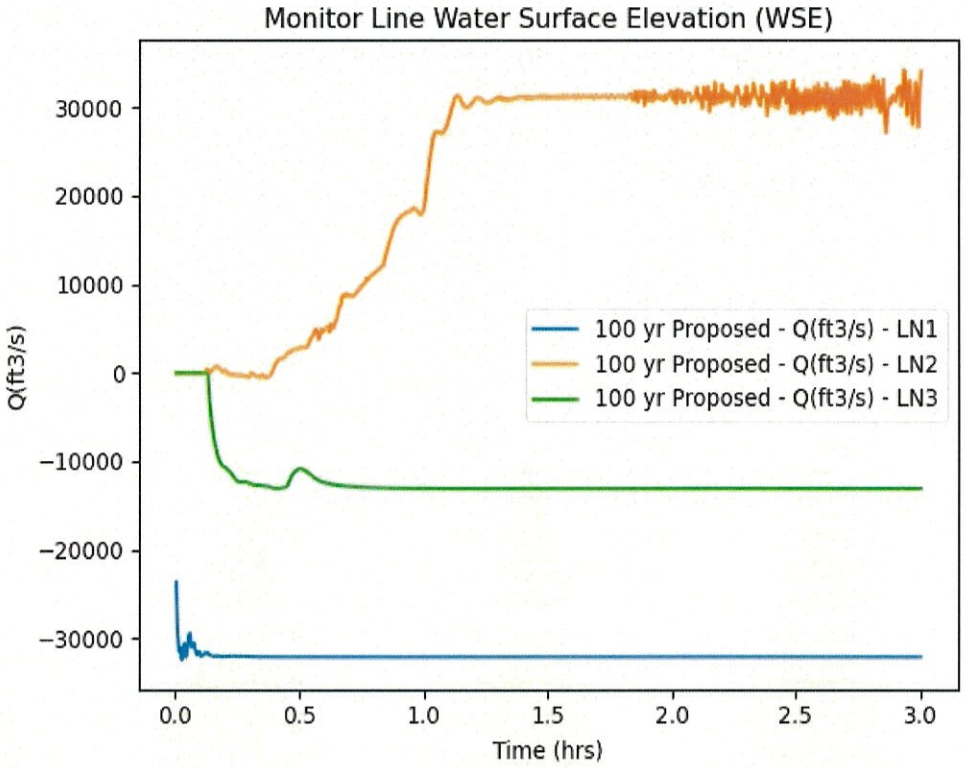
Froude	0.0	1.652
Vel_Mag_ft_p_s	0.0	11.73
Water_Depth_ft	-6.604	29.225
Water_Elev_ft	7.882	31.182

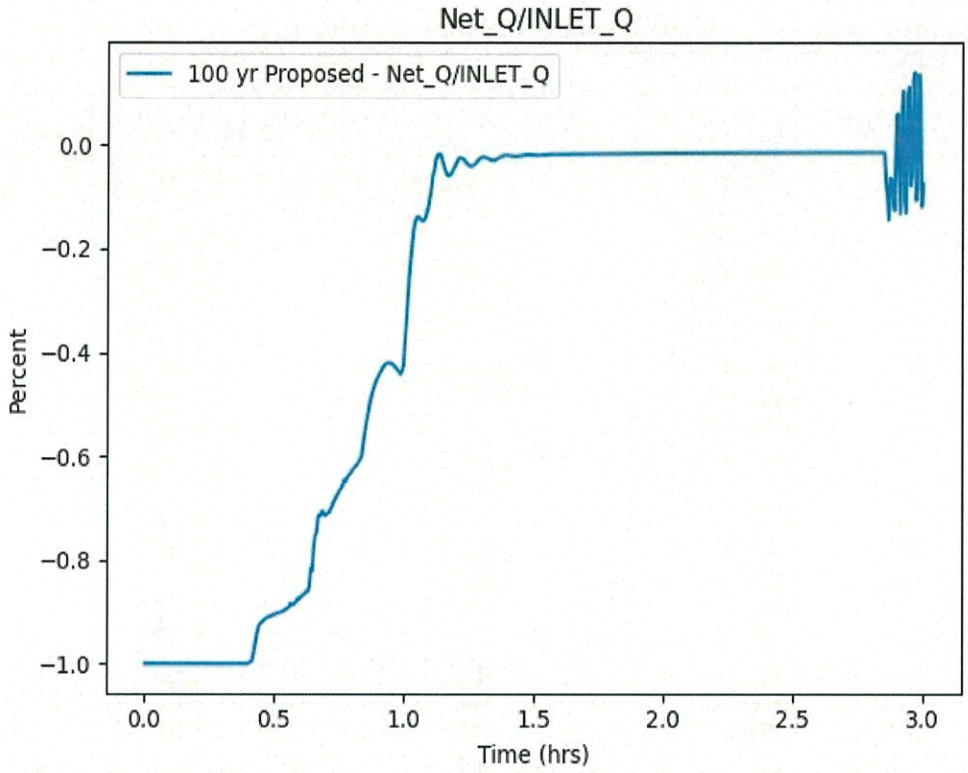
- Simulation name: Trask Simulation (Proposed 100)
  - Summary of model controls
    - Simulation type: Flow
    - Start time (hours): 0.0
    - Time step (seconds): 0.2
    - End time (hours): 3.0
    - Initial condition: Dry
    - Initial value: NA
    - Turbulence model: Parabolic
    - Turbulence parameter: 0.7
    - Unsteady output: True
    - Pressure dataset: NA
    - Output method: Specified Frequency
    - Output frequency: 0.5 (Hours)

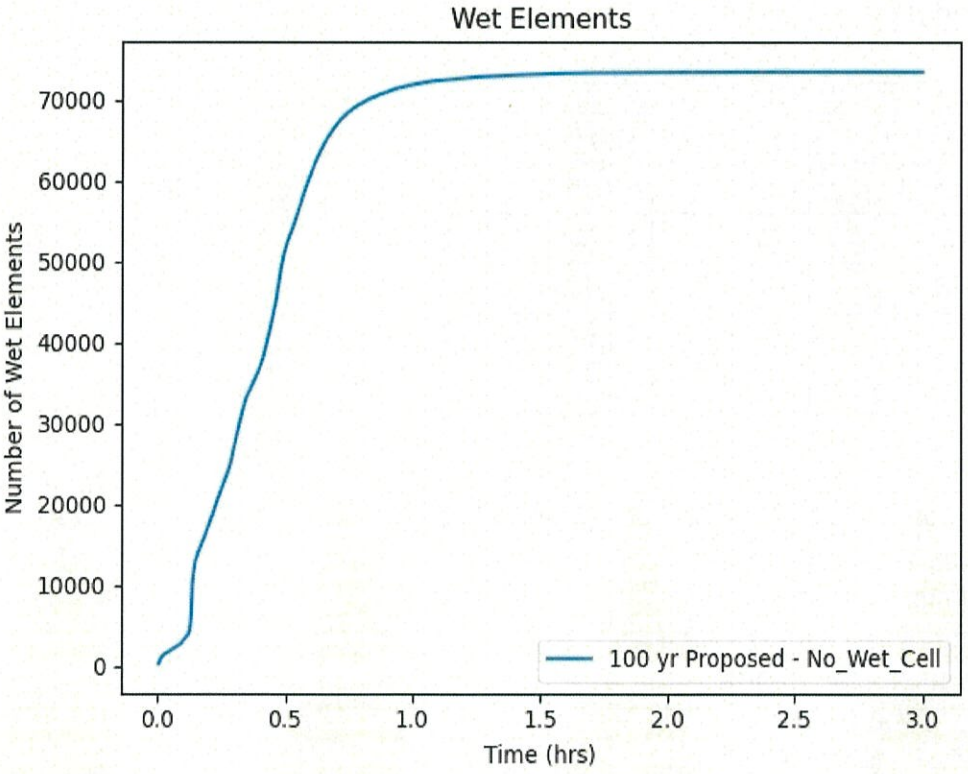
  - Mesh used: "Trask Mesh Proposed"
  - Boundary condition coverage used: "Boundary Conditions - 100 yr (FIS)"
  - Obstructions coverage used: None
  - Materials coverage used: "Materials with buildings"
  - Monitor coverage used: "Monitor"

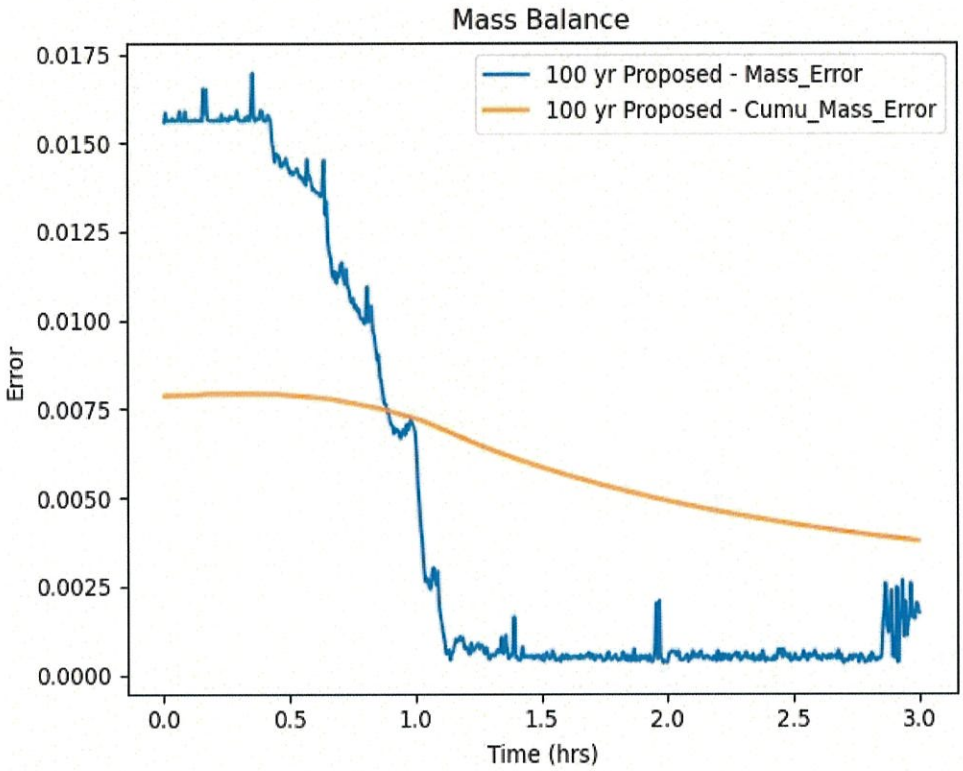
- Solution plots






Net_Q/INLET_Q
100 yr Proposed - Net_Q/INLET_Q
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
Percent
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)


Wet Elements
70000
60000
50000
40000
30000
20000
10000
0
Number of Wet Elements
100 yr Proposed - No_Wet_Cell
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)



- CPU time (hours): 3.917
- Results:

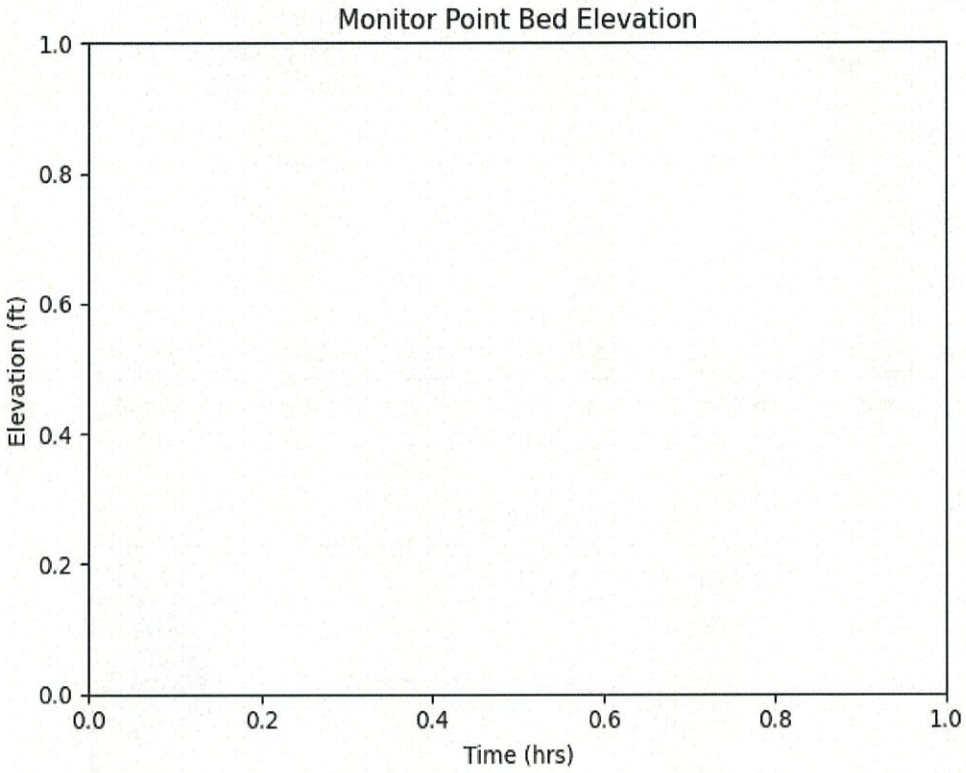
SRH-2D version: 3.3.0

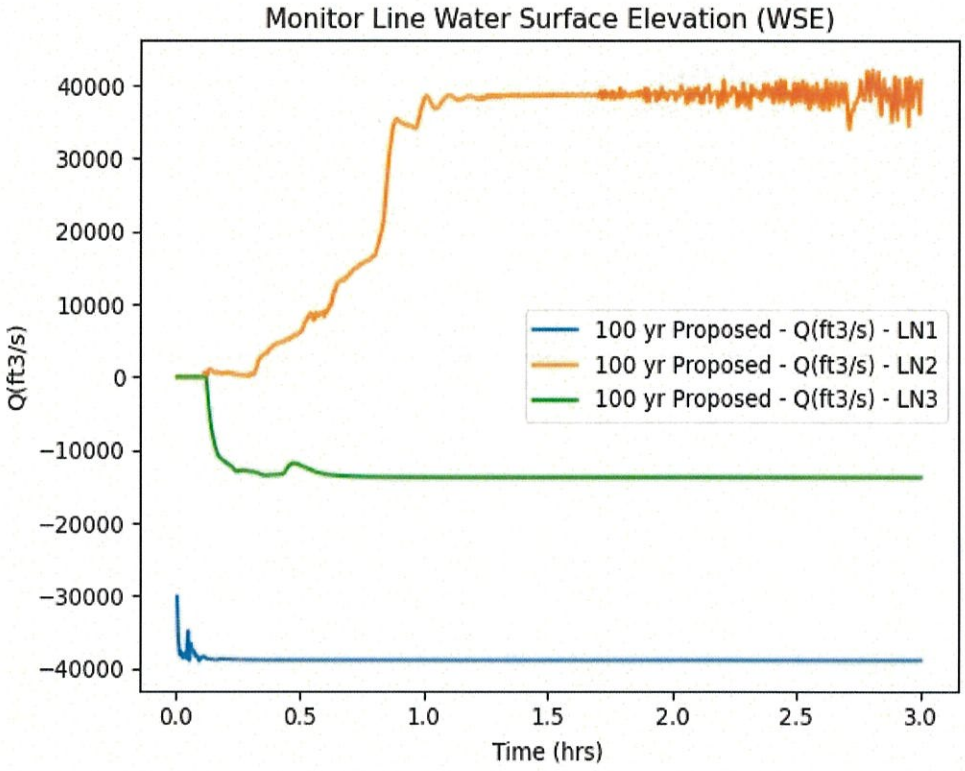
Dataset	Minimum	Maximum
B_Stress_lb_p_ft	0.0	4.405
Froude	0.0	1.684
Vel_Mag_ft_p_s	0.0	11.917
Water_Depth_ft	-5.504	29.486
Water_Elev_ft	9.718	32.173

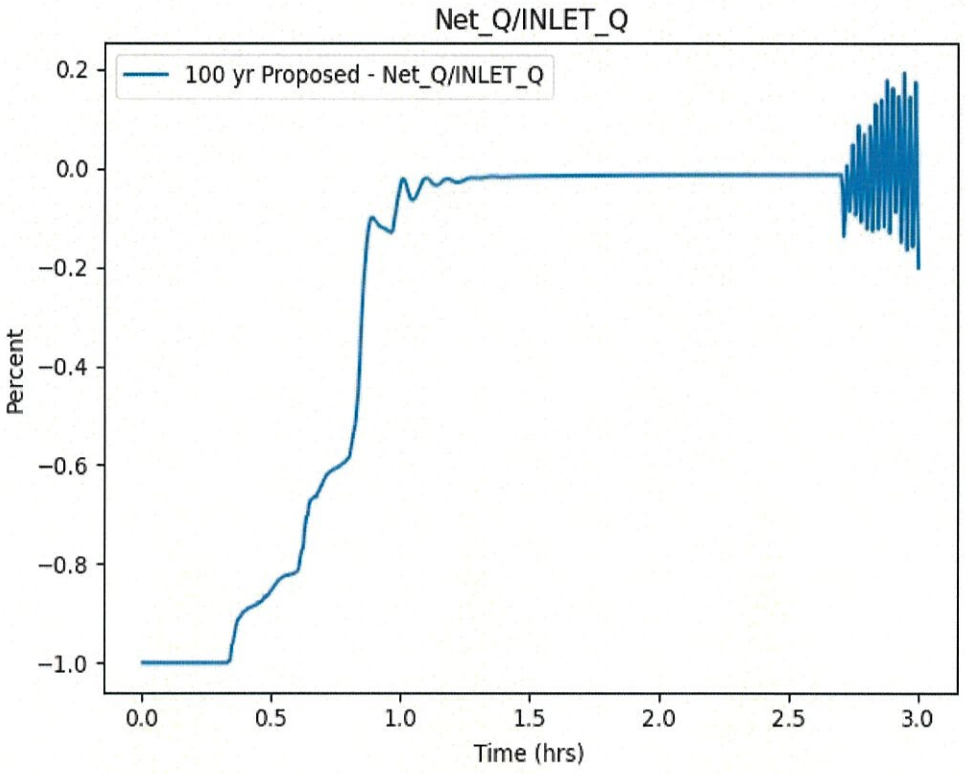
- Simulation name: Trask Simulation (Proposed 500)
  - Summary of model controls
    - Simulation type: Flow
    - Start time (hours): 0.0
    - Time step (seconds): 0.2
    - End time (hours): 3.0
    - Initial condition: Dry
    - Initial value: NA
    - Turbulence model: Parabolic
    - Turbulence parameter: 0.7
    - Unsteady output: True
    - Pressure dataset: NA
    - Output method: Specified Frequency

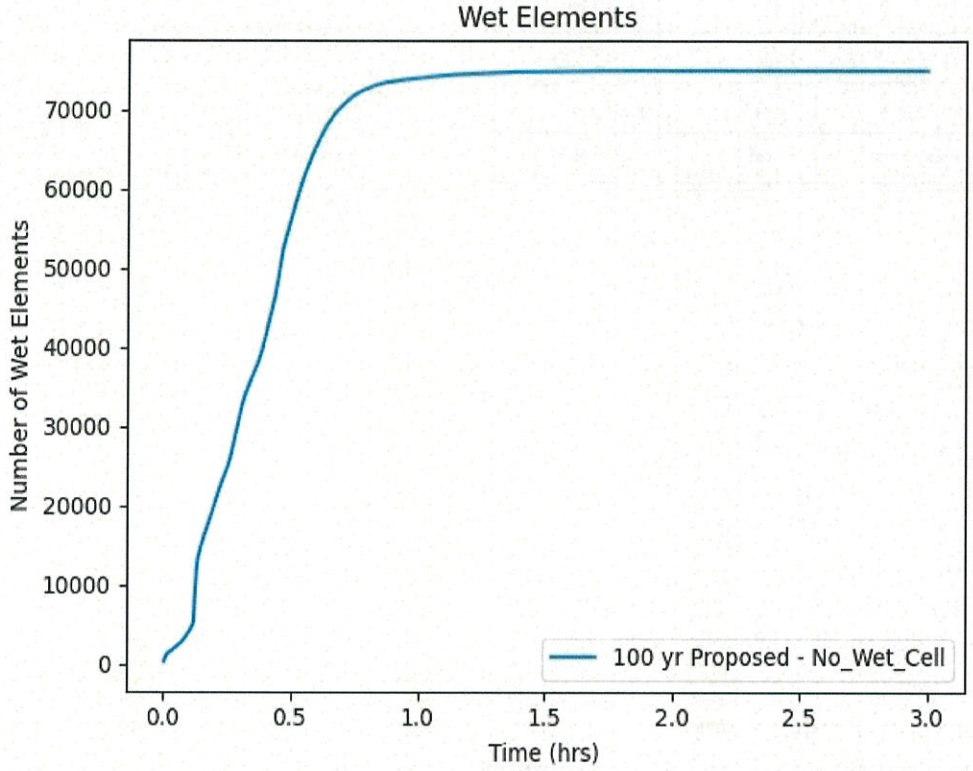
    - Output frequency: 0.5 (Hours)

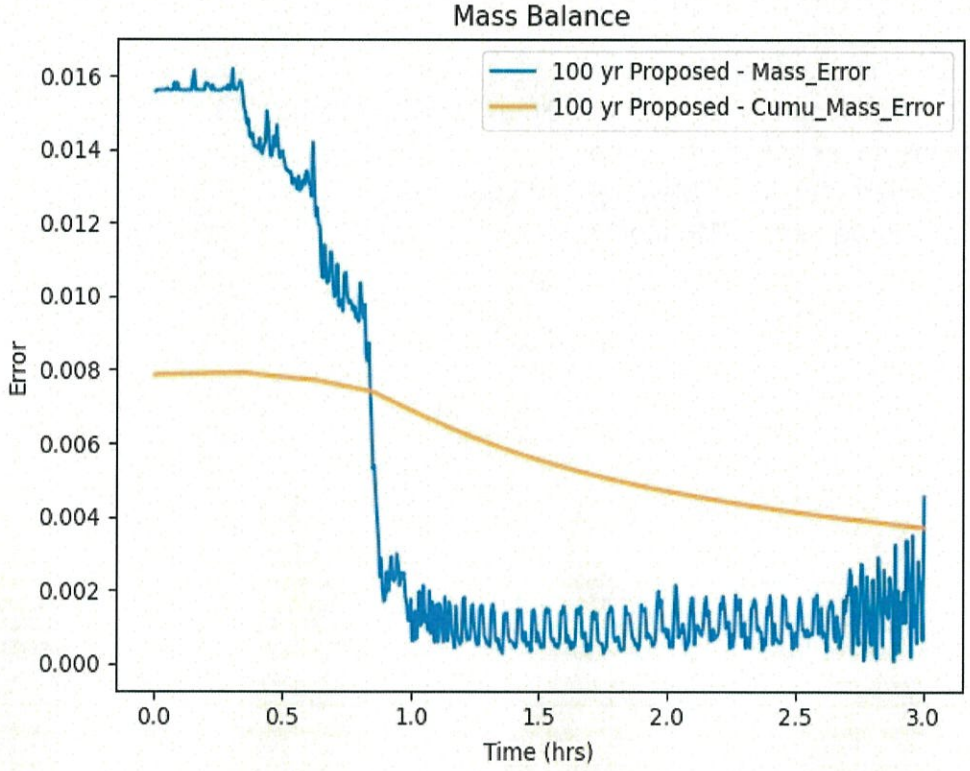
- Mesh used: "Trask Mesh Proposed"
- Boundary condition coverage used: "Boundary Conditions - 500 yr (FIS)"
- Obstructions coverage used: None
- Materials coverage used: "Materials with buildings"
- Monitor coverage used: "Monitor"
- Solution plots




Monitor Line Water Surface Elevation (WSE)
Q(ft3/s)
40000
30000
20000
10000
0
−10000
−20000
−30000
−40000
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)
100 yr Proposed - Q(ft3/s) - LN1
100 yr Proposed - Q(ft3/s) - LN2
100 yr Proposed - Q(ft3/s) - LN3


Net_Q/INLET_Q
Percent
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)
100 yr Proposed - Net_Q/INLET_Q





- CPU time (hours): 3.819
- Results:

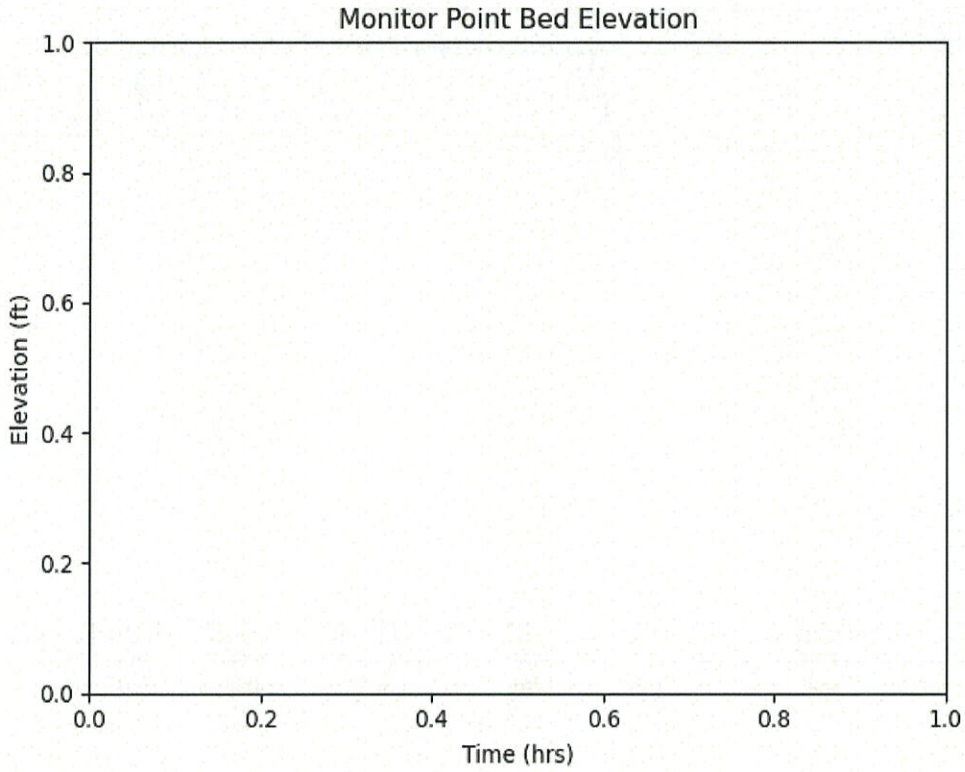
SRH-2D version: 3.3.0

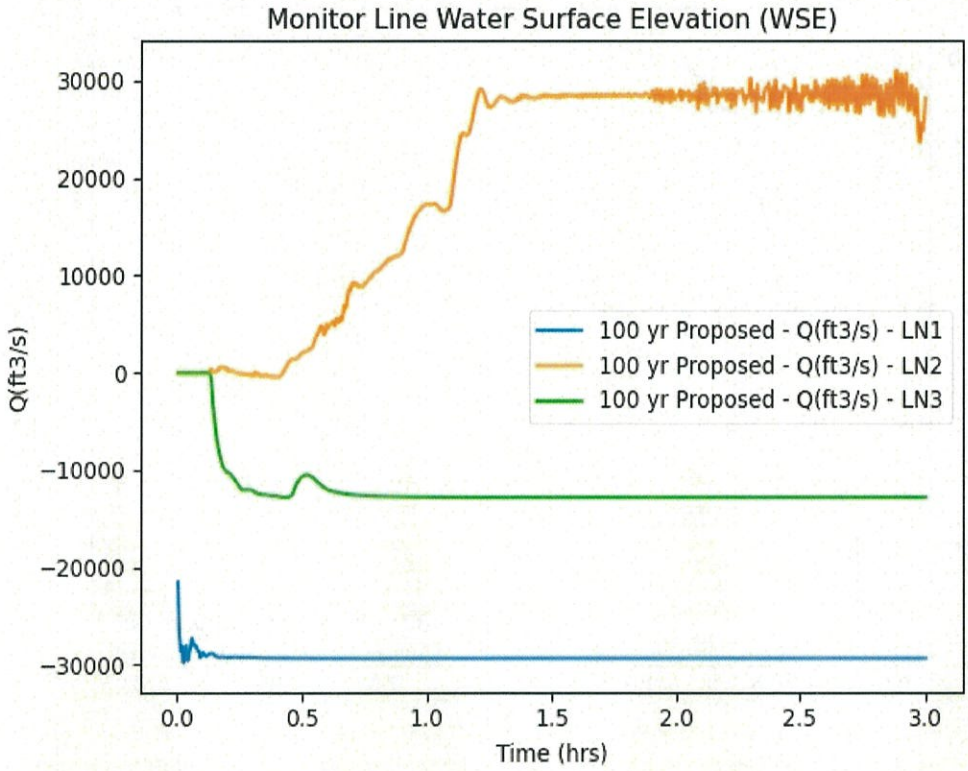
Dataset	Minimum	Maximum
B_Stress_lb_p_ft	0.0	5.184

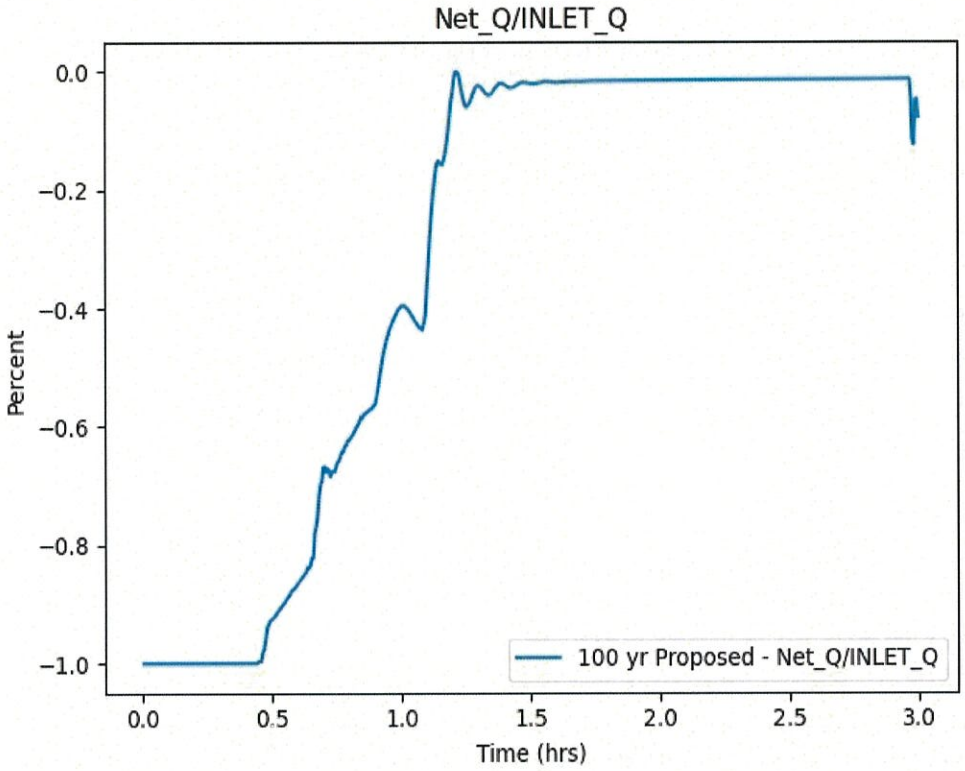
Froude	0.0	1.735
Vel_Mag_ft_p_s	0.0	11.312
Water_Depth_ft	-5.441	29.59
Water_Elev_ft	9.147	32.681

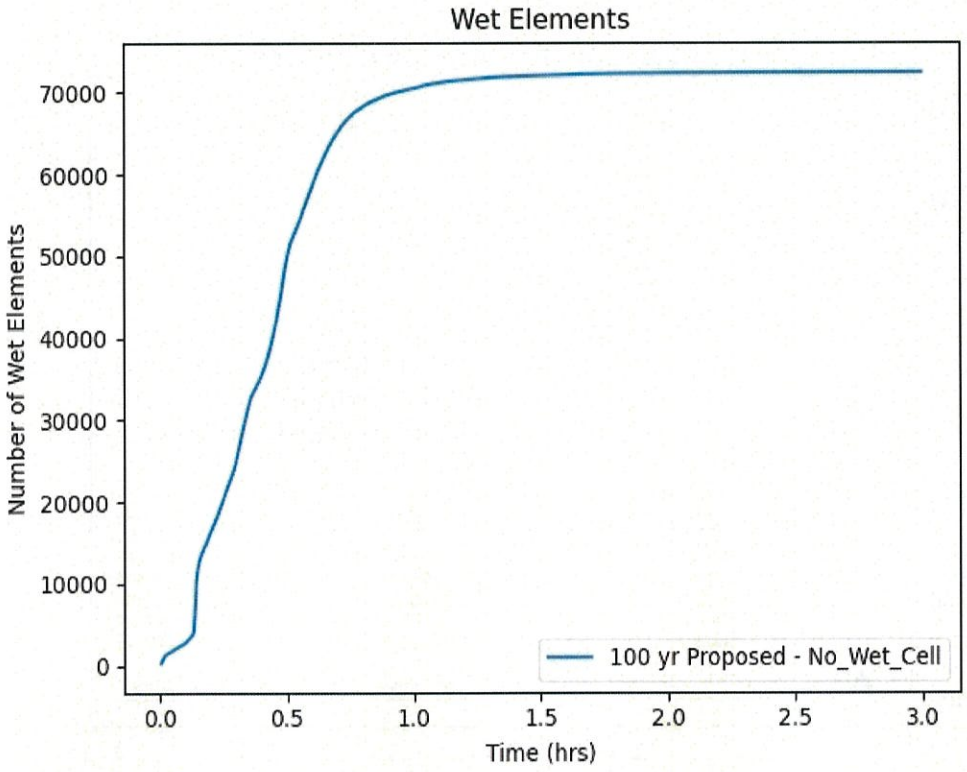
- Simulation name: Trask Simulation (Proposed 50)
  - Summary of model controls
    - Simulation type: Flow
    - Start time (hours): 0.0
    - Time step (seconds): 0.2
    - End time (hours): 3.0
    - Initial condition: Dry
    - Initial value: NA
    - Turbulence model: Parabolic
    - Turbulence parameter: 0.7
    - Unsteady output: True
    - Pressure dataset: NA
    - Output method: Specified Frequency
    - Output frequency: 0.5 (Hours)
  - Mesh used: "Trask Mesh Proposed"
  - Boundary condition coverage used: "Boundary Conditions - 50 yr (FIS)"
  - Obstructions coverage used: None
  - Materials coverage used: "Materials with buildings"
  - Monitor coverage used: "Monitor"

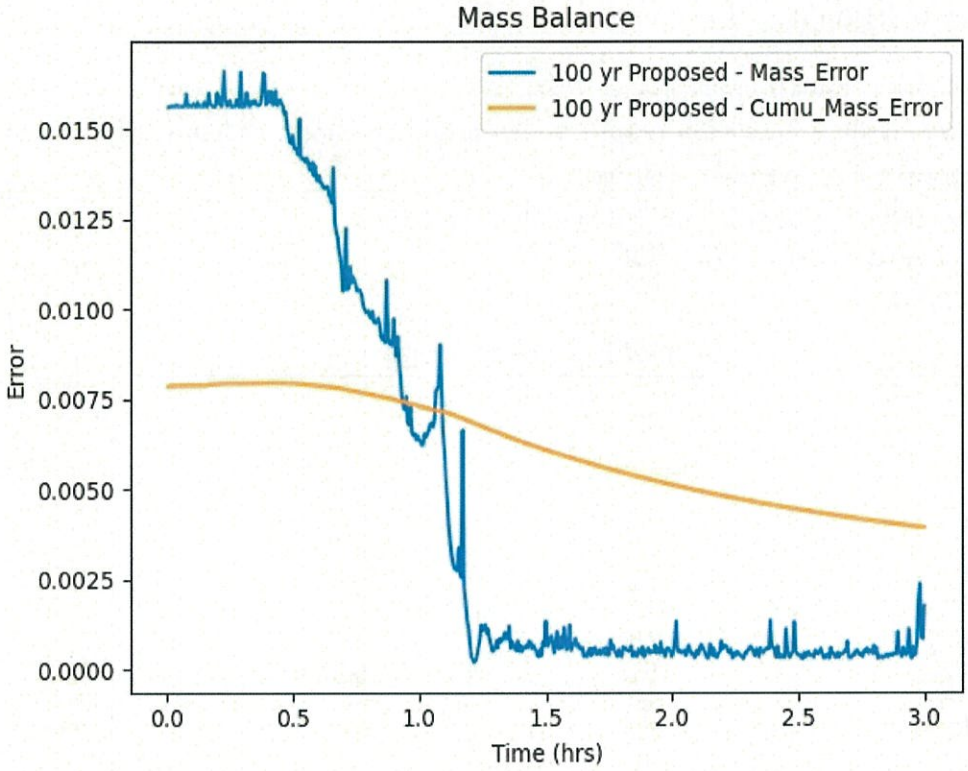
- Solution plots






Net_Q/INLET_Q
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
Percent
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)
100 yr Proposed - Net_Q/INLET_Q


Wet Elements
70000
60000
50000
40000
30000
20000
10000
0
Number of Wet Elements
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)
100 yr Proposed - No_Wet_Cell



- CPU time (hours): 3.875
- Results:

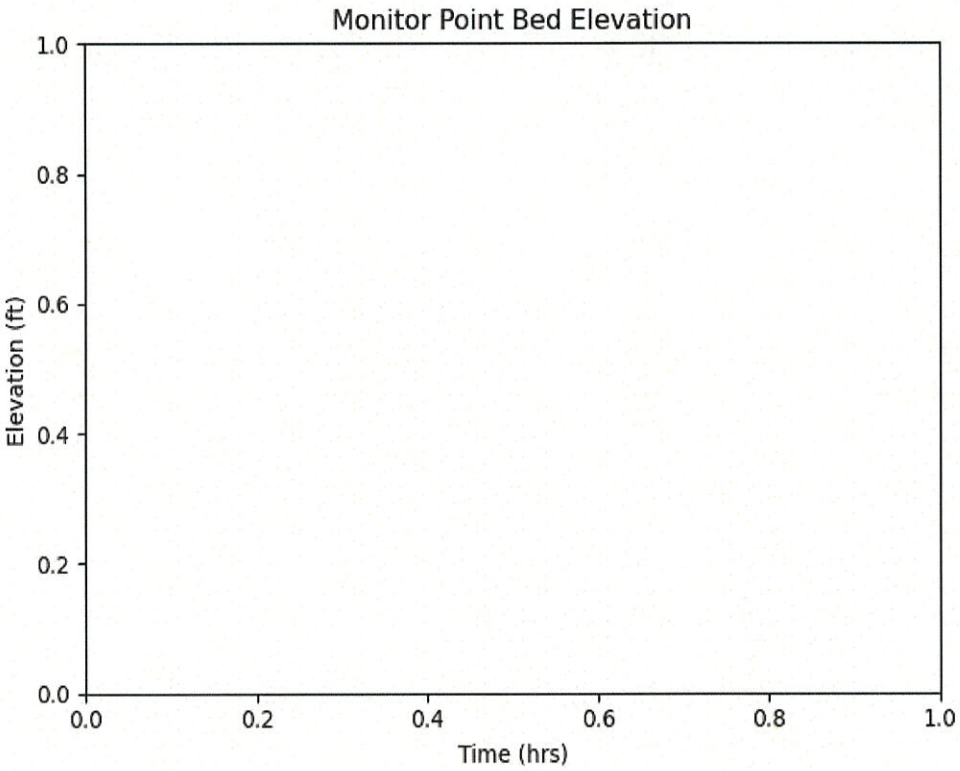
SRH-2D version: 3.3.0

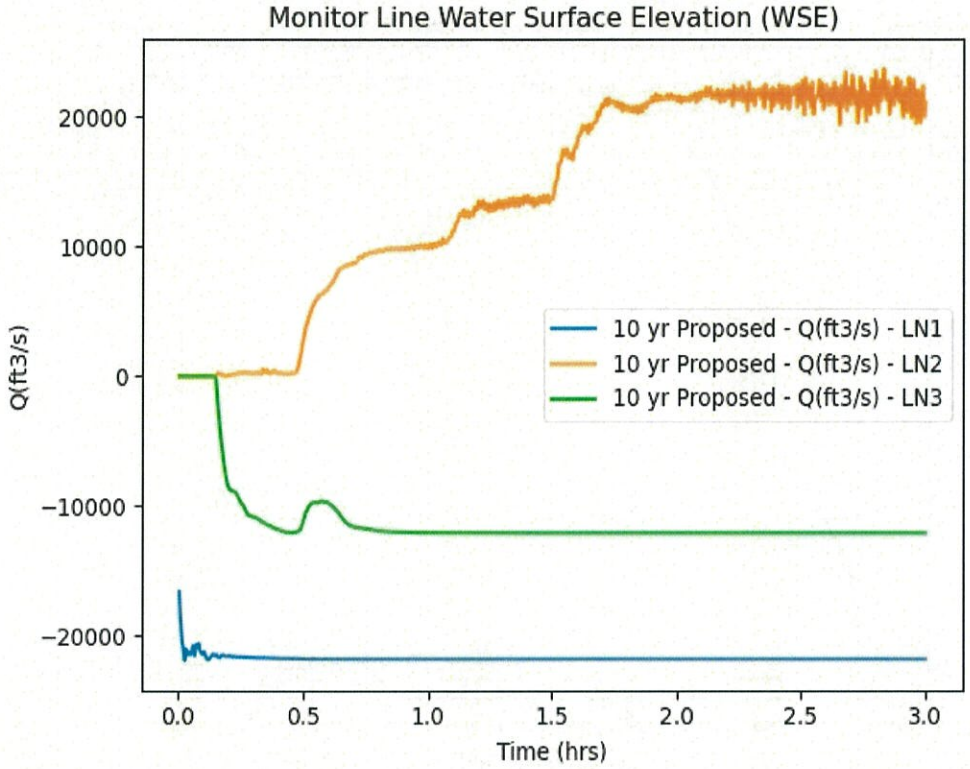
Dataset	Minimum	Maximum
B_Stress_lb_p_ft	0.0	4.087
Froude	0.0	1.816
Vel_Mag_ft_p_s	0.0	11.444
Water_Depth_ft	-5.552	29.432
Water_Elev_ft	10.42	31.952

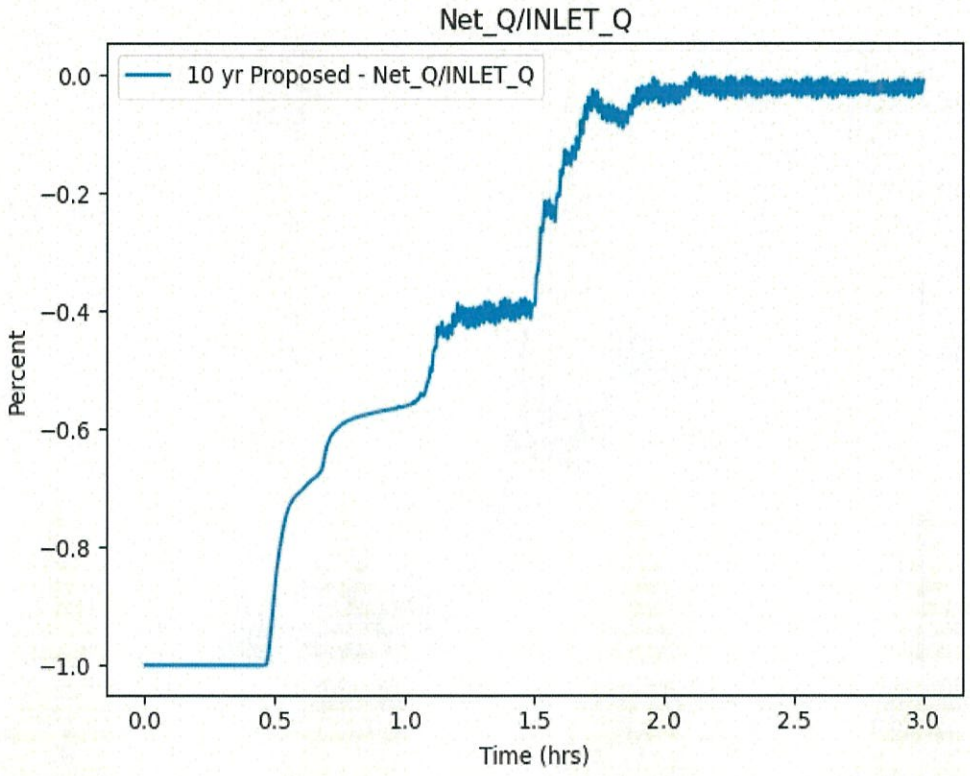
- Simulation name: Trask Simulation (Proposed 10)
  - Summary of model controls
    - Simulation type: Flow
    - Start time (hours): 0.0
    - Time step (seconds): 0.2
    - End time (hours): 3.0
    - Initial condition: Dry
    - Initial value: NA
    - Turbulence model: Parabolic
    - Turbulence parameter: 0.7
    - Unsteady output: True
    - Pressure dataset: NA
    - Output method: Specified Frequency

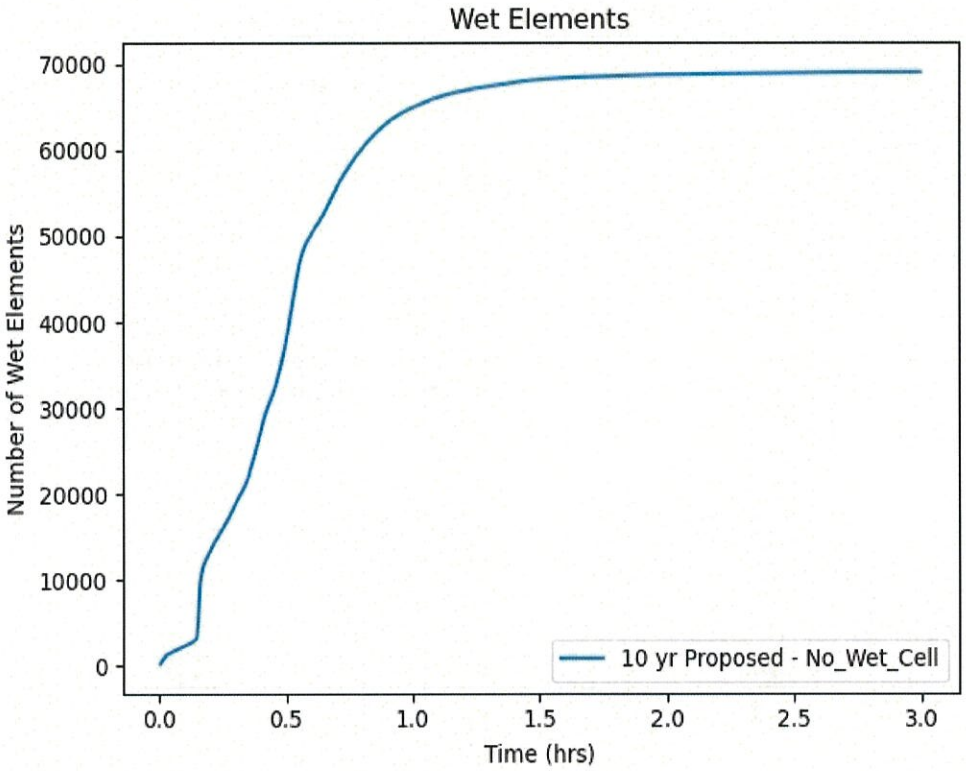
    - Output frequency: 0.5 (Hours)

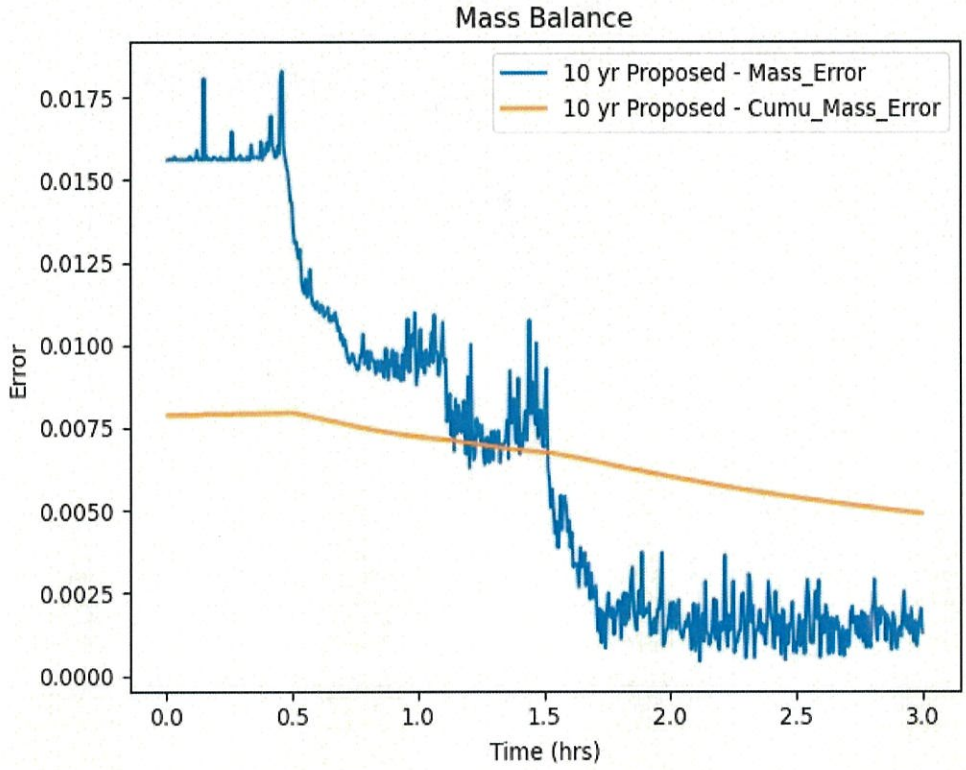
- Mesh used: "Trask Mesh Proposed"
- Boundary condition coverage used: "Boundary Conditions - 10 yr (FIS)"
- Obstructions coverage used: None
- Materials coverage used: "Materials with buildings"
- Monitor coverage used: "Monitor"
- Solution plots




Monitor Line Water Surface Elevation (WSE)
Q(ft3/s)
20000
10000
0
−10000
−20000
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)
10 yr Proposed - Q(ft3/s) - LN1
10 yr Proposed - Q(ft3/s) - LN2
10 yr Proposed - Q(ft3/s) - LN3


Net_Q/INLET_Q
Percent
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)
10 yr Proposed - Net_Q/INLET_Q





- CPU time (hours): 3.809
- Results:

SRH-2D version: 3.3.0

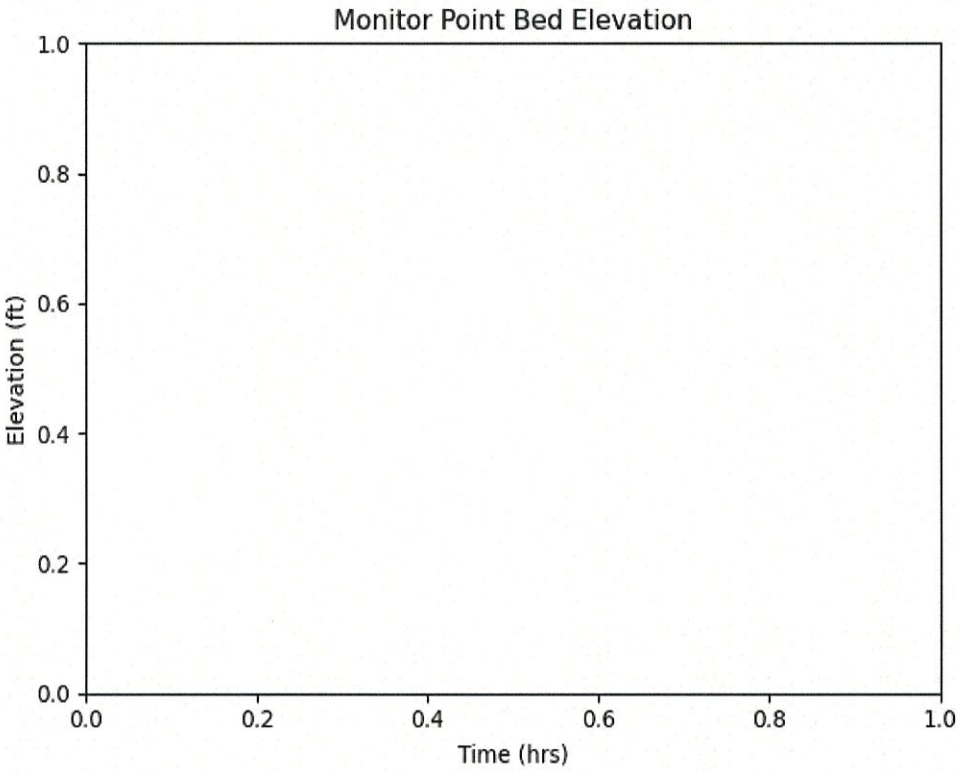
Dataset	Minimum	Maximum
B_Stress_lb_p_ft	0.0	4.755

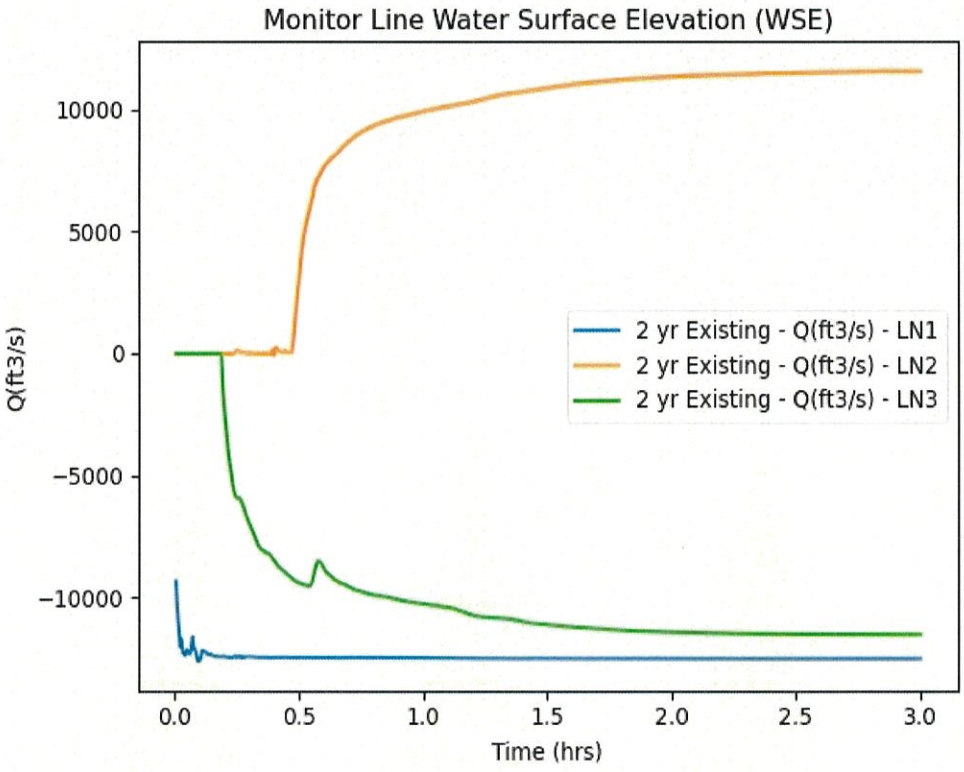
Froude	0.0	1.649
Vel_Mag_ft_p_s	0.0	11.694
Water_Depth_ft	-6.55	29.267
Water_Elev_ft	7.499	31.183

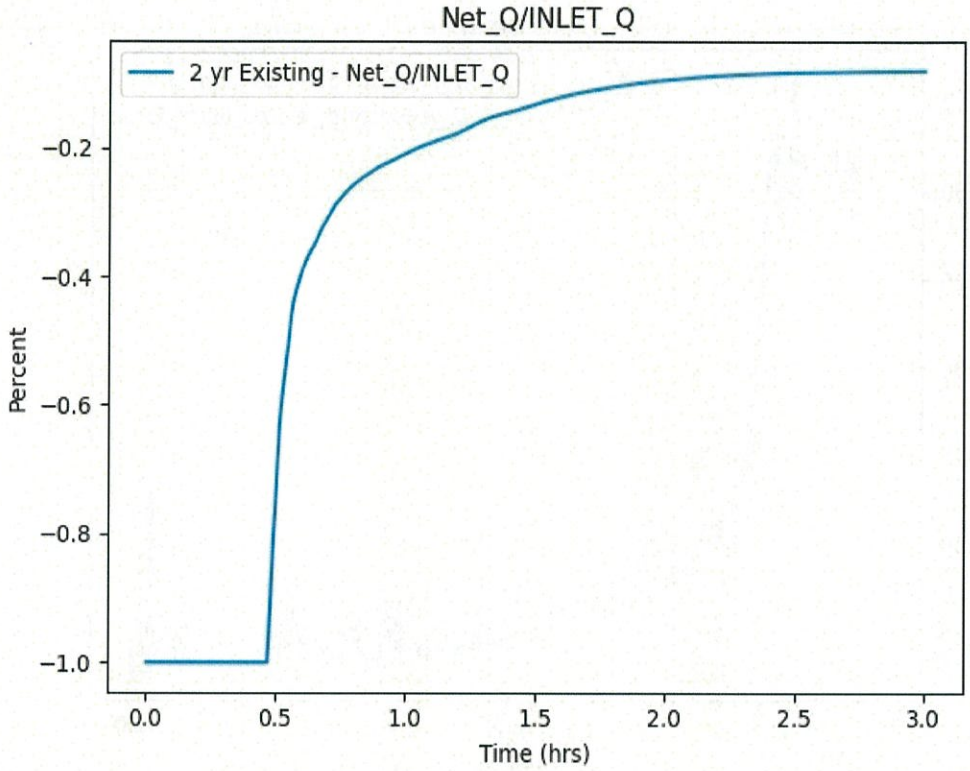
- Simulation name: Trask Simulation (Existing 02 yr)
  - Summary of model controls
    - Simulation type: Flow
    - Start time (hours): 0.0
    - Time step (seconds): 0.2
    - End time (hours): 3.0
    - Initial condition: Dry
    - Initial value: NA
    - Turbulence model: Parabolic
    - Turbulence parameter: 0.7
    - Unsteady output: True
    - Pressure dataset: NA
    - Output method: Specified Frequency
    - Output frequency: 0.5 (Hours)

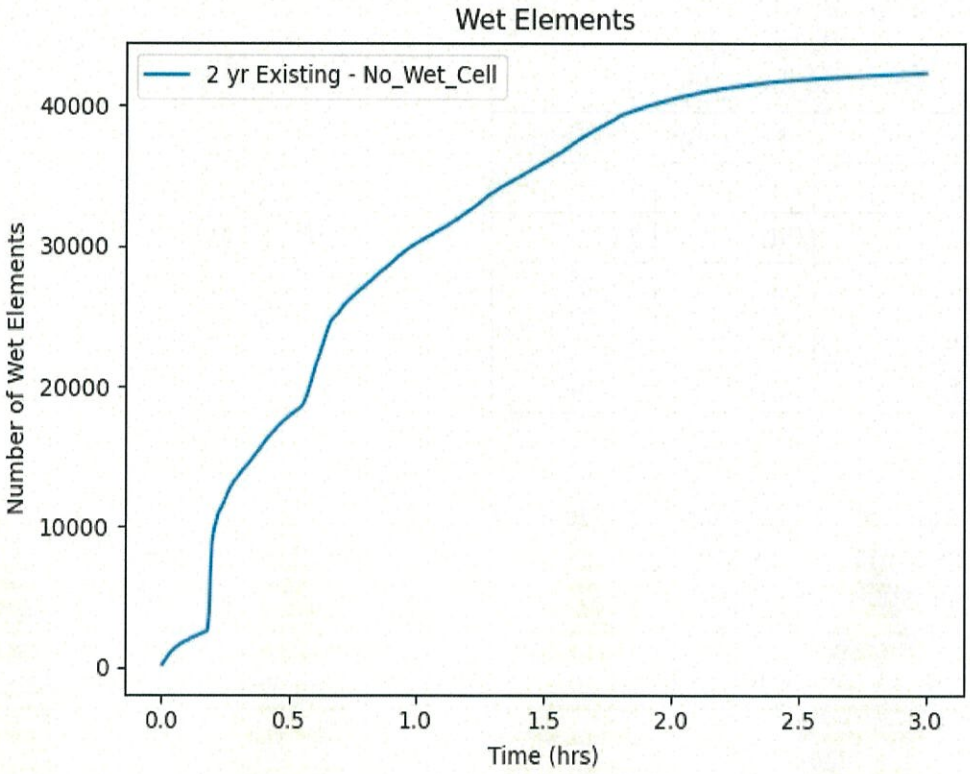
  - Mesh used: "Trask Mesh Existing"
  - Boundary condition coverage used: "Boundary Conditions - 2 yr (StreamStats)"
  - Obstructions coverage used: None
  - Materials coverage used: "Materials with buildings"
  - Monitor coverage used: "Monitor"

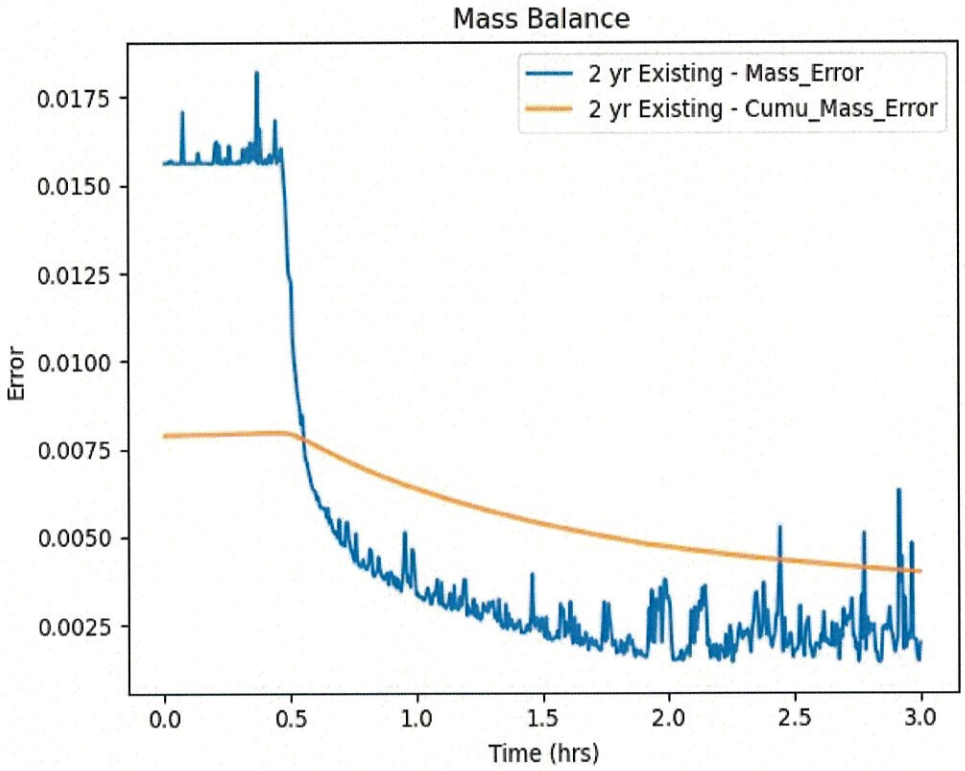
- Solution plots






Net_Q/INLET_Q
2 yr Existing - Net_Q/INLET_Q
−0.2
−0.4
−0.6
−0.8
−1.0
Percent
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)


Wet Elements
2 yr Existing - No_Wet_Cell
40000
30000
20000
10000
0
Number of Wet Elements
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)



- CPU time (hours): 2.56
- Results:

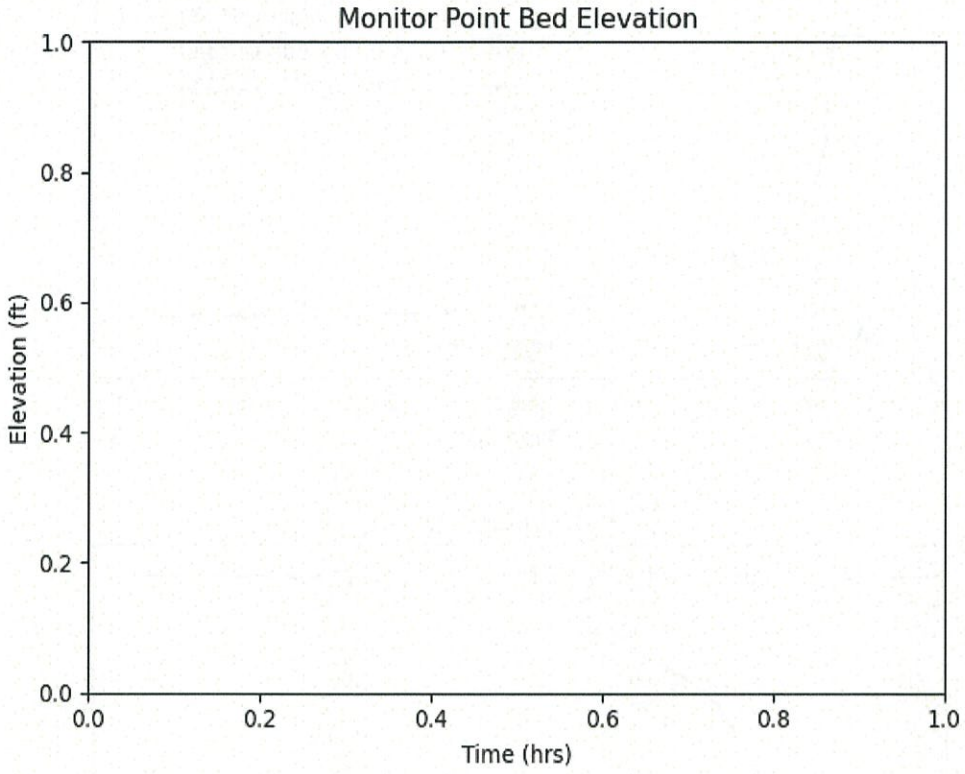
SRH-2D version: 3.3.0

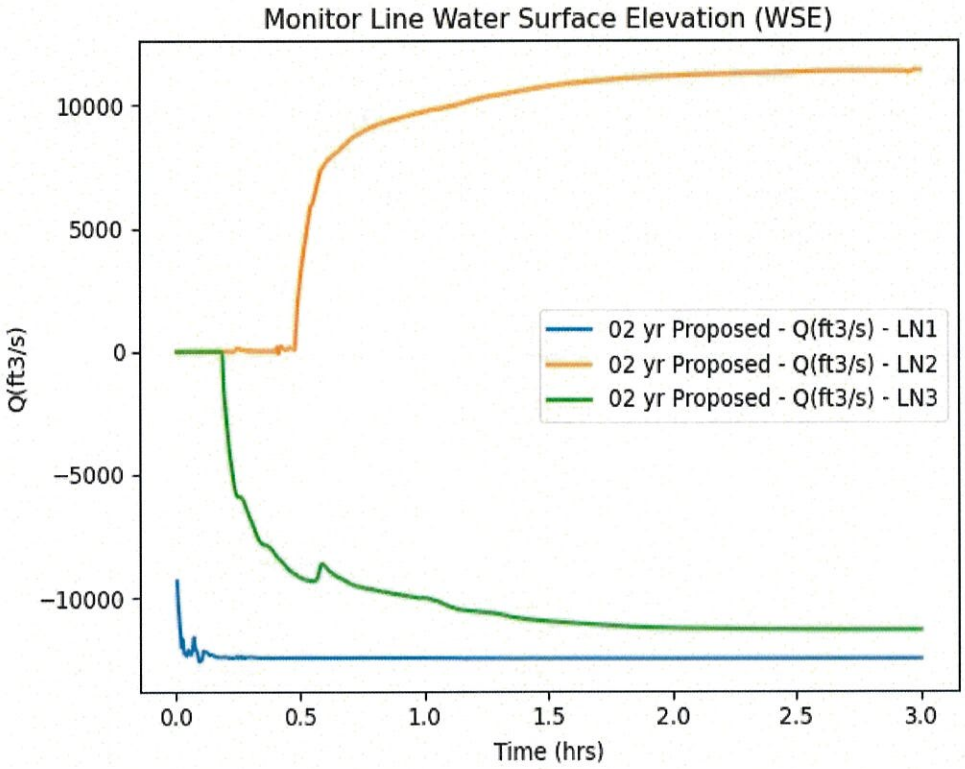
Dataset	Minimum	Maximum
B_Stress_lb_p_ft	0.0	6.17
Froude	0.0	2.008
Vel_Mag_ft_p_s	0.0	11.784
Water_Depth_ft	-8.877	28.113
Water_Elev_ft	7.942	30.842

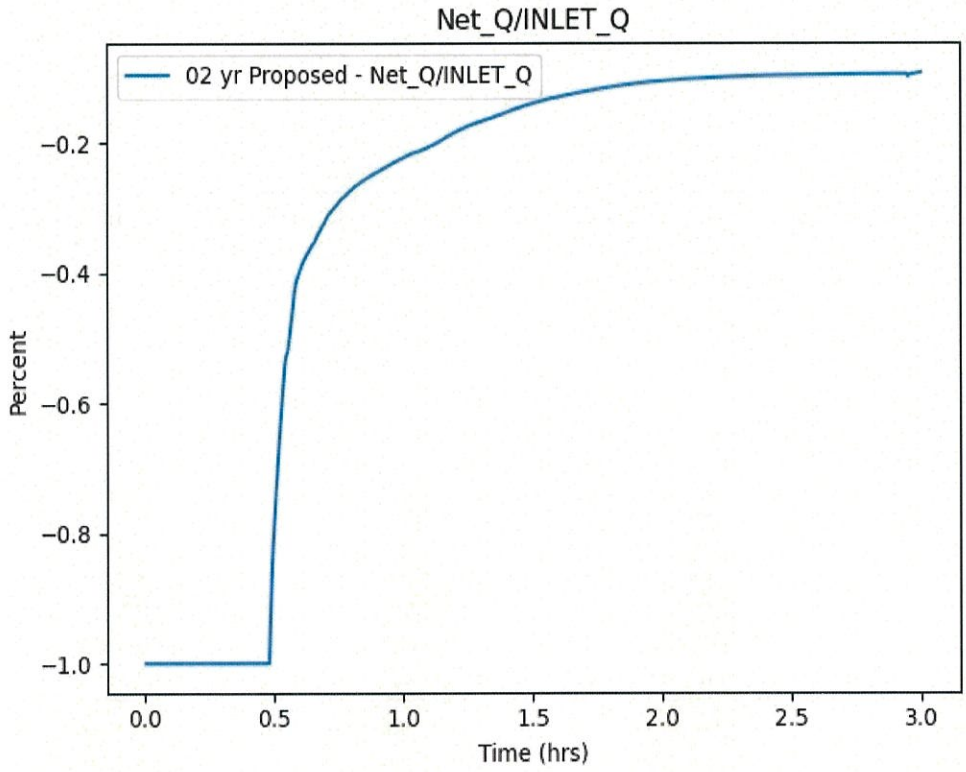
- Simulation name: Trask Simulation (Proposed 2)
  - Summary of model controls
    - Simulation type: Flow
    - Start time (hours): 0.0
    - Time step (seconds): 0.2
    - End time (hours): 3.0
    - Initial condition: Dry
    - Initial value: NA
    - Turbulence model: Parabolic
    - Turbulence parameter: 0.7
    - Unsteady output: True
    - Pressure dataset: NA
    - Output method: Specified Frequency

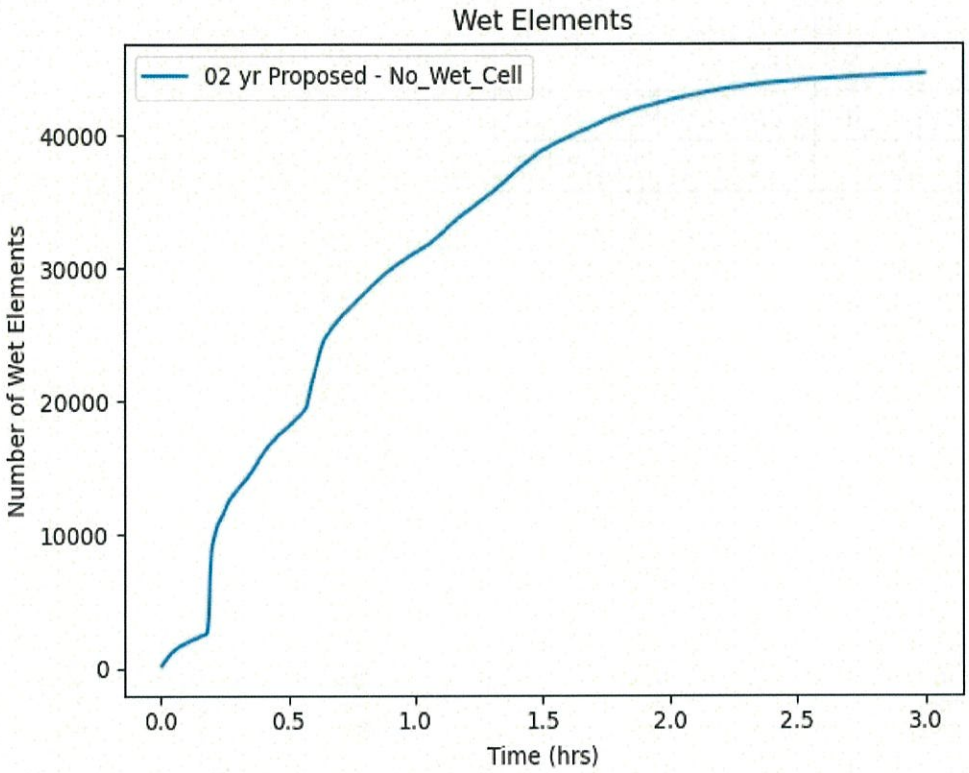
    - Output frequency: 0.5 (Hours)

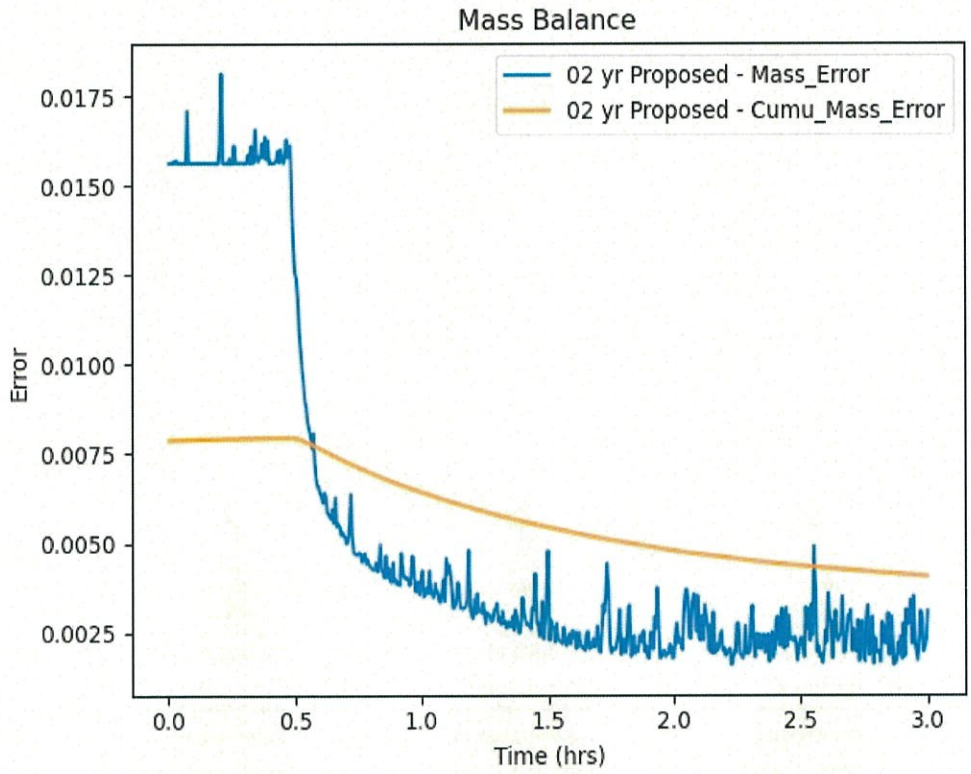
- Mesh used: "Trask Mesh Proposed"
- Boundary condition coverage used: "Boundary Conditions - 2 yr (StreamStats)"
- Obstructions coverage used: None
- Materials coverage used: "Materials with buildings"
- Monitor coverage used: "Monitor"
- Solution plots




Monitor Line Water Surface Elevation (WSE)
Q(ft3/s)
10000
5000
0
−5000
−10000
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)
02 yr Proposed - Q(ft3/s) - LN1
02 yr Proposed - Q(ft3/s) - LN2
02 yr Proposed - Q(ft3/s) - LN3


Net_Q/INLET_Q
Percent
−0.2
−0.4
−0.6
−0.8
−1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Time (hrs)
02 yr Proposed - Net_Q/INLET_Q





- CPU time (hours): 4.216
- Results:

SRH-2D version: 3.3.0

Dataset	Minimum	Maximum
B_Stress_lb_p_ft	0.0	5.961

Froude	0.0	1.809
Vel_Mag_ft_p_s	0.0	12.827
Water_Depth_ft	-7.627	28.336
Water_Elev_ft	7.337	30.842

APPENDIX 5: SCOUR CALCULATIONS

Abutment Riprap Protection Sizing

Job Name: Trask River
Job Number: 60-80023.01
Remarks: South abutment

Designed By: BPW
Designed On: 8/26/2021
Checked By:
Checked On:

Tractive Force Method per ODOT Hydraulics Manual Chapter 15

$$D_{50} = \frac{0.001 C V_a^{\,3}}{d_{avg}^{\,0.5} K_1^{\,1.5}}$$

$K_1 = (1 - (\sin^2 \Theta / \sin^2 \Phi))^{0.5}$

Φ = 41 degrees (Standard angle of repose for ODOT riprap)

Bank Slope 1V: 1.5 H

Θ = 34 degrees

K_1 = 0.534

$C = C_{sg} C_{sf}$

$C_{sg} = 2.12 / (S_s - 1)^{1.5}$

S_s = 2.65 (Specific gravity of riprap)

C_{sg} = 1

$C_{sf} = (SF/1.2)^{1.5}$

SF = 2.0

R_S = 200 (Stream Radius)

W_S = 72 (Stream Width)

C_{sf} = 2.15

C = 2.15

V_a = 6.06 fps (from HEC RAS output 100 year storm)

$d_{avg} = (A_{channel}/W_{channel})$

$A_{channel}$ = 1536 sf (from HEC RAS output 100 year storm)

$W_{channel}$ = 72 ft (from HEC RAS output 100 year storm)

d_{avg} = 21.33 ft

D_{50} = 0.27 ft

Use Class 200 to match existing

HEC 18 Pier Scour Calculations

Pier 2

Project: Trask River
Project #: 60-80023.01
Designer: BPW
Date: 4/12/2025

Design Storm: 100 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	0.8	
Pier Shape =	Square Nose	
L =	12	ft
θ =	26	
a =	2	
Fr_1 =	0.37	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	2.27	
K_3 =	1.1	
y_s/y_1 =	5.91	ft
y_s =	4.73	ft

Check Storm: 500 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	1.22	
Pier Shape =	Square Nose	
L =	12	ft
θ =	26	
a =	2	
Fr_1 =	0.37	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	2.27	
K_3 =	1.1	
y_s/y_1 =	4.49	ft
y_s =	5.48	ft

HEC 18 Pier Scour Calculations

Pier 3

Project: Trask River
Project #: 60-80023.01
Designer: BPW
Date: 4/12/2025

Design Storm: 100 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	2.3	
Pier Shape =	Square Nose	
L =	8	ft
θ =	26	
a =	2	
Fr_1 =	0.33	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	1.89	
K_3 =	1.1	
y_s/y_1 =	2.35	ft
y_s =	5.41	ft

Check Storm: 500 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	2.5	
Pier Shape =	Square Nose	
L =	8	ft
θ =	26	
a =	2	
Fr_1 =	0.36	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	1.89	
K_3 =	1.1	
y_s/y_1 =	2.31	ft
y_s =	5.78	ft

HEC 18 Pier Scour Calculations

Pier 4

Project: Trask River
Project #: 60-80023.01
Designer: BPW
Date: 4/12/2025

Design Storm: 100 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	28.65	
Pier Shape =	Square Nose	
L =	27.66	ft
θ =	26	
a =	2	
Fr_1 =	0.19	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	3.26	
K_3 =	1.1	
y_s/y_1 =	0.62	ft
y_s =	17.83	ft

Check Storm: 500 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	28.76	
Pier Shape =	Square Nose	
L =	27.66	ft
θ =	26	
a =	2	
Fr_1 =	0.21	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	3.26	
K_3 =	1.1	
y_s/y_1 =	0.65	ft
y_s =	18.64	ft

HEC 18 Pier Scour Calculations

Pier 5

Project: Trask River
Project #: 60-80023.01
Designer: BPW
Date: 4/12/2025

Design Storm: 100 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	28.65	
Pier Shape =	Square Nose	
L =	27.66	ft
θ =	26	
a =	2	
Fr_1 =	0.16	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	3.26	
K_3 =	1.1	
y_s/y_1 =	0.58	ft
y_s =	16.56	ft

Check Storm: 500 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	28.76	
Pier Shape =	Square Nose	
L =	27.66	ft
θ =	26	
a =	2	
Fr_1 =	0.18	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	3.26	
K_3 =	1.1	
y_s/y_1 =	0.61	ft
y_s =	17.44	ft

HEC 18 Pier Scour Calculations

Pier 6

Project: Trask River
Project #: 60-80023.01
Designer: BPW
Date: 4/12/2025

Design Storm: 100 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	11.8	
Pier Shape =	Square Nose	
L =	8	ft
θ =	0	
a =	2	
Fr_1 =	0.04	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.1	
K_2 =	1.00	
K_3 =	1.1	
y_s/y_1 =	0.19	ft
y_s =	2.26	ft

Check Storm: 500 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	12.4	
Pier Shape =	Square Nose	
L =	8	ft
θ =	0	
a =	2	
Fr_1 =	0.05	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.1	
K_2 =	1.00	
K_3 =	1.1	
y_s/y_1 =	0.20	ft
y_s =	2.53	ft

HEC 18 Pier Scour Calculations

Pier 7

Project: Trask River
Project #: 60-80023.01
Designer: BPW
Date: 4/12/2025

Design Storm: 100 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	4.62	
Pier Shape =	Square Nose	
L =	12	ft
θ =	15	
a =	2	
Fr_1 =	0.06	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	1.82	
K_3 =	1.1	
y_s/y_1 =	0.69	ft
y_s =	3.21	ft

Check Storm: 500 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	4.82	
Pier Shape =	Square Nose	
L =	12	ft
θ =	15	
a =	2	
Fr_1 =	0.07	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	1.82	
K_3 =	1.1	
y_s/y_1 =	0.72	ft
y_s =	3.48	ft

HEC 18 Pier Scour Calculations

Pier 8

Project: Trask River
Project #: 60-80023.01
Designer: BPW
Date: 4/12/2025

Design Storm: 100 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	4.75	
Pier Shape =	Square Nose	
L =	12	ft
θ =	15	
a =	2	
Fr_1 =	0.07	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	1.82	
K_3 =	1.1	
y_s/y_1 =	0.73	ft
y_s =	3.46	ft

Check Storm: 500 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	4.84	
Pier Shape =	Square Nose	
L =	12	ft
θ =	15	
a =	2	
Fr_1 =	0.08	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	1.82	
K_3 =	1.1	
y_s/y_1 =	0.76	ft
y_s =	3.69	ft

HEC 18 Pier Scour Calculations

Pier 9

Project: Trask River
Project #: 60-80023.01
Designer: BPW
Date: 4/12/2025

Design Storm: 100 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	5.83	
Pier Shape =	Square Nose	
L =	12	ft
θ =	15	
a =	2	
Fr_1 =	0.09	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	1.82	
K_3 =	1.1	
y_s/y_1 =	0.71	ft
y_s =	4.14	ft

Check Storm: 500 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	5.93	
Pier Shape =	Square Nose	
L =	12	ft
θ =	15	
a =	2	
Fr_1 =	0.09	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	1.82	
K_3 =	1.1	
y_s/y_1 =	0.70	ft
y_s =	4.17	ft

HEC 18 Pier Scour Calculations

Pier 10

Project: Trask River
Project #: 60-80023.01
Designer: BPW
Date: 4/12/2025

Design Storm: 100 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	5.26	
Pier Shape =	Square Nose	
L =	12	ft
θ =	15	
a =	2	
Fr_1 =	0.11	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	1.82	
K_3 =	1.1	
y_s/y_1 =	0.83	ft
y_s =	4.36	ft

Check Storm: 500 year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	5.36	
Pier Shape =	Square Nose	
L =	12	ft
θ =	15	
a =	2	
Fr_1 =	0.12	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	1.82	
K_3 =	1.1	
y_s/y_1 =	0.85	ft
y_s =	4.55	ft

HEC 18 Pier Scour Calculations

Pier 11

Project: Trask River
Project #: 60-80023.01
Designer: BPW
Date: 4/12/2025

Design Storm:	100	year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	2.11	
Pier Shape =	Square Nose	
L =	12	ft
θ =	15	
a =	2	
Fr_1 =	0.19	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	1.82	
K_3 =	1.1	
y_s/y_1 =	1.90	ft
y_s =	4.00	ft

Check Storm:	500	year event

Pier Scour Equation

$y_s/y_1 = 2.0K_1K_2K_3(a/y_1)^{0.65}Fr_1^{0.43}$

y_1 =	2.2	
Pier Shape =	Square Nose	
L =	12	ft
θ =	15	
a =	2	
Fr_1 =	0.2	
Bed Condition =	Clear Water Scour	

Correction Factors

K_1 =	1.0	
K_2 =	1.82	
K_3 =	1.1	
y_s/y_1 =	1.89	ft
y_s =	4.15	ft

US101 Trask River

Existing Conditions Scour Summary
No thalweg migration

			100-Year						500-Year					
Bent[1]	Existing Ground Elev.[2]	Pile Tip Elev.[1]	Flow Depth at Pier[3]	Contraction Scour[4]	Pier Scour	Total Calculated Scour Depth	Total Calculated Scour Elev.	Embedment[5]	Flow Depth at Pier[3]	Contraction Scour[4]	Pier Scour	Total Calculated Scour Depth	Total Calculated Scour Elev.	Embedment[5]
#	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
1	34.5	-9.97	26.48	0	4.8	4.8	29.7	39.67	26.59	2.52	4.8	7.32	27.18	37.15
2	26.02	-8.27	26.48	0	4.73	4.73	21.285	29.555	26.59	2.52	5.48	8	18.02	26.29
3	23.96	-12.67	26.48	0	5.41	5.41	18.55	31.22	26.59	2.52	5.78	8.3	15.66	28.33
4	2.16	-30.47	26.48	0	17.83	8.5	-6.34	24.13	26.59	2.52	8.5	11.02	-8.86	21.61
5	4.39	-30.77	26.48	0	16.56	8.5	-4.11	26.66	26.59	2.52	8.5	11.02	-6.63	24.14
6	15.93	-22.67	26.48	0	2.26	2.26	13.67	36.34	26.59	2.52	2.53	5.05	10.88	33.55
7	22.16	-6.57	26.48	0	3.21	3.21	18.95	25.52	26.59	2.52	3.48	6	16.16	22.73
8	21.89	-6.77	26.48	0	3.46	3.46	18.425	25.20	26.59	2.52	3.69	6.21	15.68	22.45
9	20.52	-9.67	26.48	0	4.14	4.14	16.38	26.05	26.59	2.52	4.17	6.69	13.83	23.50
10	21.38	-8.27	26.48	0	4.36	4.36	17.02	25.29	26.59	2.52	4.55	7.07	14.31	22.58
11	25.10	-6.67	26.48	0	4.00	4	21.1	27.77	26.59	2.52	4.15	6.67	18.43	25.10
12	33.01	-5.97	26.48	0	4.8	4.8	28.21	34.18	26.59	2.52	4.8	7.32	25.69	31.66

Notes:

1) Bent numbering and Pile Tip elevations taken from As-constructed plan dated 12-19-1972 and converted to NAVD88
2) Existing ground taken from survey and averaged from ground shots at both sides of the upstream pier face, except Bent 5 which was taken from channel shot just upstream of pier.
3) Flow Depth at Pier is taken just upstream of each pier
4) Contraction Scour calculated across the opening from previous Hydraulic Report
5) Total Calculated Scour Elevation minus the Pile Tip Elevation. Negative numbers are fully undermined.

Bent[1]	Scour Elev. NAVD88	Scour Elev. NGVD29
#	(ft)	
1	27.18	23.75
2	18.02	14.59
3	15.66	12.23
4	-8.86	-12.29
5	-6.63	-10.06
6	10.88	7.45
7	16.16	12.73
8	15.68	12.25
9	13.83	10.40
10	14.31	10.88
11	18.43	15.00
12	25.69	22.26

??V-???

STATE OF OREGON

DEPARTMENT OF TRANSPORTATION

PLANS FOR PROPOSED PROJECT

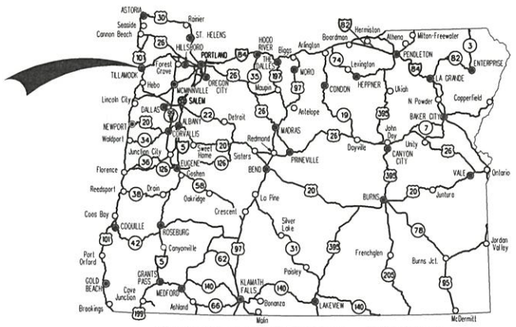
GRADING, DRAINAGE & ROADSIDE DEVELOPMENT

US101: TRASK RIVER BRIDGE PROJ.

OREGON COAST HWY.

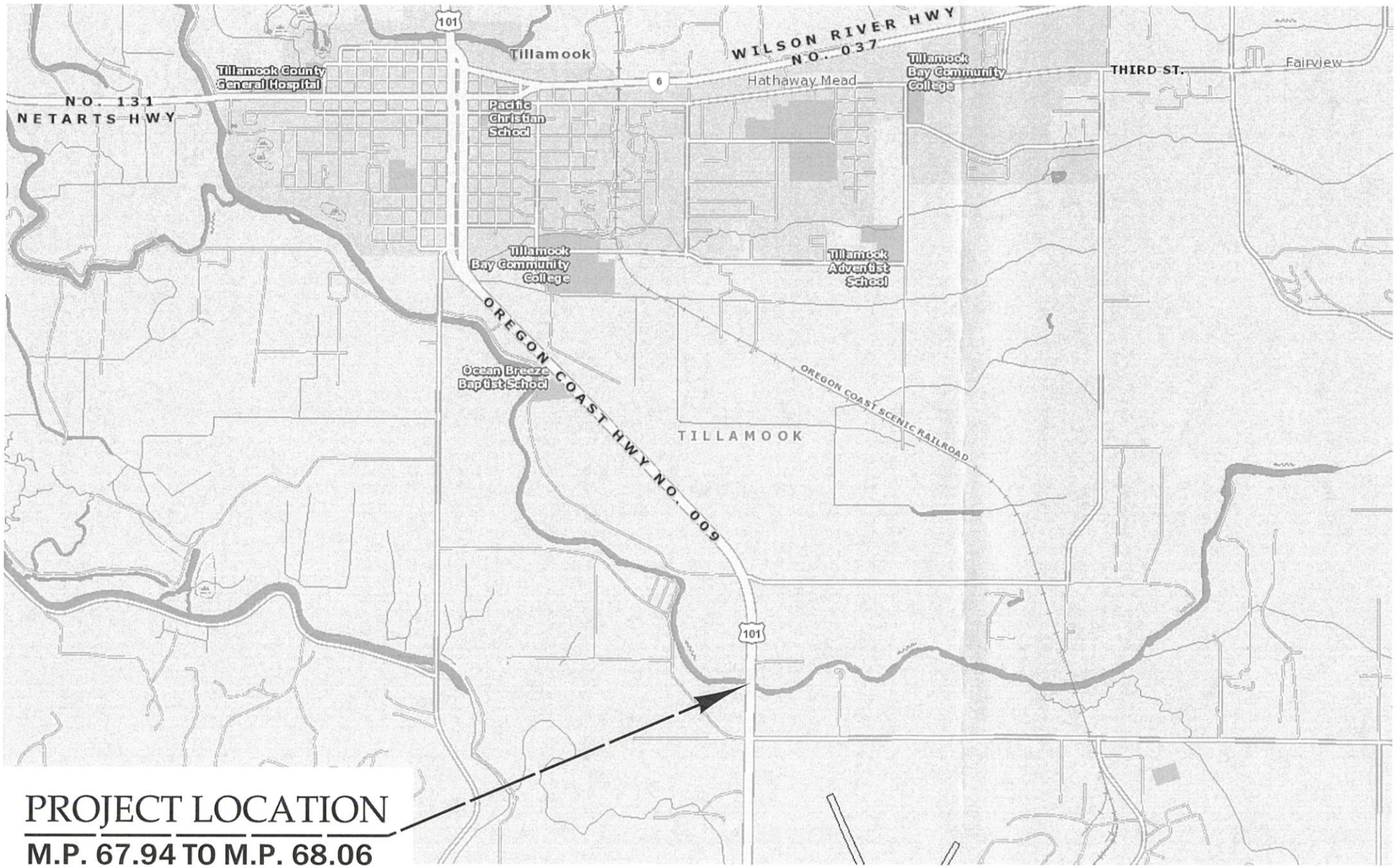
TILLAMOOK COUNTY
DECEMBER 2022

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
A01	Title Sheet
A02	Index Of Sheets Cont. And Std. Dwg. Nos.
A03	Survey Control Data



Overall Length Of Project - 0.12 Miles

SEC. 5, T. 2 S., R. 9 W., W.M.
SEC. 6, T. 2 S., R. 9 W., W.M.



PROJECT LOCATION
M.P. 67.94 TO M.P. 67.06

LET'S ALL WORK TOGETHER TO MAKE THIS JOB SAFE

ATTENTION:
Oregon Law Requires You To Follow Rules Adopted By The Oregon Utility Notification Center. Those Rules Are Set Forth In OAR 952-001-0001 Through OAR 952-001-0090. You May Obtain Copies Of The Rules By Calling The Center (Note: The Telephone Number For The Oregon Utility Notification Center Is (503) 232-1987).

PLANS PREPARED FOR
OREGON DEPARTMENT OF TRANSPORTATION

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OREGON TRANSPORTATION COMMISSION

Robert Van Brocklin	CHAIR
Alando Simpson	COMMISSIONER
Julie Brown	COMMISSIONER
Sharon Smith	COMMISSIONER
Maurice Henderson	COMMISSIONER
Kristopher W. Strickler	DIRECTOR OF TRANSPORTATION

These plans were developed using ODOT design standards. Exceptions to these standards, if any, have been submitted and approved by the ODOT Chief Engineer or their delegated authority.

Approving Authority: _____
Signature & date

_____
Print name and title

FINAL REVIEW PLANS

_____
Concurrence by ODOT Chief Engineer

US101: TRASK RIVER BRIDGE PROJ.
OREGON COAST HWY.
TILLAMOOK COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	STATE	A01

R_K20448_ts_01.dgn :: Default 11/30/2021 1:17:11 PM SDinca

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

Rotation: 0° Scale: 1"=100'

INDEX OF SHEETS, CONT.	
SHEET NO.	DESCRIPTION
	ROADWAY DETAILS
BB01, BB02	*Details*
	ROADWAY CONSTRUCTION
C01, C02	*General Construction*
	TRAFFIC CONTROL
EB01, EB02	*Traffic Control Plan*
	ROADSIDE DEVELOPMENT/EROSION CONTROL
FA01, FA02	*Roadside Development Restoration Plan*
FB01 Thru FB05	*Erosion And Sediment Control*
	HYDRAULICS
HD01, HD02	*Temporary Water Management*
HG01 Thru HG03	*Details*

Std. Dwg. Nos.

RD810 - *Barbed And Woven Wire Fences*

RD1000 - *Construction Entrances*
RD1015 - *Inlet Protection Type 4*
RD1032 - *Sediment Barrier Type 8*
RD1033 - *Sediment Barrier Type 9*

TM800 - *Tables, Abrupt Edge And PCMS Details*
TM820 - *Temporary Barricades*
TM822 - *Temporary Sign Supports*
TM850 - *2-Lane, 2-Way Roadways*

DET6100 - *Tree Planting and Staking Details*
DET6101 - *Planting Details*
DET6103 - *Planting Cutting Installation*

Standard Drawings located on the web at:
http://www.oregon.gov/ODOT/Engineering/Pages/Standards.aspx

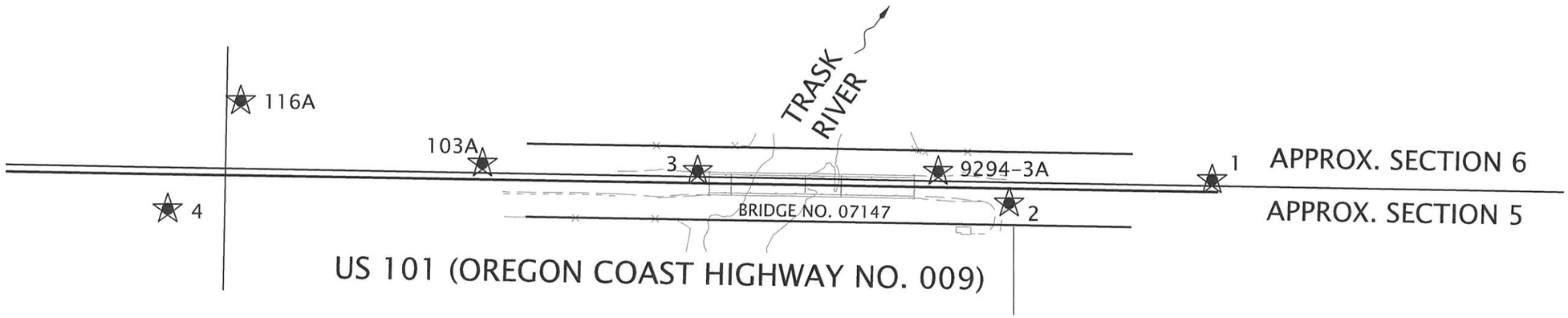
US101: TRASK RIVER BRIDGE PROJ.
OREGON COAST HWY.
TILLAMOOK COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	SEE SHEET A01	A02

SECTIONS 5 & 6, T.2S., R.9W., W.M.

NOTES:

COORDINATE SYSTEM: OREGON COORDINATE REFERENCE SYSTEM (OCRS) OREGON COAST ZONE
HORIZONTAL DATUM: NAD83 (2011) (EPOCH 2010.00)
VERTICAL DATUM: NAVD 88
SURVEY OF RECORD: B-4128 TILLAMOOK COUNTY, OR, FILED MARCH 15, 2021
FIELD VERIFY ALL CONTROL BEFORE USE!



LEGEND
★ GPS STATION

N

200 100 0 200
FEET

OPC = ORANGE PLASTIC CAP
W/ = WITH

CONTROL POINT TABLE

PT. NO.	OCRS NORTHING	OCRS EASTING	NAVD88 ELEVATION	DESCRIPTION
1	1459583.93	500052.35	30.38	5/8" X 30" REBAR W/ OPC "DOWL CONTROL", FLUSH
2	1459249.67	500091.30	33.67	MAGNETIC NAIL W/ WASHER "DOWL CONTROL" FLUSH
3	1458735.21	500039.07	33.42	5/8" X 30" REBAR W/ OPC "DOWL CONTROL", FLUSH
4	1457861.12	500103.14	22.01	5/8" X 30" REBAR W/ OPC "DOWL CONTROL", FLUSH
103A	1458378.94	500027.57	29.44	1-1/2" BRASS DISC IN CONCRETE "ODOT CONTROL 103", FLUSH
116A	1457980.83	499925.65	21.20	1-1/2" BRASS DISC IN CONCRETE "ODOT CONTROL 116", FLUSH
9294-3A	1459132.25	500039.49	33.47	3" BRASS DISC IN CONCRETE "GEODETIC CONTROL 1999 09294-3", DOWN 0.1'

REGISTERED PROFESSIONAL LAND SURVEYOR
OREGON
MAY 12, 2011
ANDREW JOSEPH SILBERNAGEL
#79198
RENEWS: JUNE 30, 2022

FINAL REVIEW PLANS

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OREGON DEPARTMENT OF TRANSPORTATION

US101: TRASK RIVER BRIDGE PROJ.
OREGON COAST HWY.
TILLAMOOK COUNTY

Designer: B. Doss | Reviewer: J. Colton
Drafter: S. Gurley | Checker: A. Silbernagel

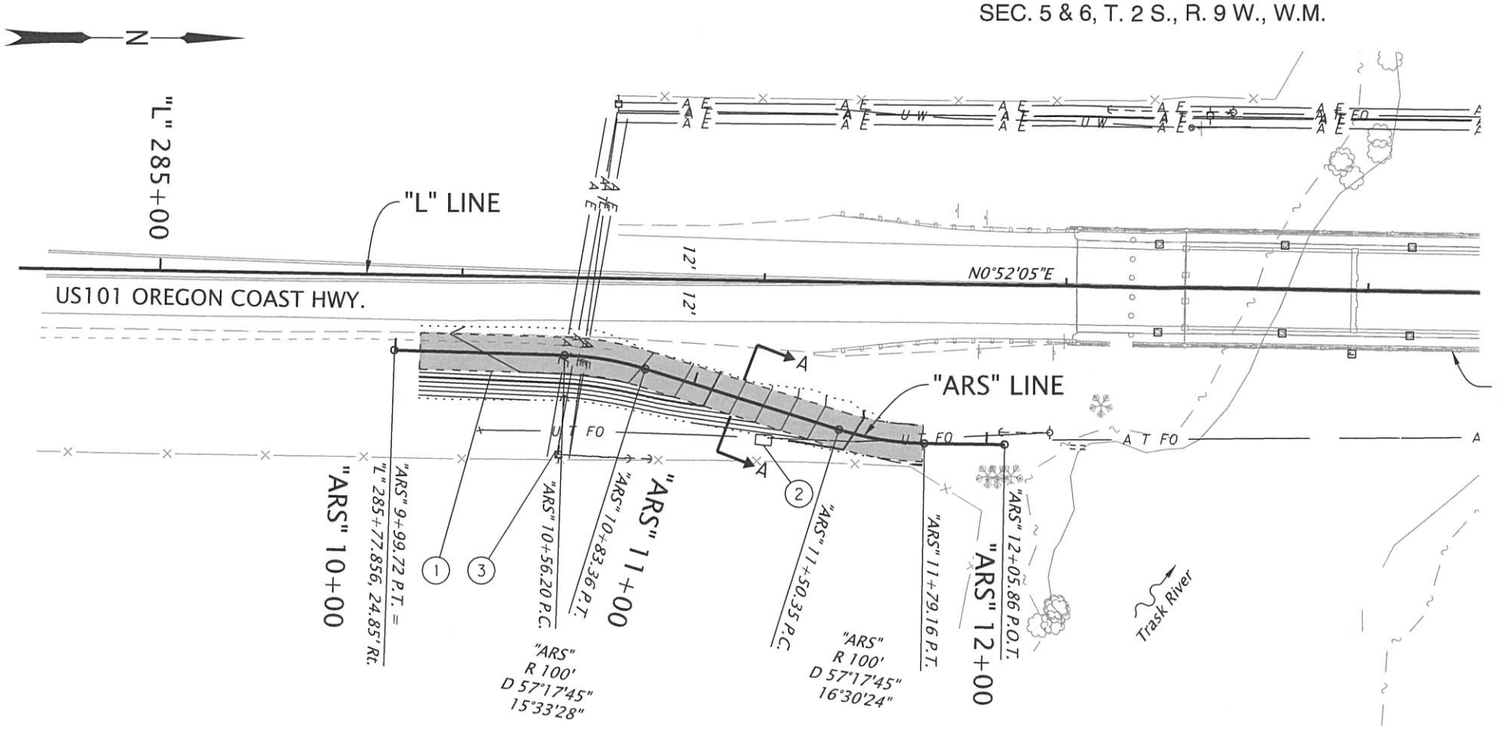
SURVEY CONTROL DATA | SHEET NO. A03

Rotation: 270° Scale: 1"=200'

SEC. 5 & 6, T. 2 S., R. 9 W., W.M.

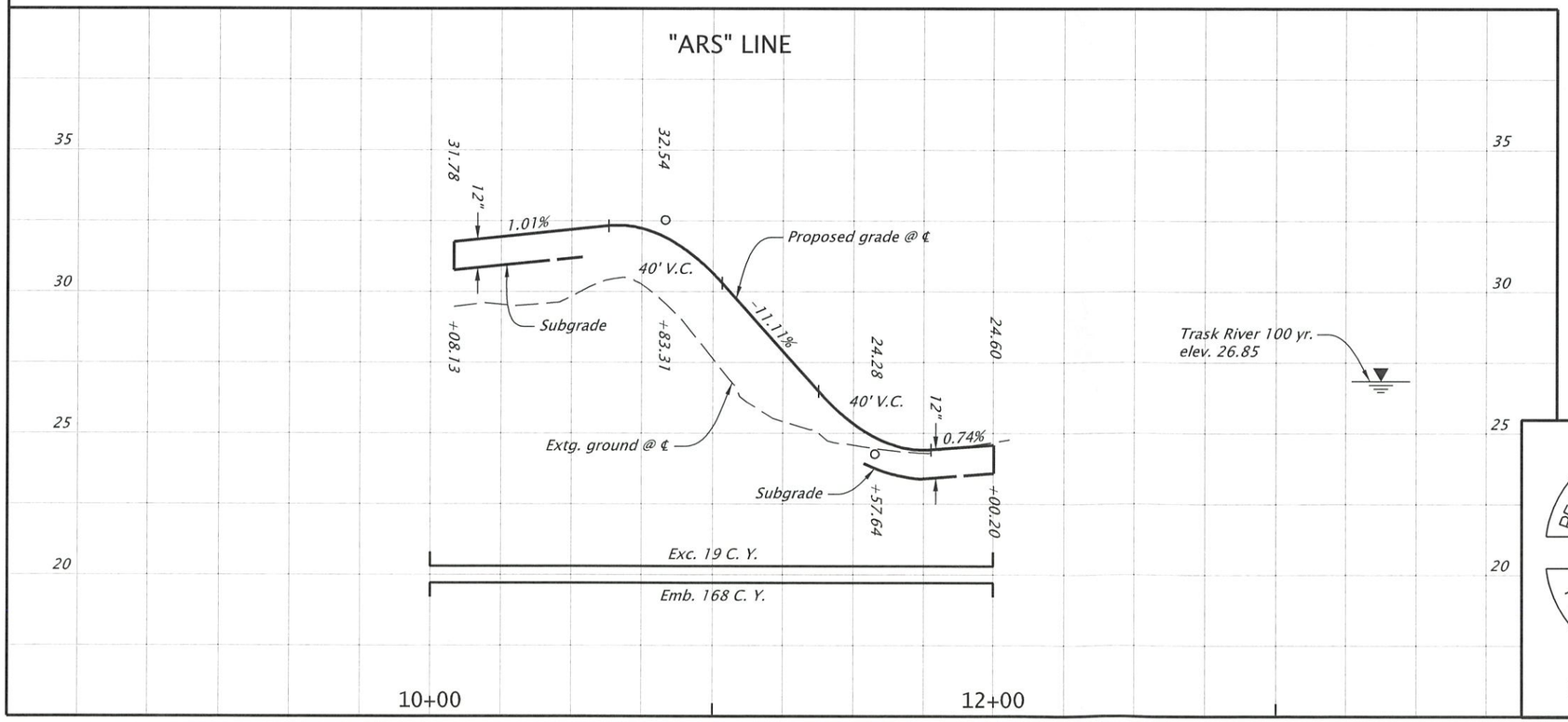
N

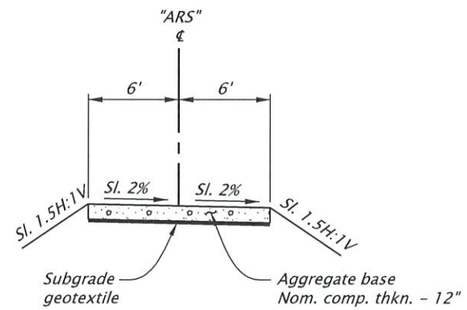
1 Const. and remove temp. access road
2 Preserve and protect extg. comm. line
3 Preserve and protect extg. utility pole



LEGEND

Aggregate base





SECTION A-A

REGISTERED PROFESSIONAL ENGINEER
OREGON
TYLER WILLIAM KLEIN
FINAL REVIEW PLANS
MAY 12, 2020
EXPIRES: 6/30/

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OREGON DEPARTMENT OF TRANSPORTATION

US101: TRASK RIVER BRIDGE PROJ.
OREGON COAST HWY.
TILLAMOOK COUNTY

Designer: Tyler Klein
Drafter: Serban Dinca
Reviewer: Jared Trowbridge
Checker: Kyle Farnsworth

DETAILS

SHEET NO. BB01

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

Rotation: 90° Scale: 1"=50'

SEC. 5 & 6, T. 2 S., R. 9 W., W.M.

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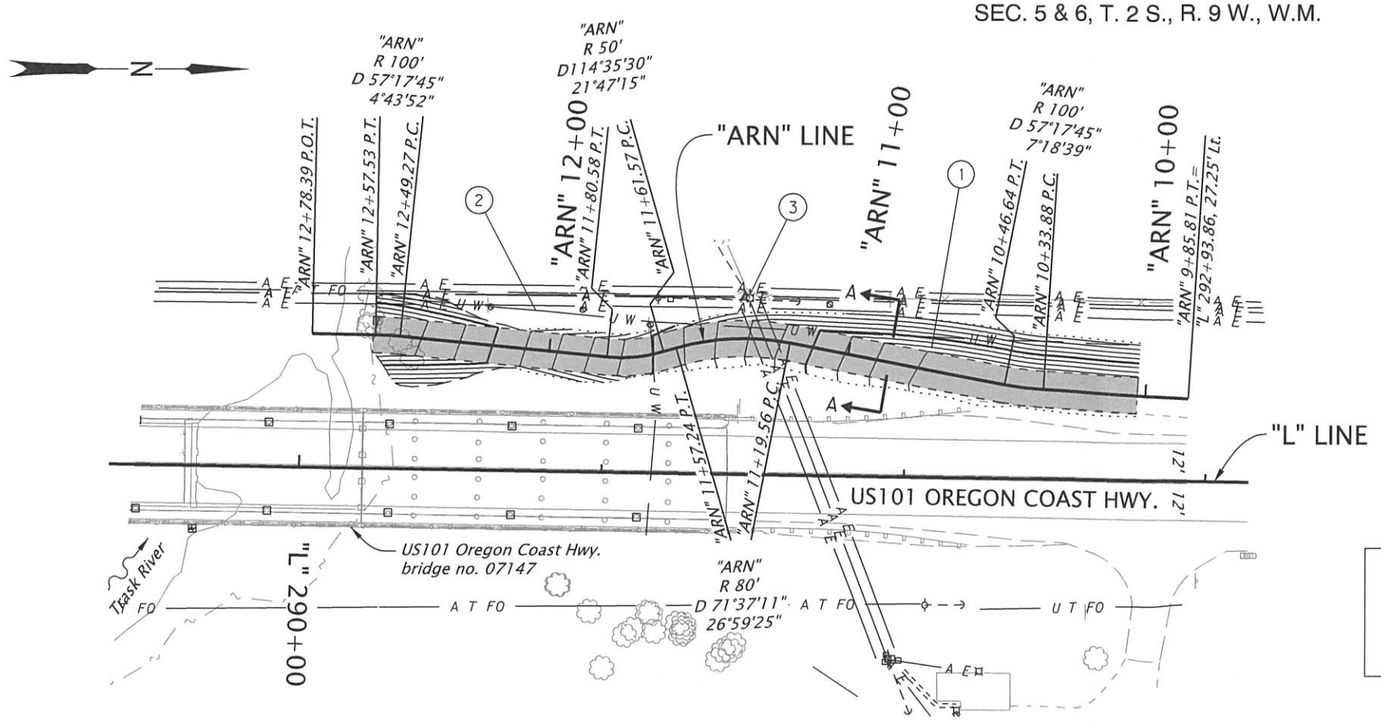

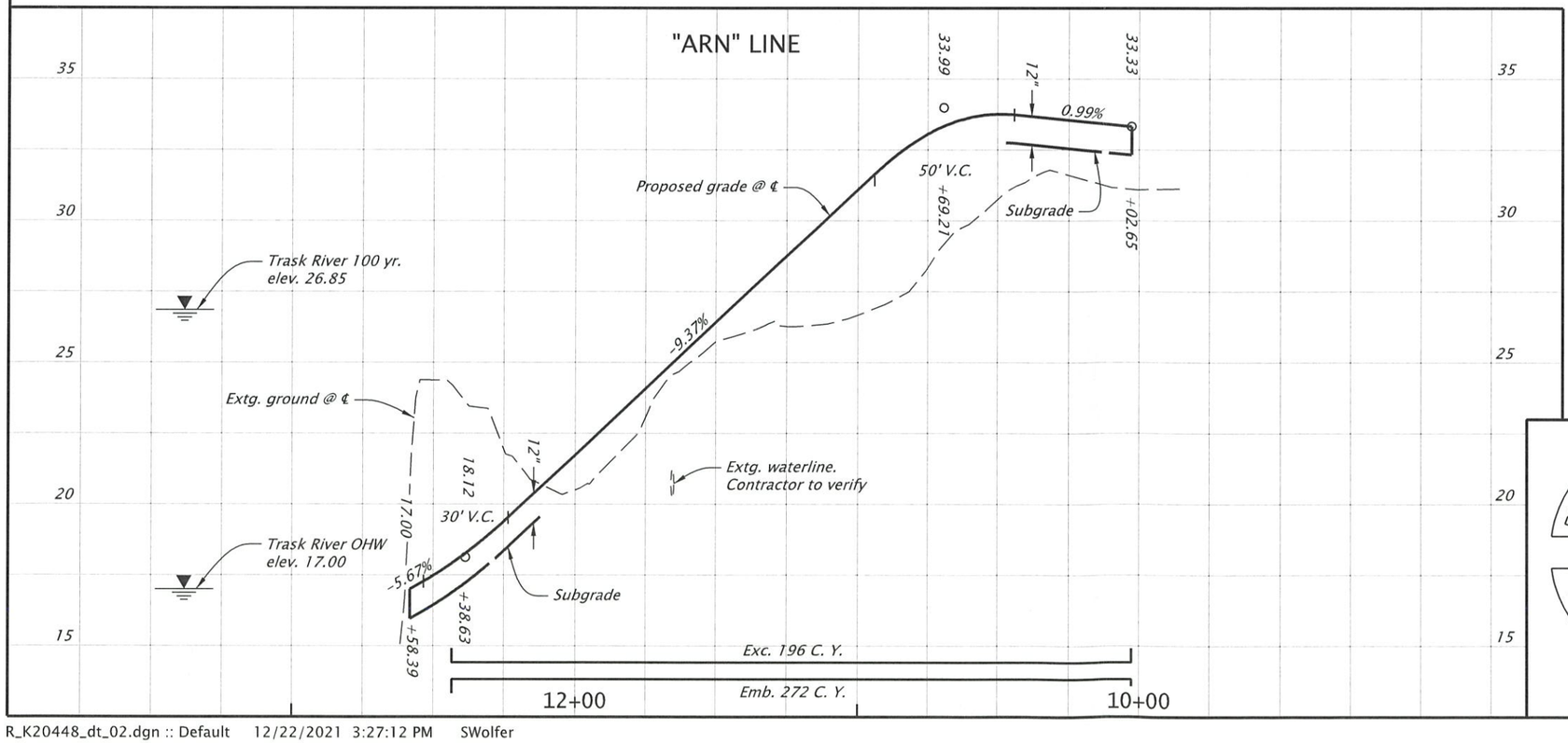

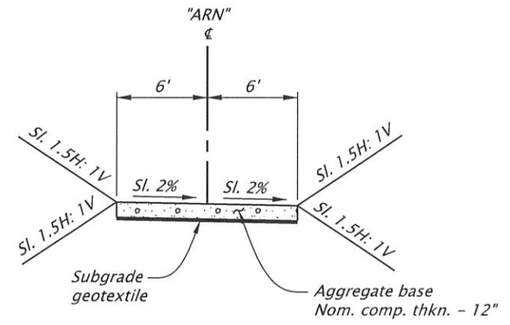

SECTION A-A

REGISTERED PROFESSIONAL ENGINEER
OREGON
TYLER WILLIAM KLEIN
FINAL REVIEW PLANS
MAY 12, 2020
EXPIRES: 6/30/

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OREGON DEPARTMENT OF TRANSPORTATION

US101: TRASK RIVER BRIDGE PROJ.
OREGON COAST HWY.
TILLAMOOK COUNTY

Designer: Tyler Klein	Reviewer: Jared Trowbridge
Drafter: Serban Dinca	Checker: Kyle Farnsworth

DETAILS

SHEET NO. BB02

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FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

Rotation: 90° Scale: 1"=50'

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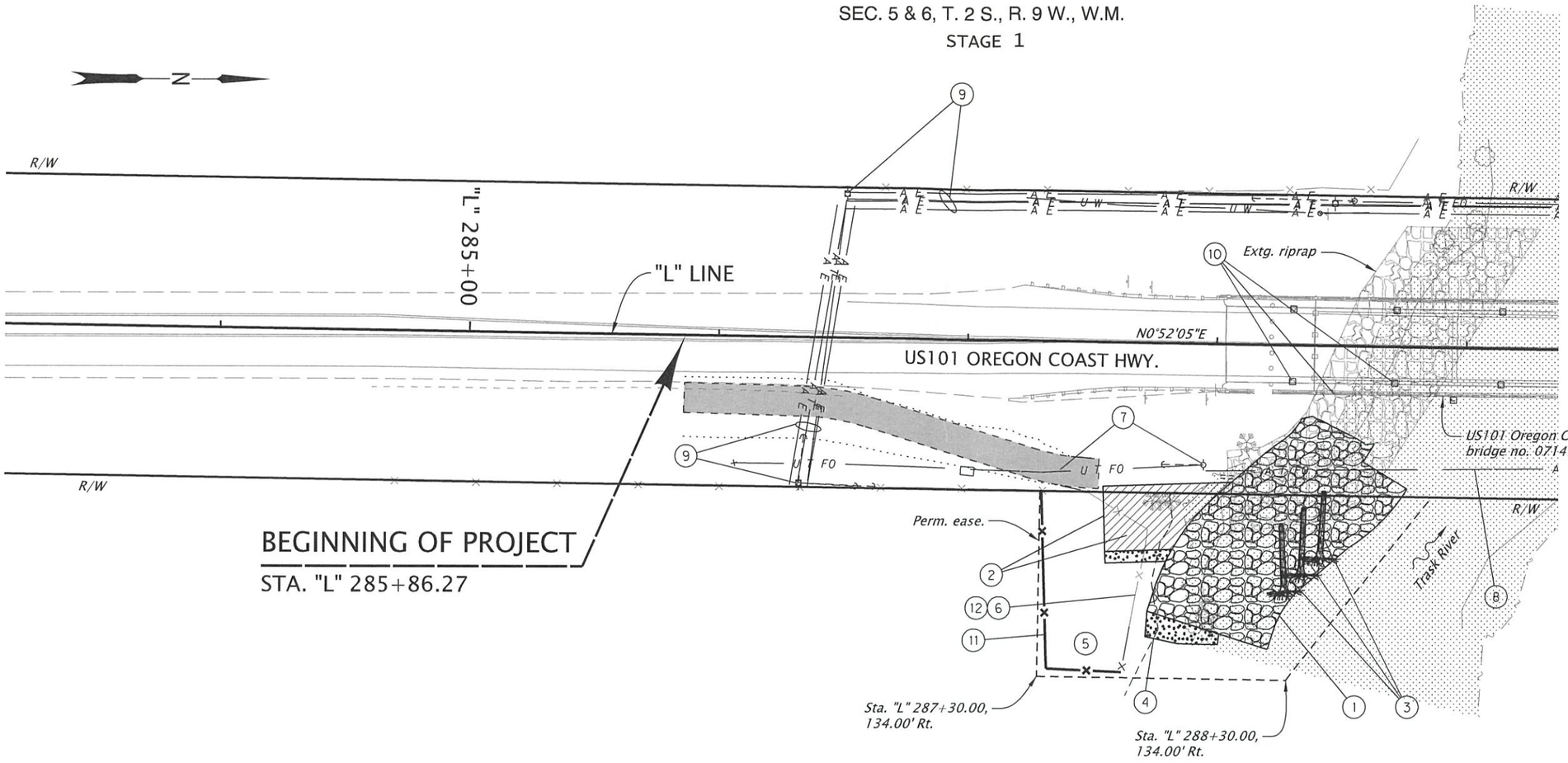
SEC. 5 & 6, T. 2 S., R. 9 W., W.M.

STAGE 1



(1) *Inst. soiled riprap (Class 200) - 950 cu. yd.*
Inst. riprap geotextile, type 2 - 530 sq. yd.
Perform clearing and grubbing - 0.11 ac.
Perform excavation - 567 cu. yd.
(For details, see sht. HG01)

(2) *Inst. loose riprap (Class 200) - 180 cu. yd.*
Inst. riprap geotextile, type 2 - 370 sq. yd.
Perform clearing and grubbing - 0.04 ac.
Perform excavation - 212 cu. yd.
Inst. selected top soil - 32 cu. yd.
Inst. permanent seeding - 0.05 ac.
(For details, see sht. HG01)

(3) *Inst. large woody material with rootwads (18" DBH) - 3*
(For details, see shts. HG01 & HG02)

(4) *Inst. permanent seeding, Mix No. 2 - 0.002 ac.*

(5) *Sta. "L" 288+59.4, 126.4' Rt. to Sta. "L" 287+96.1, 32.6' Rt.*
Inst. temp. water management facility
(For details, see sht. HD01)

(6) *Sta. "L" 287+43.5, 65.1' Rt. to Sta. "L" 287+73.1, 83.1' Rt.*
Remove fence, Type 1, w/ metal posts - 105 ft
(See dwg. no RD810)

(7) *Preserve and protect underground fiber optic line and pole*

(8) *Preserve and protect overhead fiber optic line*

(9) *Preserve and protect extg. electrical and telephone lines and pole*

(10) *Preserve and protect extg. bridge structure*

(11) *Sta. "L" 287+30.5, 64.8 Rt. to Sta. "L" 287+73.1, 83.1 Rt.*
Const. temporary chainlink fence - 110 ft
Construct temporary fence prior to removal of existing fence, see const. note 6.
Do not remove temporary fence until perm. fence is constructed, see const. note 12

(12) *Sta. "L" 287+30.5, 64.8 Rt. to Sta. "L" 287+73.1, 83.1 Rt.*
Const. perm. fence, Type 1, w/ metal posts - 105 ft

LEGEND

- *Soiled riprap*
- *Loose riprap (buried)*
- *Permanent seeding*
- *Regulated work area*

REGISTERED PROFESSIONAL ENGINEER
9566
OREGON
NOVEMBER 12, 2019
BRIAN J MEUNIER
EXPIRES: 12/31/
FINAL REVIEW PLANS

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OREGON DEPARTMENT OF TRANSPORTATION

US101: TRASK RIVER BRIDGE PROJ.
OREGON COAST HWY.
TILLAMOOK COUNTY

Designer: Jeff Tolentino | Reviewer: Jared Trowbridge
Drafter: Serban Dinca | Checker: Brian Meunier

GENERAL CONSTRUCTION | SHEET NO. C01

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

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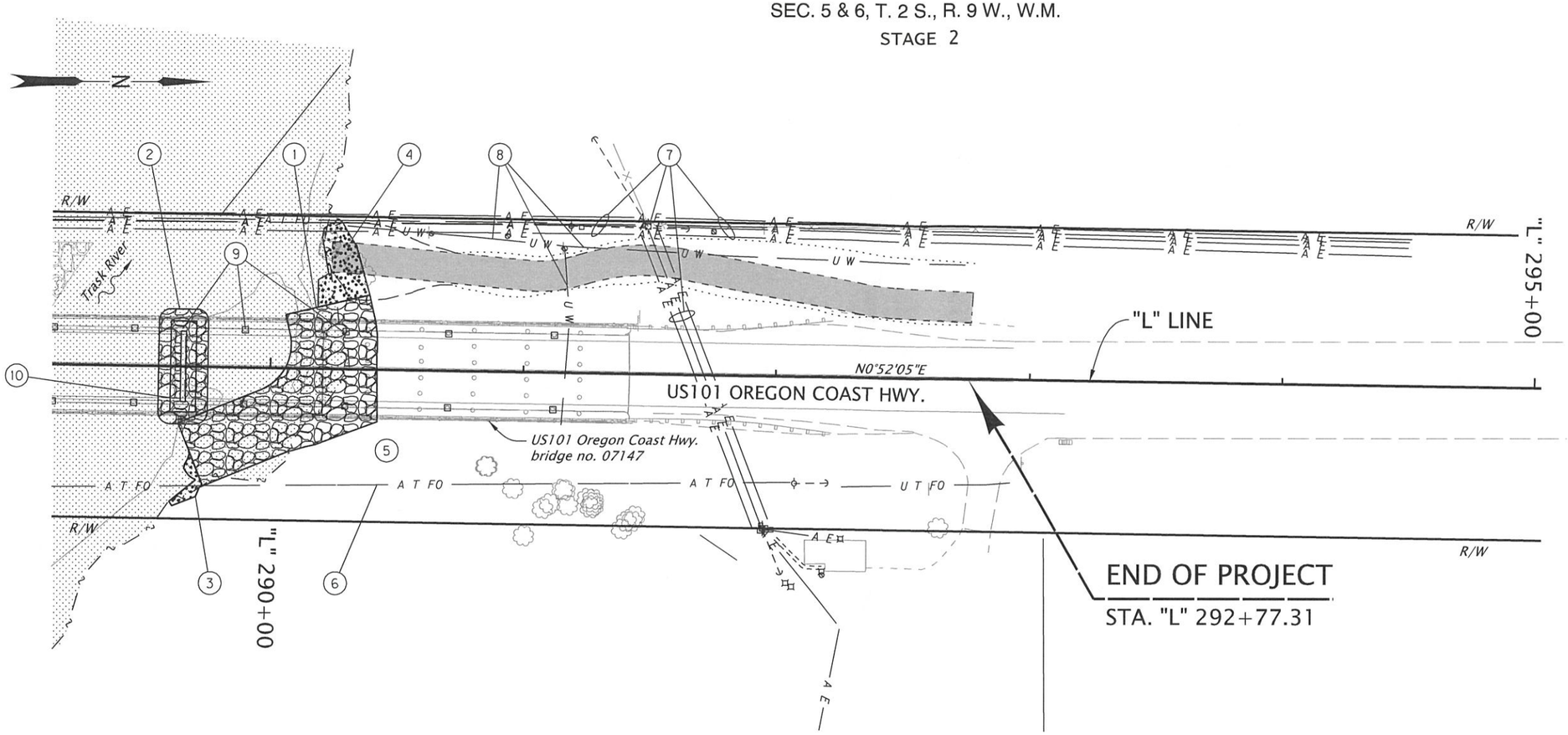
Rotation: 90° Scale: 1"=50'

SEC. 5 & 6, T. 2 S., R. 9 W., W.M.
STAGE 2



1. *Inst. soiled riprap (Class 200) - 403 cu. yd.*
   Inst. riprap geotextile, type 2 - 370 sq. yd.
   Perform clearing and grubbing - 0.08 ac.
   Perform excavation - 452 cu. yd.
   (For details, see sht. HG03)
2. *Inst. loose riprap (Class 200) - 98 cu. yd.*
   Inst. riprap geotextile, type 2 - 290 sq. yd.
   Perform excavation - 98 cu. yd.
   (For details, see sht. HG03)
3. *Perform grading to provide smooth transition between riprap and extg. ground*
   Inst. erosion compost blanket - 10 sq. yd.
   Inst. permanent seeding, Mix No. 2 - 0.002 ac.
4. *Perform grading to provide smooth transition between riprap and extg. ground*
   Inst. erosion compost blanket - 18 sq. yd.
   Inst. permanent seeding - 0.003 ac.
5. *Sta. "L" 289+48.2, 43.8' Rt. to Sta. "L" 290+15.5, 44.1' Lt.*
   Inst. temp. water management facility
   (TWMP graphics omitted for clarity.
   For details, see sht. HD02)
6. *Preserve and protect overhead fiber optic line*
7. *Preserve and protect extg. electrical and telephone lines and pole*
8. *Preserve and protect extg. underground water line*
9. *Preserve and protect extg. bridge structure*
10. *Preserve and protect extg. USGS gauge (Mounted on bridge)*

LEGEND

Soiled riprap

Regulated work area

REGISTERED PROFESSIONAL ENGINEER
956[illegible]
OREGON
DECEMBER 12, 2019
BRIAN J MEUNIER
EXPIRES: 12/31/.....

FINAL REVIEW PLANS

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OREGON DEPARTMENT OF TRANSPORTATION

US101: TRASK RIVER BRIDGE PROJ.
OREGON COAST HWY.
TILLAMOOK COUNTY

Designer: Jeff Tolentino | Reviewer: Jared Trowbridge
Drafter: Serban Dinca | Checker: Brian Meunier

GENERAL CONSTRUCTION

SHEET NO. C02

STAGE 1

To be accompanied by dwg. nos. TM800, TM820, TM822 & TM850.

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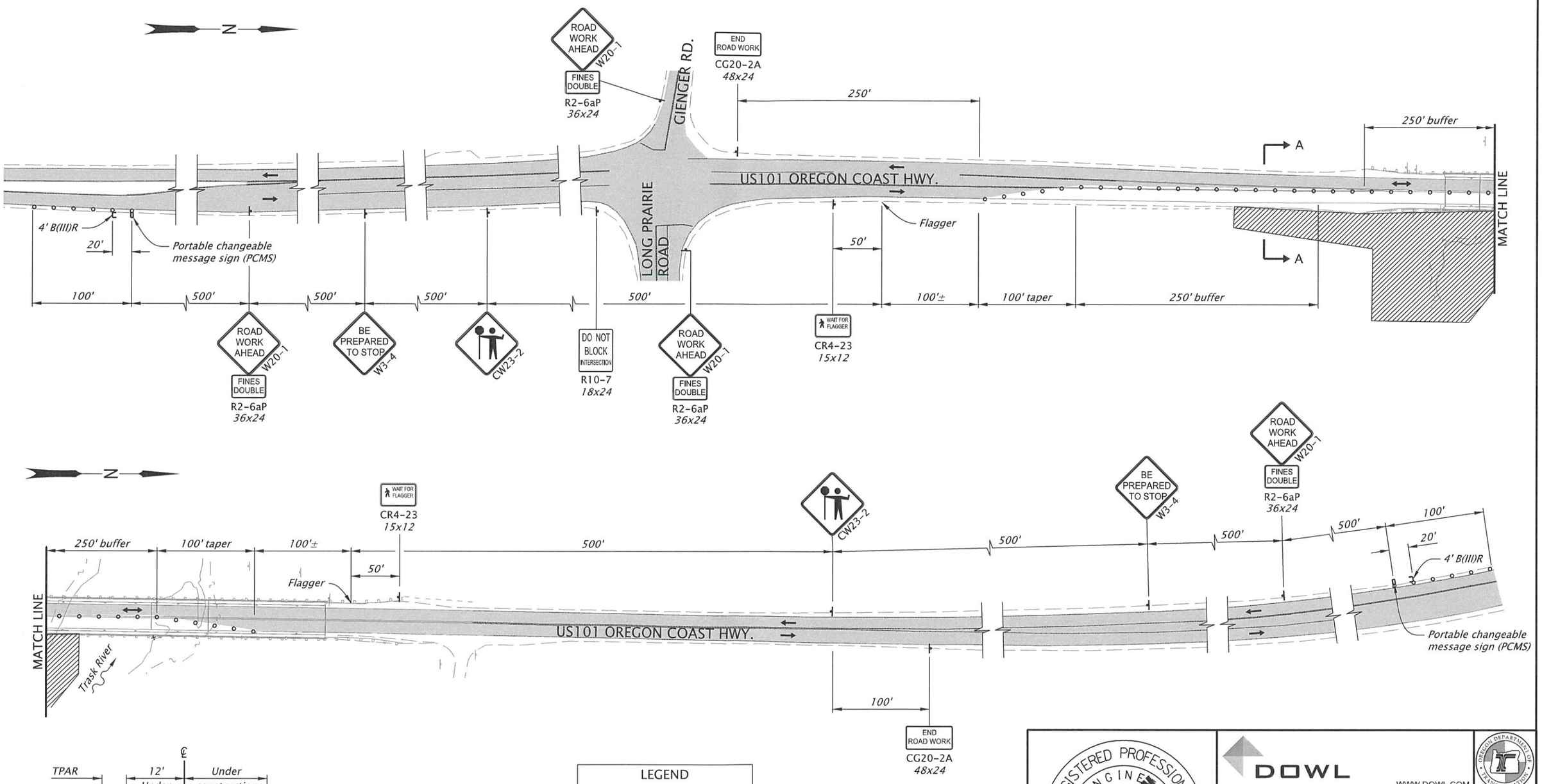

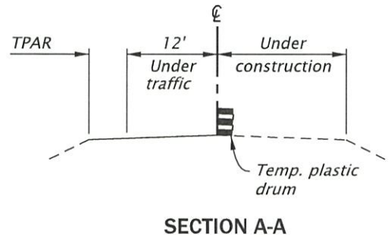

SECTION A-A

Under traffic

Existing ground

LEGEND

- Direction of traffic
- Under traffic
- Under construction
- Temp. plastic drums on 20' max. spacing
- PCMS

CONSTRUCTION SEQUENCING:

1. *Install temporary signs and traffic control devices.*
2. *Construct Stage 1 temporary access road.*
3. *Construct Stage 1 scour repair.*

REGISTERED PROFESSIONAL ENGINEER
OREGON
TYLER WILLIAM KLEIN
FINAL REVIEW PLANS
MAY 12, 2020
EXPIRES: 6/30/

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OREGON DEPARTMENT OF TRANSPORTATION

US101: TRASK RIVER BRIDGE PROJ.
OREGON COAST HWY.
TILLAMOOK COUNTY

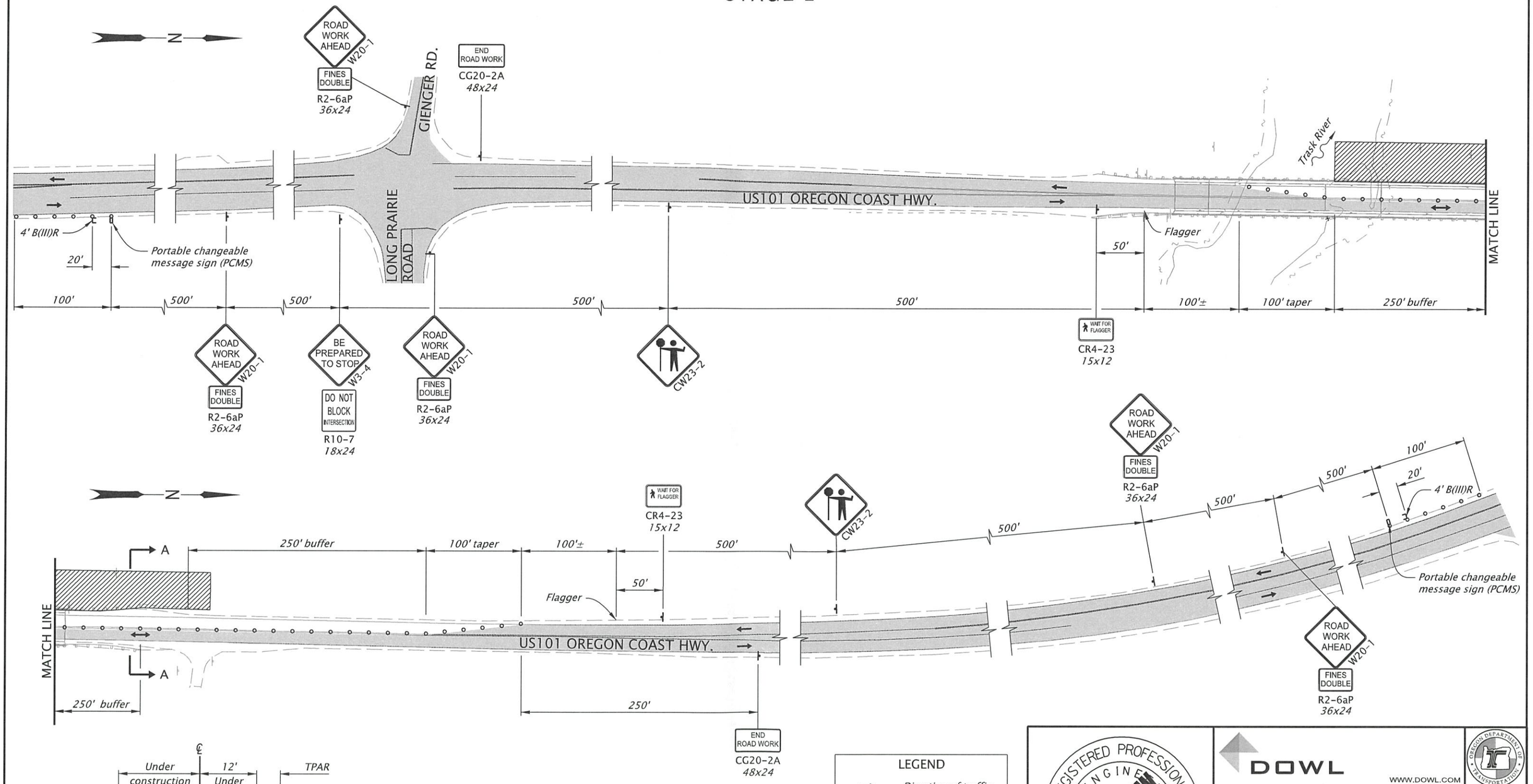
Designer: Tyler Klein
Reviewer: Jared Trowbridge
Drafter: Serban Dinca
Checker: Kyle Farnsworth

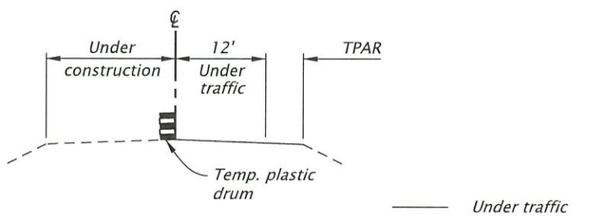
TRAFFIC CONTROL PLAN

SHEET NO. EB01

??V-???

STAGE 2





SECTION A-A

Under traffic

Existing ground

CONSTRUCTION SEQUENCING:

1. *Remove temporary signs and traffic control devices from Stage 1.*
2. *Install temporary signs and traffic control devices for Stage 2.*
3. *Construct Stage 2 temporary access road.*
4. *Construct Stage 2 scour repair.*

LEGEND

- *Direction of traffic*
- *Under traffic*
- *Under construction*
- *Temp. plastic drums on 20' max. spacing*
- *PCMS*

REGISTERED PROFESSIONAL ENGINEER
OREGON
TYLER WILLIAM KLEIN
MAY 12, 2020
FINAL REVIEW PLANS
EXPIRES: 6/30/

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OREGON DEPARTMENT OF TRANSPORTATION

US101: TRASK RIVER BRIDGE PROJ.
OREGON COAST HWY.
TILLAMOOK COUNTY

Designer: Tyler Klein	Reviewer: Jared Trowbridge
Drafter: Serban Dinca	Checker: Kyle Farnsworth

TRAFFIC CONTROL PLAN — SHEET NO. EB02

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

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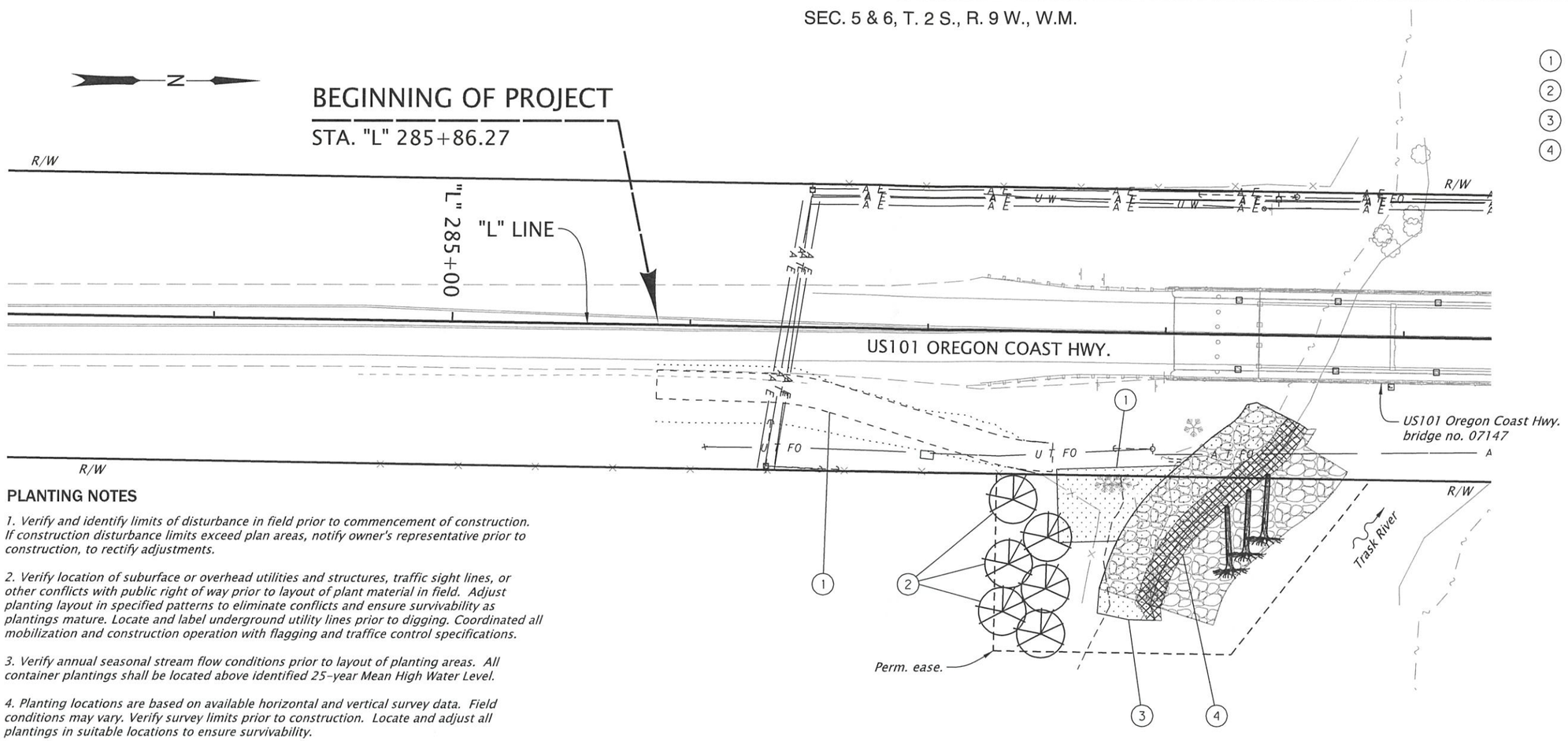
Rotation: 90° Scale: 1"=100'



1. *Inst. permanent seeding, Mix No. 1 - 0.14 ac.*
2. *Inst. conifer trees, 6 ft. height - 6 ea.*
3. *Inst. permanent seeding, Mix No. 2- 0.06 ac.*
4. *Plant cuttings, greater than 1 inch - 60 ea.*

PLANTING NOTES

1. Verify and identify limits of disturbance in field prior to commencement of construction. If construction disturbance limits exceed plan areas, notify owner's representative prior to construction, to rectify adjustments.

2. Verify location of suburface or overhead utilities and structures, traffic sight lines, or other conflicts with public right of way prior to layout of plant material in field. Adjust planting layout in specified patterns to eliminate conflicts and ensure survivability as plantings mature. Locate and label underground utility lines prior to digging. Coordinated all mobilization and construction operation with flagging and traffice control specifications.

3. Verify annual seasonal stream flow conditions prior to layout of planting areas. All container plantings shall be located above identified 25-year Mean High Water Level.

4. Planting locations are based on available horizontal and vertical survey data. Field conditions may vary. Verify survey limits prior to construction. Locate and adjust all plantings in suitable locations to ensure survivability.

5. Disturbance and impacts to existing native vegetation shall be minimized to the greatest extent practicable. Do not remove native plant species, felled trees, stumps or native detritus.

6. Minimal clearing may be required in order to establish suitable planting locations in areas where existing vegetation will not be disturbed during construction activities.

7. Specified willow cuttings to be coordinated with and installed during placement of riprap material. Verify elevation prior to installation. See Plant Cutting Installation in Rip-Rap on Std. Dwg. No DET6103.

8. Planting areas shall be prepared in accordance with the ODOT 2021 Oregon Standard Specifications for Construction and the project specific Special Provisions.

9. Contractor shall verify the availability of sufficient existing planting soil on site prior to construction. If imported topsoil is needed, submit topsoil type, source, and quantity for approval before commencement of construction.

10. Plant trees according to the Tree Planting detail on Std. Dwg. No. DET6100. This work does not include wire tree ties.

11. See Sheet FA02 for additional planting details

12. Provided browse protection for all container plants. See Seedling Protection detail on Std. Dwg. No. DET6101.

13. Mulch and tackifier shall be utilized during all seeding applications.

14. Plantings shall be irrigated manually or by other approved method, as necessary, to ensure plant establishment.

SITE RESTORATION PLATING LEGEND

SYMBOL	SCIENTIFIC NAME	COMMON NAME	SIZE	QUANTITY	LOCATION
TREES					
	Pseudotsuga menziesii	*Douglas Fir*	*6-foot*	*6*	*As shown*
PLANT CUTTINGS					
	Salix Lucida	*Pacific Willow*	*2-inch diameter, 48-inch length*	*60*	*As shown, space 4-feet on center*
SEEDING					
	N/A	*Seed Mix No. 1*	*N/A*	*50 Lbs / acre see specifications*	*As shown*
	N/A	*Seed Mix No. 2*	*N/A*	*50 Lbs / acre see specifications*	*As shown*

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749
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OREGON
05/13/11
LANDSCAPE ARCHITECT
EXPIRES 05/31/22
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Checker: Brian Meunier

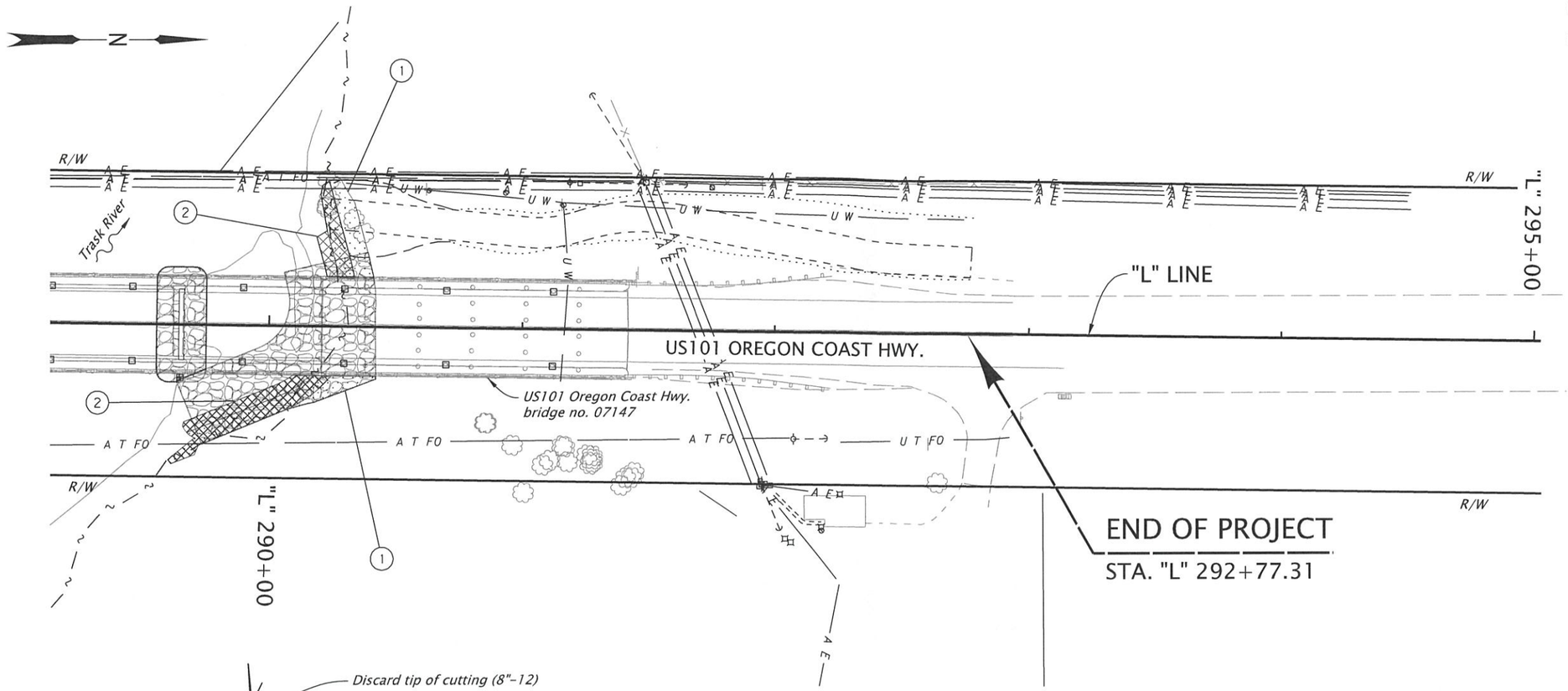
ROADSIDE DEVELOPMENT RESTORATION PLAN

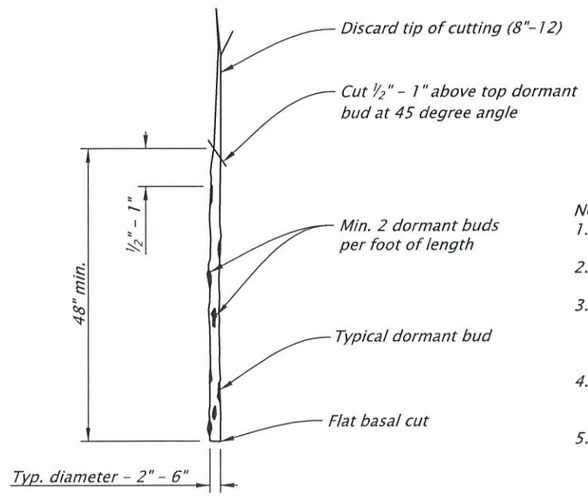
SHEET NO. FA01

SEC. 5 & 6, T. 2 S., R. 9 W., W.M.

(1) *Inst. permanent seeding, Mix No. 2 - 0.07 ac.*

(2) *Inst. willow cuttings - 50 ea.*





WILLOW CUTTING DETAIL

Not to scale

NOTES:

1. *Harvest area to be within same ecoregion as project area.*
2. *Cut for vigorous 1-3 year old wood on plants growing in full sunlight.*
3. *Immediately remove all lateral branches and cut leader (apical stem) approximately 8"-12" down stem from tip of leader; seal top cut with a dap of paint.*
4. *Store protected at 32°-42° farenheit for up to 4 months, or before dormant bud development.*
5. *Soak entire length of cuttings for 10-12 days prior to installation.*

See FA01 for planting notes and legend.

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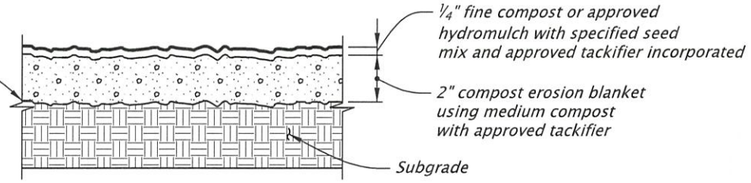
ROADSIDE DEVELOPMENT RESTORATION PLAN

SHEET NO. FA02



NOTE:
See standard specifications 03020 for compost specifications.

APPLICATION - TEMPORARY/PERMANENT VEGETATIVE COVER

EROSION AND SEDIMENT CONTROL GENERAL NOTES:
The construction, adjustment, maintenance, and upgrading of these Erosion And Sediment Control measures is the responsibility of the Contractor for the duration of the project to comply with Section 00280 of the Oregon Standard Specifications For construction (2021) and the NPDES 1200-CA permit.

Erosion And Sediment Control measures shown on this plan are for anticipated site conditions. Adjust or upgrade these measures for unexpected storm events to ensure that sediment and sediment-laden water does not leave the site.

Develop a revised plan of the Erosion And Sediment Control measures shown as required by Section 00280, Oregon Standard Specifications For Construction (2021). Implement this plan for all clearing and grading activities and in segments applicable to each staging phase. Construct in such a manner so as to ensure that sediment and sediment-ladenwater does not enter the roadway or drainage system, or violate applicable water standards.

Install measures within the right-of-way unless directed otherwise.

STANDARD DRAWINGS

- ■ *RD1000 Construction Entrances*
- ☐ *RD1005 Check Dams Type 1, 3 and 4*
- ☐ *RD1006 Check Dams Type 2 and 6*
- ☐ *RD1010 Inlet Protection Type 2, 3, 6, 7 10 and 11*
- ■ *RD1015 Inlet Protection Type 4*
- ☐ *RD1030 Sediment Barrier Type 2, 3 and 4*
- ☐ *RD1031 Sediment Barrier Type 5 and 6*
- ■ *RD1032 Sediment Barrier Type 8*
- ■ *RD1033 Sediment Barrier Type 9*
- ☐ *RD1040 Sediment Fence*
- ☐ *RD1045 Temporary Slope Drain With Energy Dissipator*
- ☐ *RD1050 Temporary Scour Basin / Energy Dissipator*
- ☐ *RD1055 Slope and Channel Matting*
- ☐ *RD1060 Tire Wash Facility Type 1 and 2*
- ☐ *RD1065 Sediment Trap*
- ☐ *RD1070 Concrete Truck Wash Out*

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EROSION AND SEDIMENT CONTROL

SHEET NO.
FB01

FINAL ELECTRONIC DOCUMENT
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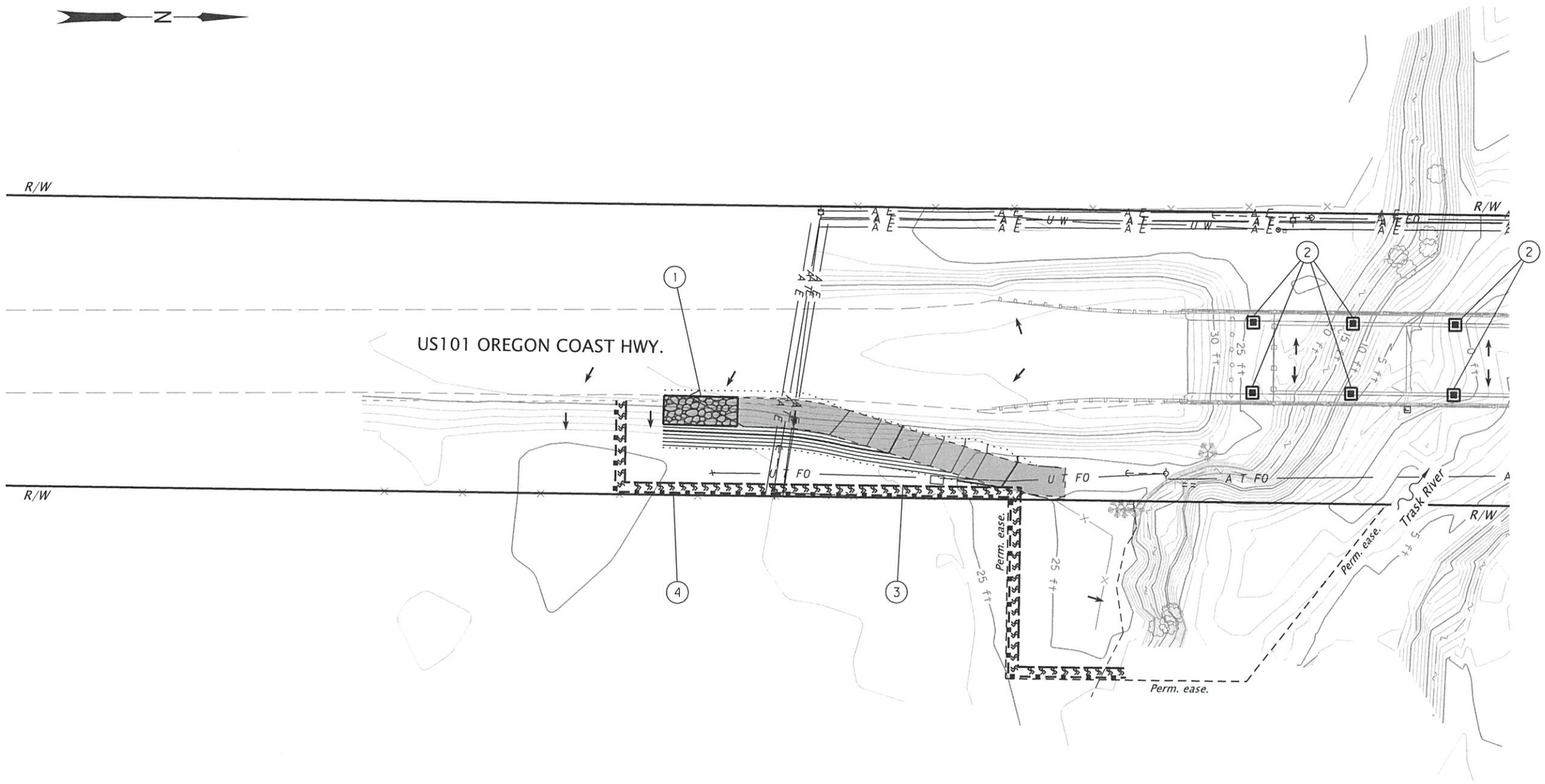
SEC. 5 & 6, T. 2 S., R. 9 W., W.M.
STAGE 1, PHASE 1

N



1. *Const. construction entrance, type 1 (See dwg. no. RD1000)*
2. *Const. inlet protection Type 4, bio-filter bag (See dwg. no. RD1015)*
3. *Inst. sediment barrier Type 9, compost filter berm (See dwg. no. RD1033)*
4. *Inst. orange construction fence*

LEGEND

- *Flow direction*
- *Slope direction*
- *Inlet protection*
- *Construction entrance*
- *Orange construction fence*
- *Sediment barrier, type 9 (Compost filter berm)*

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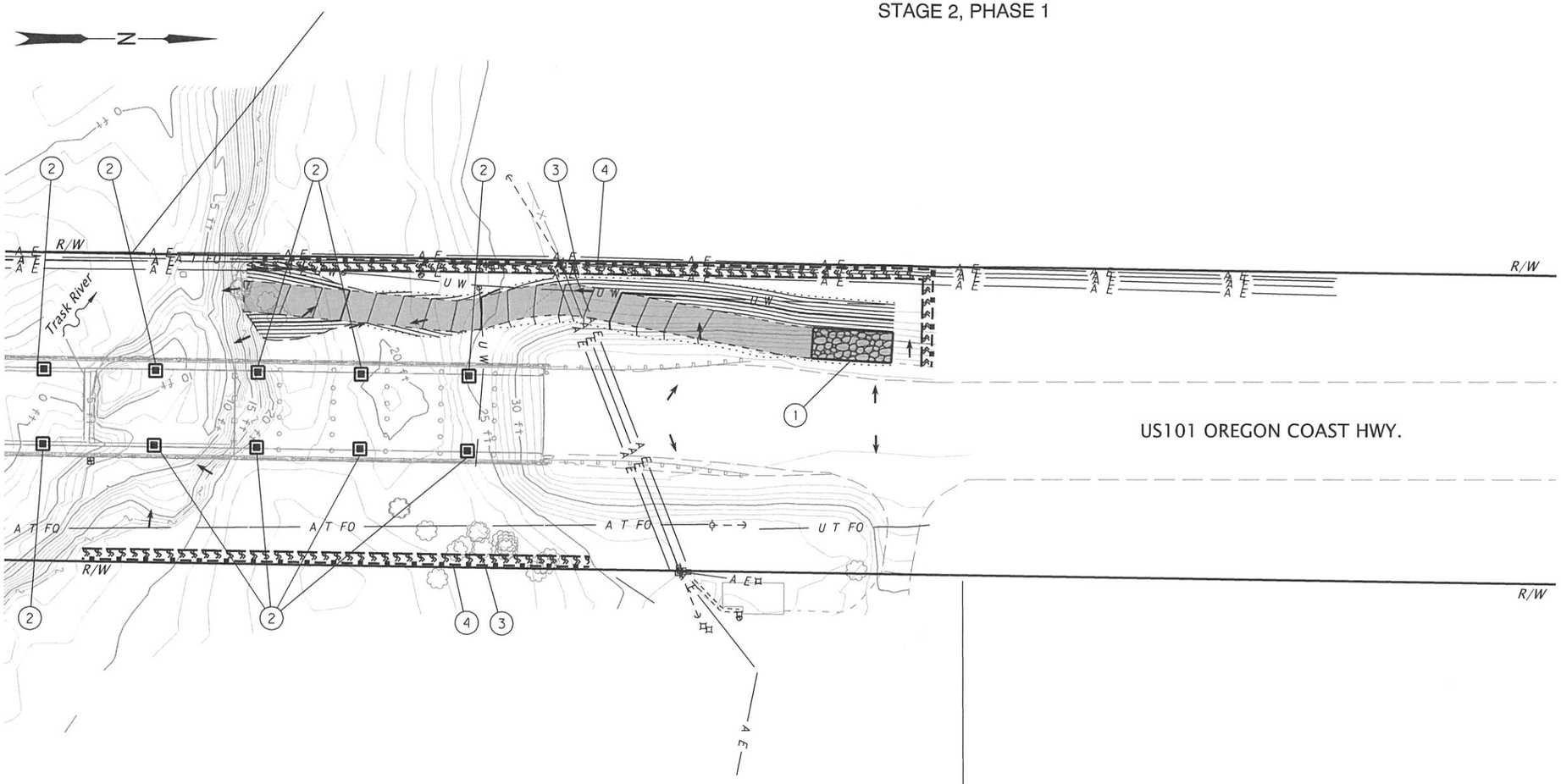
EROSION AND SEDIMENT CONTROL

SHEET NO.
FB02

??V-???

SEC. 5 & 6, T. 2 S., R. 9 W., W.M.
STAGE 2, PHASE 1



1. *Const. construction entrance, type 1*
2. *Const. inlet protection Type 4, bio-filter bag*
3. *Inst. sediment barrier Type 9, compost filter berm*
4. *Inst. orange construction fence*

LEGEND

- *Flow direction*
- *Slope direction*
- *Inlet protection*
- *Construction entrance*
- *Orange construction fence*
- *Sediment barrier, type 9 (Compost filter berm)*

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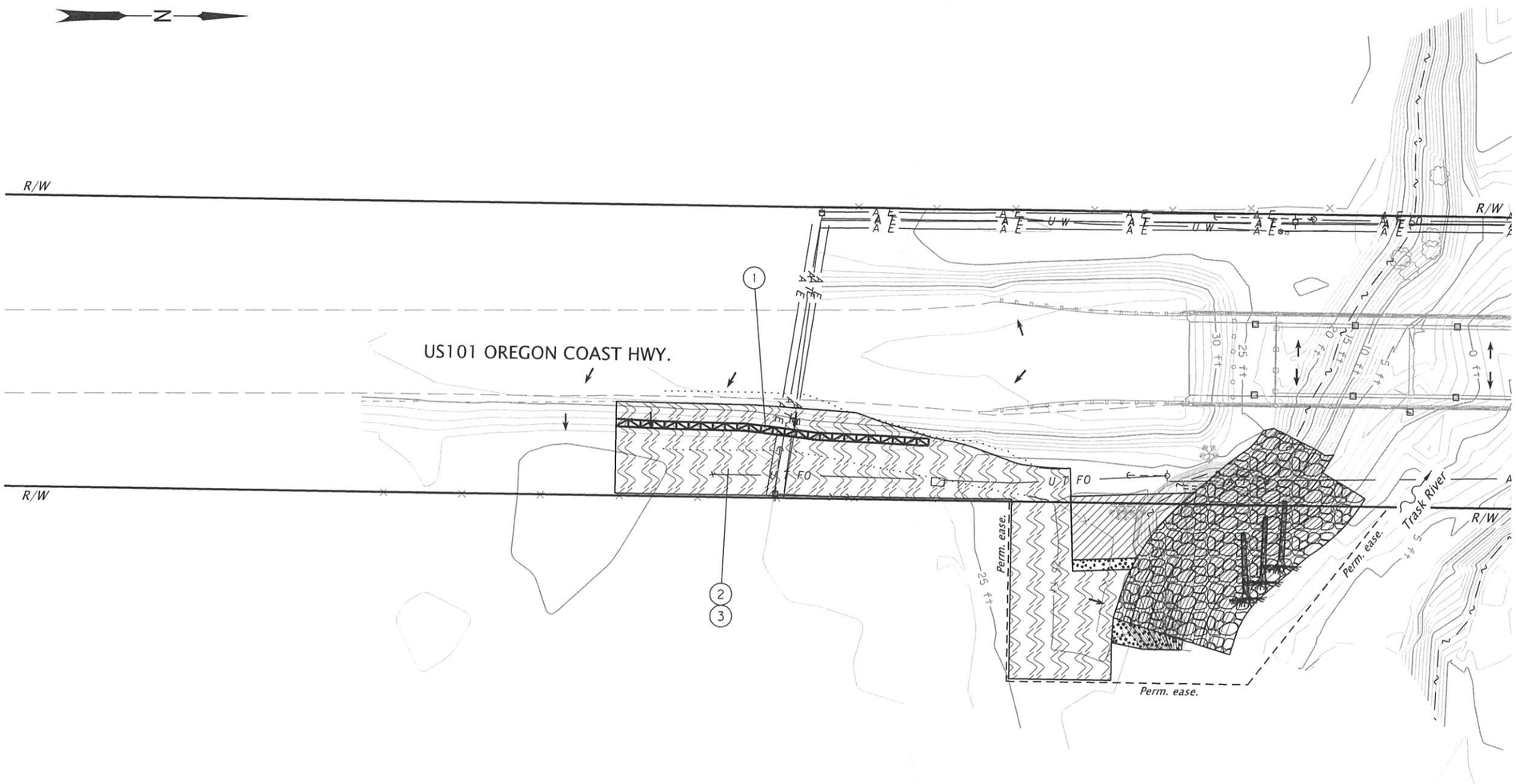
EROSION AND SEDIMENT CONTROL

SHEET NO. FB03

SEC. 5 & 6, T. 2 S., R. 9 W., W.M.
STAGE 1, PHASE 2

N

1. *Inst. sediment barrier Type 8, straw wattle (See dwg. no. RD1032)*
2. *Inst. compost erosion blanket, 2" thick (For details, see sht. FA01)*
3. *Apply permanent seed mix no. 1 on top of compost erosion blanket (For details, see sht. FA01)*



LEGEND

- *Flow direction*
- *Slope direction*
- *Erosion compost blanket*
- *Sediment barrier, type 8 (Straw wattle)*

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EXPIRES: 6/30/

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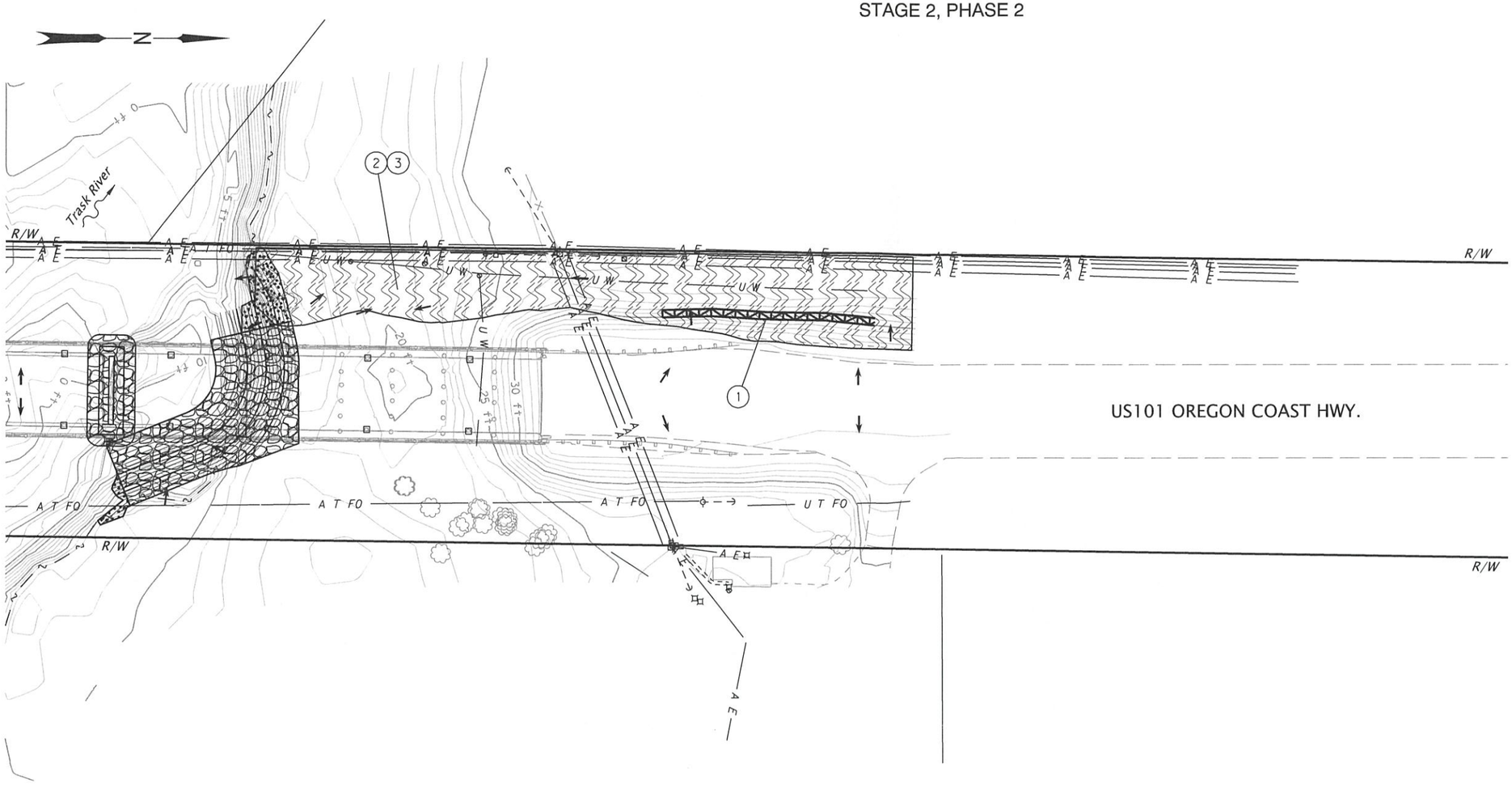
Drafter: Serban Dinca	Checker: Kyle Farnsworth

EROSION AND SEDIMENT CONTROL

SHEET NO.
FB04

SEC. 5 & 6, T. 2 S., R. 9 W., W.M.
STAGE 2, PHASE 2



1. *Inst. sediment barrier Type 8, straw wattle*
2. *Inst. compost erosion blanket, 2" thick (For details, see sht. FA01)*
3. *Apply permanent seed mix no. 1 on top of compost erosion blanket (For details, see sht. FA01)*

LEGEND

- *Flow direction*
- *Slope direction*
- *Erosion compost blanket*
- *Sediment barrier, type 8 (Straw wattle)*

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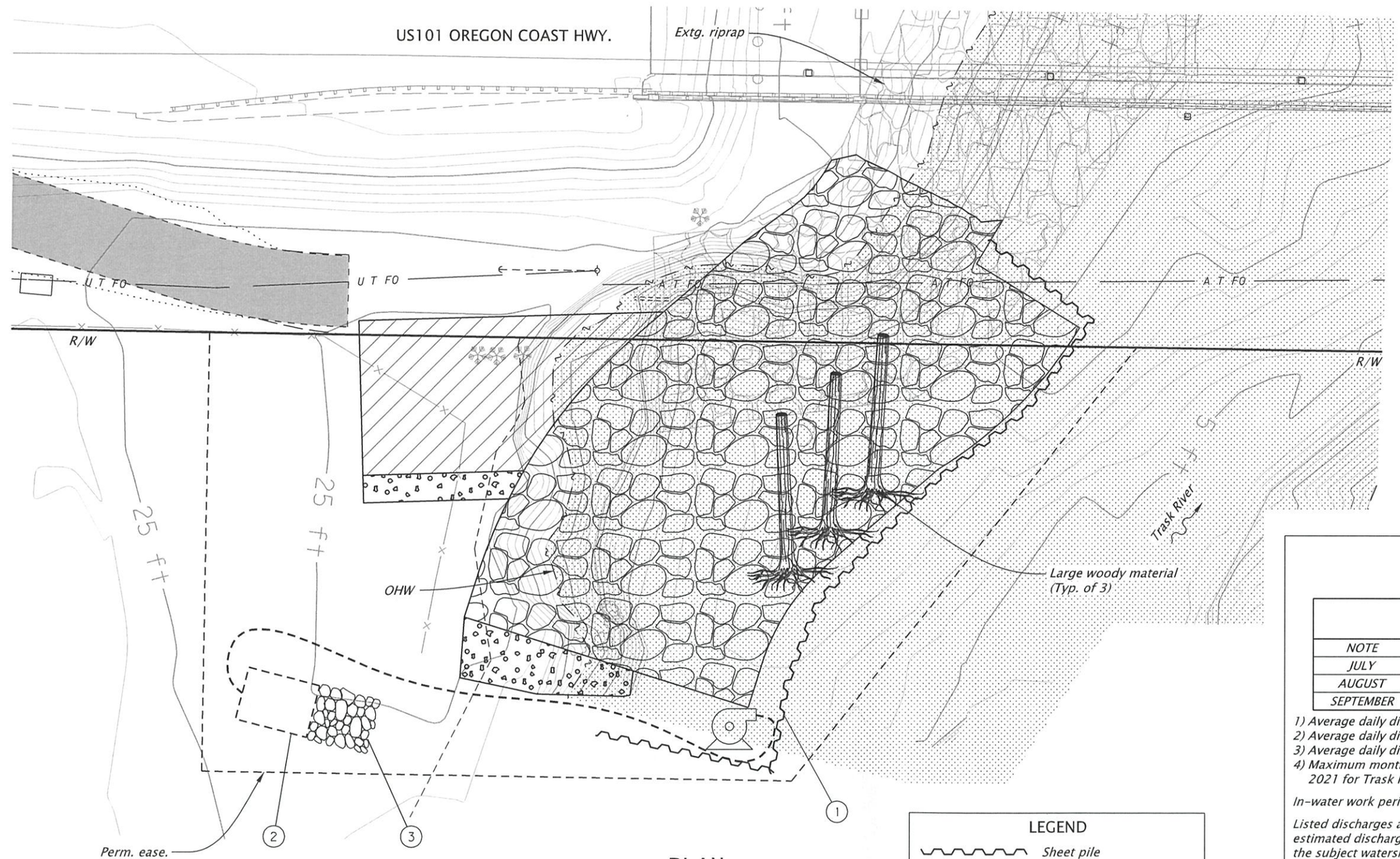
EROSION AND SEDIMENT CONTROL — SHEET NO. FB05

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

STAGE 1



PLAN

GENERAL NOTES

The implementation of a Temporary Water Management Plan and the design, construction, maintenance, replacement and upgrading of this facility is the responsibility of the contractor until all construction is completed and approved.

The Temporary Water Management Facility shown on this plan is the minimum requirements for anticipated site conditions. During the construction periods, the facility shall be upgraded for unexpected storm events and to insure that sediment and sediment-laden water does not leave the site.

Turbidity monitoring required, per specification section 00290.

Remove all Temporary Water Management features and restore site as per plans and specifications.

PARTIAL ISOLATION NOTES

1. *Isolating the work site: Install coffer dam along the stream channel. Size the barrier based on site stream flow and tidal conditions. Average daily discharged (USGS StreamStats) and maximum monthly water surface elevation (USGS Trask River gauge at US 101, Gauge No. 452546123492700) are provided in the table below for estimating flow and water surface elevations.*
2. *Provide adequate sediment control measures during dewatering of the work area to insure sediment laden water does not leave the site and/or enter the waters of the state.*
3. *Install energy dissipator pad downstream from sediment control facility. Location to be set based on topography and easements available.*

TRASK RIVER AT HWY 101
ESTIMATED DISCHARGES FOR
TEMPORARY WATER MANAGEMENT

	AVERAGE DAILY DISCHARGE IN CUBIC FEET PER SECOND			MAX. GAUGED WATER ELEVATION
NOTE	1	2	3	4
JULY	418	320	798	9.52
AUGUST	241	161	282	9.77
SEPTEMBER	204	128	147	9.68

1) Average daily discharge expected to be exceeded 2 days each month.
2) Average daily discharge expected to be exceeded 8 days each month.
3) Average daily discharge expected to be exceeded 16 days each month.
4) Maximum monthly water surface elevation between 2018 and 2021 for Trask River at US101 gauge.

In-water work period extends from 1 July through 15 September.

Listed discharges are surface water from the upstream watershed. The estimated discharges are based on nearby gauged basins. Discharges in the subject watershed may differ.

LEGEND

- *Sheet pile*
- *Regulated work zone*
- *Energy dissipator*
- *Sediment control facility*
- *Dewatering sump pump*

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95[illegible]
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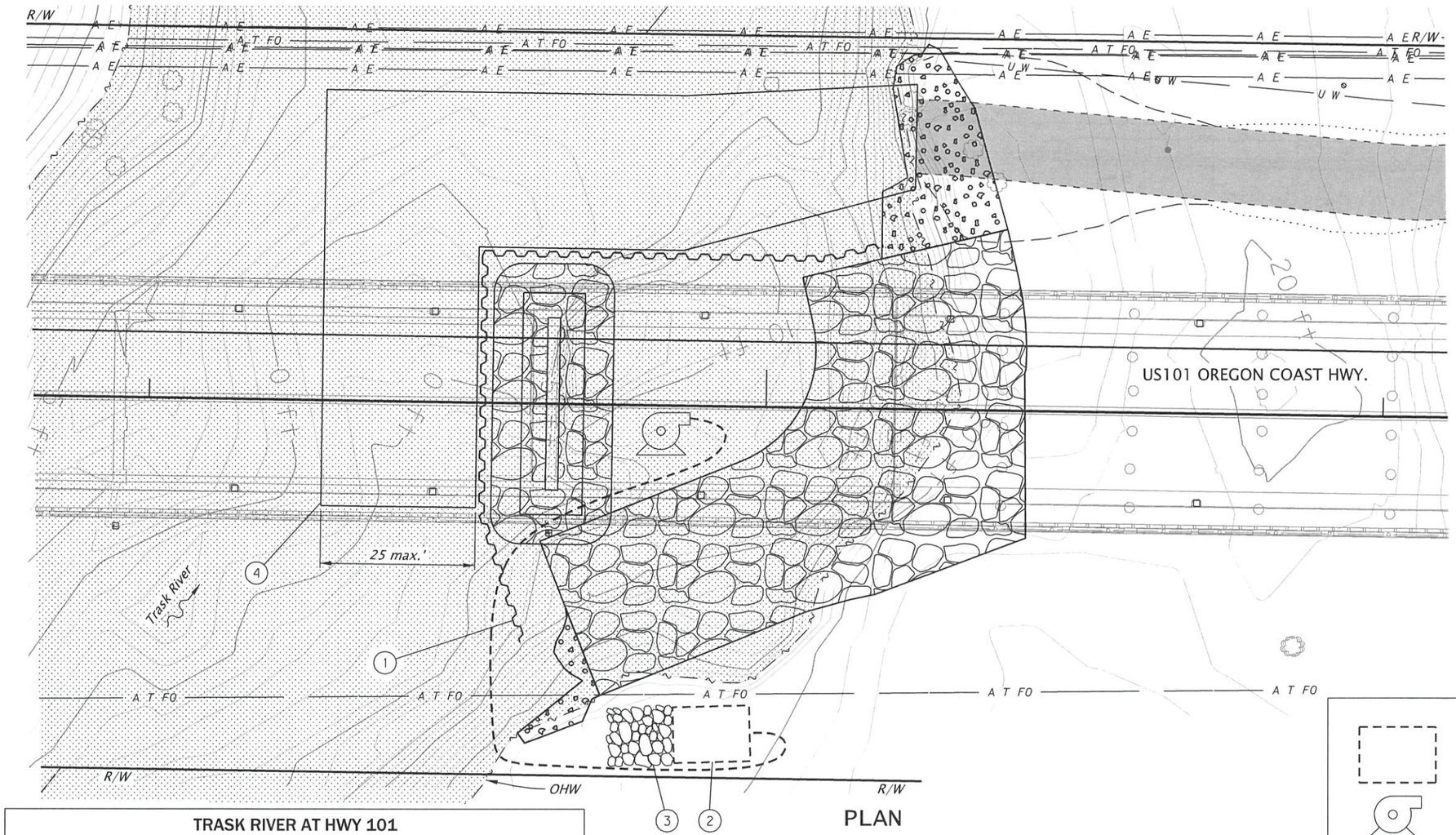
TEMPORARY WATER MANAGEMENT CONCEPT

SHEET NO. HD01

STAGE 2



PLAN

TRASK RIVER AT HWY 101
ESTIMATED DISCHARGES FOR
TEMPORARY WATER MANAGEMENT

	AVERAGE DAILY DISCHARGE IN CUBIC FEET PER SECOND			MAX. GAUGED WATER ELEVATION
NOTE	1	2	3	4
JULY	418	320	798	9.52
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1) Average daily discharge expected to be exceeded 2 days each month.
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Listed discharges are surface water from the upstream watershed. The estimated discharges are based on nearby gauged basins. Discharges in the subject watershed may differ.

GENERAL NOTES

The implementation of a Temporary Water Management Plan and the design, construction, maintenance, replacement and upgrading of the facility is the responsibility of the contractor until all construction is completed and approved.

The Temporary Water Management Facility shown on this plan is the minimum requirements for anticipated site conditions. During the construction periods, the facility shall be upgraded for unexpected storm events and to insure that sediment and sediment-laden water does not leave the site.

Turbidity monitoring required, per specification section 00290.

Remove all Temporary Water Management features and restore site as per plans and specifications.

PARTIAL ISOLATION NOTES

(1) *Isolating the work site: Install coffer dam along the stream channel. Size the barrier based on site stream flow and tidal conditions. Average daily discharged (USGS StreamStats) and maximum monthly water surface elevation (USGS Trask River gauge at US 101, Gauge No. 452546123492700) are provided in the table below for estimating flow and water surface elevations. Below bridge, sheet pile cofferdam may be installed in vertical sections welded together. Vertical length will depend on water surface elevation (approximate 12 ft lengths). Preserve and protect bridge during installation and removal of sheet piles.*

(2) *Provide adequate sediment control measures during dewatering of the work area to insure sediment laden water does not leave the site and/or enter the waters of the state.*

(3) *Install energy dissipator pad downstream from sediment control facility. Location to be set based on topography and easements available.*

(4) *Construct temporary work bridge.*

LEGEND

- *Sediment control facility*
- *Energy dissipator*
- *Dewatering sump pump*
- *Regulated work zone*
- *Sheet pile*

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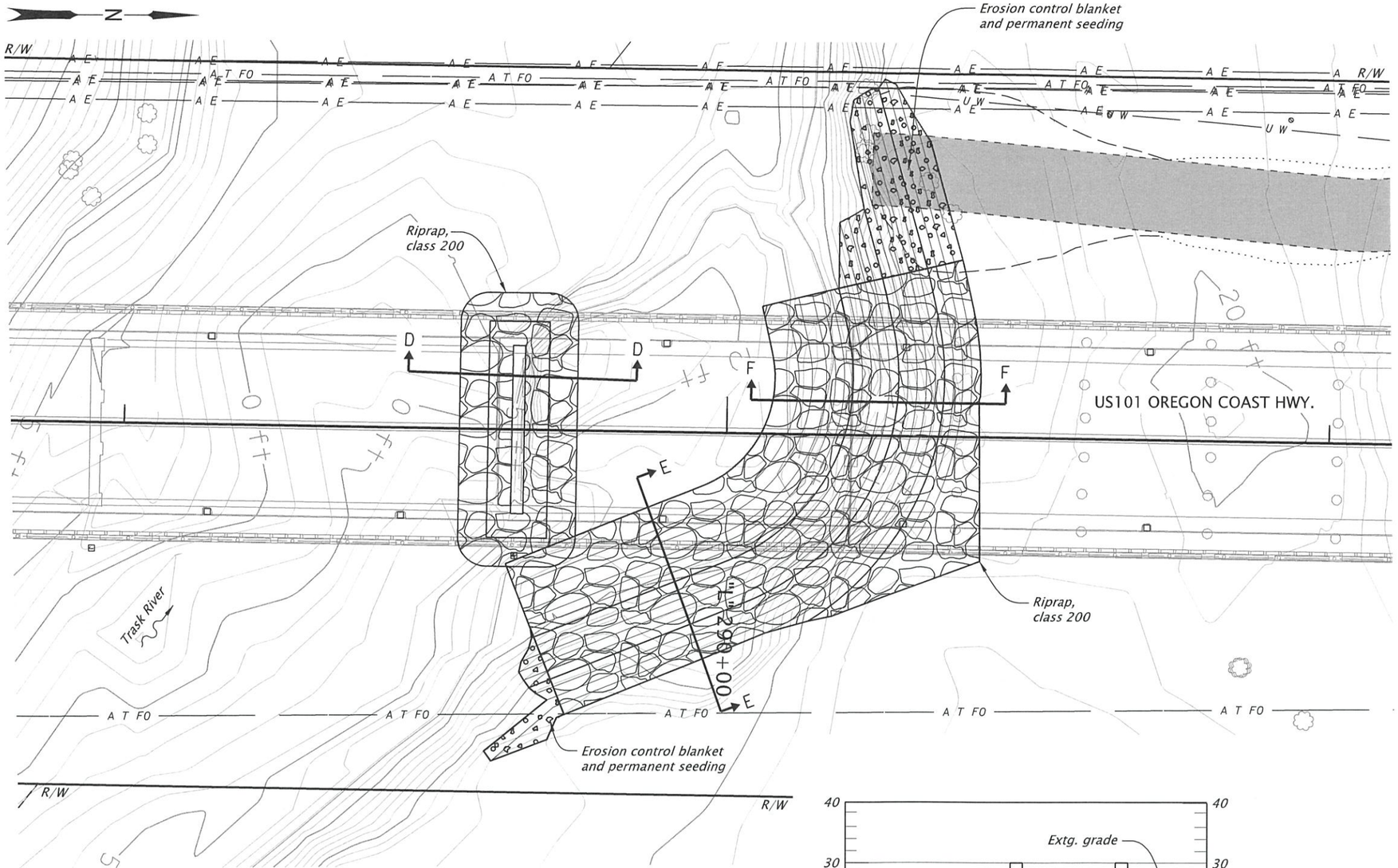
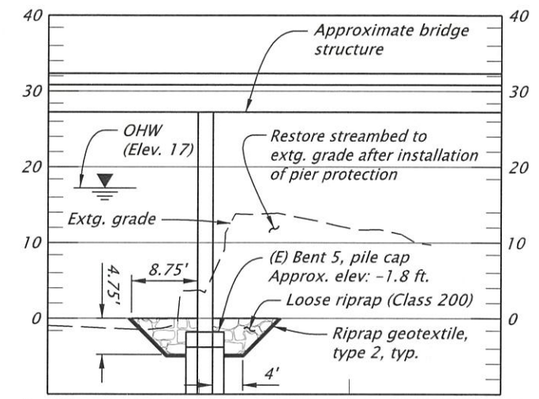
TEMPORARY WATER MANAGEMENT CONCEPT

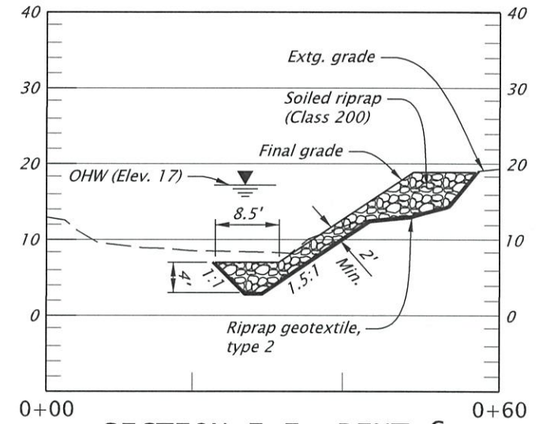
SHEET NO. HD02



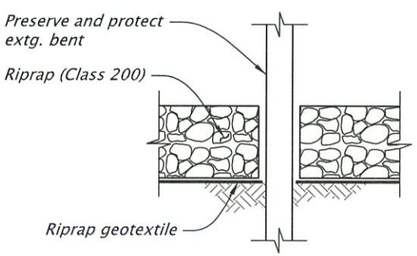
PLAN



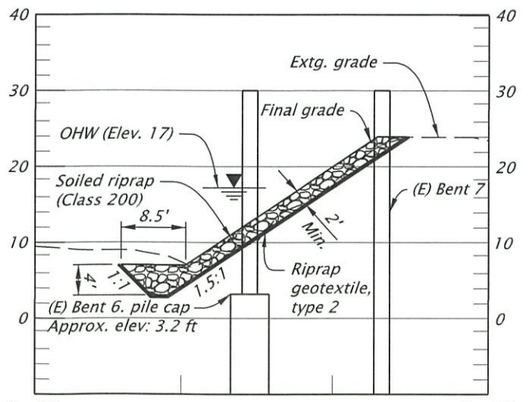
SECTION D-D: BENT 5
PIER PROTECTION DETAIL



SECTION E-E: BENT 6
PROTECTION DETAIL



RIPRAP AT BENTS
DETAIL



SECTION F-F: BENT 6
PROTECTION DETAIL 2

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DETAILS	SHEET NO. HG03