

Attachment 3

HYDRAULIC REPORT RIVERBEND EXPANSION - MODULES 10 AND 11, RIVERBEND LANDFILL COMPANY



prepared for
Latimer Environmental LLC

prepared by
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November 17, 2014

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1 INTRODUCTION

Waterways Consulting Inc. (Waterways) has been retained by Latimer Environmental, LLC (LE) to conduct a hydraulic evaluation of the proposed buildout conditions of the Riverbend Landfill – Modules 10 and 11, Riverbend Landfill Company (Project) and a channel and floodplain enhancement plan developed for the southern tributary channel located to the south of the landfill.

The landfill is located in Yamhill County adjacent to the South Yamhill River, approximately three miles southwest of McMinnville (Figure 1). Landfill operation facilities are located on the northern side of the South Yamhill River and bounded by two tributaries to the north and south that originate to the west of Highway 18 (Figure 2).

The landfill is proposing to expand operations by constructing berms along the northern, southwestern, and southern portion of the landfill and build an access ramp across the southern tributary. The access ramp will include a stream crossing structure designed to meet fish passage criteria established by the Oregon Department of Fish and Wildlife (ODFW). The Federal Emergency Management Agency (FEMA) has mapped a portion of the proposed landfill expansion areas within the Special Flood Hazard Area (SFHA) (Attachment A).

The following report has been prepared to support a No-Rise certification and presents our hydraulic analysis of existing and proposed conditions and provides recommendations for design of the crossing structure.

2 PEAK FLOW HYDROLOGY

Peak discharges for the South Yamhill River were obtained from the FEMA Flood Insurance Study (FIS) for Yamhill County, Oregon (Unincorporated Areas), dated March 2, 2010. Peak discharges for the tributary channels to the north and the south of the landfill were developed using USGS regional regression equations (Cooper, 2005). Parameters used in the equations include drainage area and the 2-yr 24-hour precipitation. These parameters were estimated using StreamStats (USGS, 2012), a web-based geographic information system application that provides an interactive map for calculating basin characteristics and peak flow hydrology.

Our analysis used a 100-year peak flow values of 50,000 cfs for the South Yamhill River, 277 cfs for the southern tributary, and 298 cfs in the northern tributary.

3 PEAK FLOW HYDRAULICS

METHODS

Hydraulic modeling was conducted using HEC-RAS version 4.1 river analysis software developed by the United States Army Corps of Engineers (USACE, 2010). An existing conditions (Duplicate Effective) hydraulic model used to prepare a Letter of Map Revision (FEMA Case No. 12-10-1146P) for the South Yamhill River was provided by LE. The LOMR was approved by FEMA with an effective date of May 9, 2013. The duplicate effective model geometry was developed using aerial topographic mapping prepared by Aerometric Geospatial Solutions and dated April 22, 2011. The hydraulic models, topographic mapping, and resulting water surface elevations are referenced to the NAVD88 vertical datum.

Waterways prepared an existing conditions (Corrected Effective) model by revising the duplicate effective model to include the northern and southern tributaries as separate reaches. Fifteen (15) cross sections were used to delineate these tributary channels between the confluence with the South Yamhill River and the Highway 18 crossings (Figure 2). The three culverted crossings along the southern tributary were assumed to be blocked for this hydraulic analysis and were not included in the model as crossing structures. Two additional cross sections on the South Yamhill River were added to the corrected effective model that were not present in the duplicate effective model. These sections were added to correctly model the tributaries and their junctions in the HEC-RAS analysis.

The proposed conditions model was created by updating cross section geometry to depict the Project conditions and a channel and floodplain enhancement plan located on the southern tributary channel. Proposed conditions geometry for the Project was based on a Final Grading Plan prepared by Geosyntec Consultants, Inc. and submitted to Yamhill County with the Site Design Review Application for the Riverbend Expansion – Modules 10 and 11 prepared by Waste Management and dated November 5, 2014. Proposed conditions geometry for the channel and floodplain enhancement on the southern tributary was based on the Riverbend Landfill South Tributary Channel and Floodplain Enhancement 30% Design prepared by Waterways Consulting Inc. and dated November 4, 2014. A bottomless arch or box culvert was selected as the preferred crossing structure at the access ramp and was used in the proposed conditions modeling.

The models cover approximately 2.9 miles of the South Yamhill River and 1.4 miles of tributary channels from their confluence to the Highway 18 crossings. The existing and proposed conditions roughness values within the tributary channel are set to 0.05 for the channel and 0.1 for the overbank areas. The roughness values for the South Yamhill River were not changed from the LOMR analysis and ranged from 0.05 to 0.12 for the channel and from 0.035 to 0.1 for the overbank areas.

The downstream boundary condition for the South Yamhill River was set to a known water surface elevation corresponding to the FEMA Flood Insurance Rate Map Base Flood Elevation listed at Cross Section AE.

RESULTS

The proposed conditions modeling predicts no rise in water surface elevations or average channel velocities relative to existing conditions (Figures 3, 4, and 5). Water surface elevations on each of the tributaries during the 100-yr flood are largely controlled by backwatering from the South Yamhill River. A proposed 16 foot span x 8 foot rise box culvert below the ramp on the southern tributary would result in no rise to the 100-yr water surface elevation relative to existing conditions. Smaller structures resulted in minor increases to the 100-yr flood profile upstream of the crossing. Fish passage design criteria for road crossings presented by ODFW typically require a structure that has a minimum span of at least the active stream channel width or the width that occurs annually at ordinary high water. Channel measurements upstream of the highway 18 crossing indicate that a 12-foot span culvert would satisfy the ODFW design criteria.

Table 1 presents the 100-year water surface elevations for selected cross sections. Complete hydraulic results are presented in Attachment C.

Table 1. Summary of 100-Year Peak Flow Hydraulics				
100-Year Water Surface Elevation (ft)				
Section ID (River Station)	Location	Existing Conditions	Proposed Conditions	Difference
22.15	S. Yamhill	140.23	140.23	0.00
20.28	S. Yamhill	138.80	138.80	0.00
4449.22	N. Tributary	138.32	138.32	0.00
3365	S. Tributary	139.54	139.54	0.00
2865	S. Tributary	139.50	139.48	-0.02

Figure 2 depicts the 100-year flood boundary for existing and proposed conditions. The 100-year flood inundation area would be increased near the proposed channel and floodplain enhancement area but remains virtually identical in other areas. Flood inundation areas on the tributaries are due to backwatering from the South Yamhill River.

4 REFERENCES

Cooper, R.M., 2005. Estimation of Peak Discharges for Rural, Unregulated Streams in Western Oregon: U.S. Geological Survey Scientific Investigation Report 2005-5116.

Federal Emergency Management Agency. 2010. Flood Insurance Study (FIS) for Yamhill County, Oregon and Unincorporated Areas. March 2, 2010.

U.S. Army Corps of Engineers. 2010, Hydrologic Engineering Center. Computer Program HEC-RAS Version 4.1. Davis, California.

U.S. Army Corps of Engineers. 2010, Hydrologic Engineering Center. Hydraulic Reference Manual. Version 4.1. Davis, California.

U.S. Geologic Survey , 2012, The StreamStats program, online at <http://streamstats.usgs.gov>

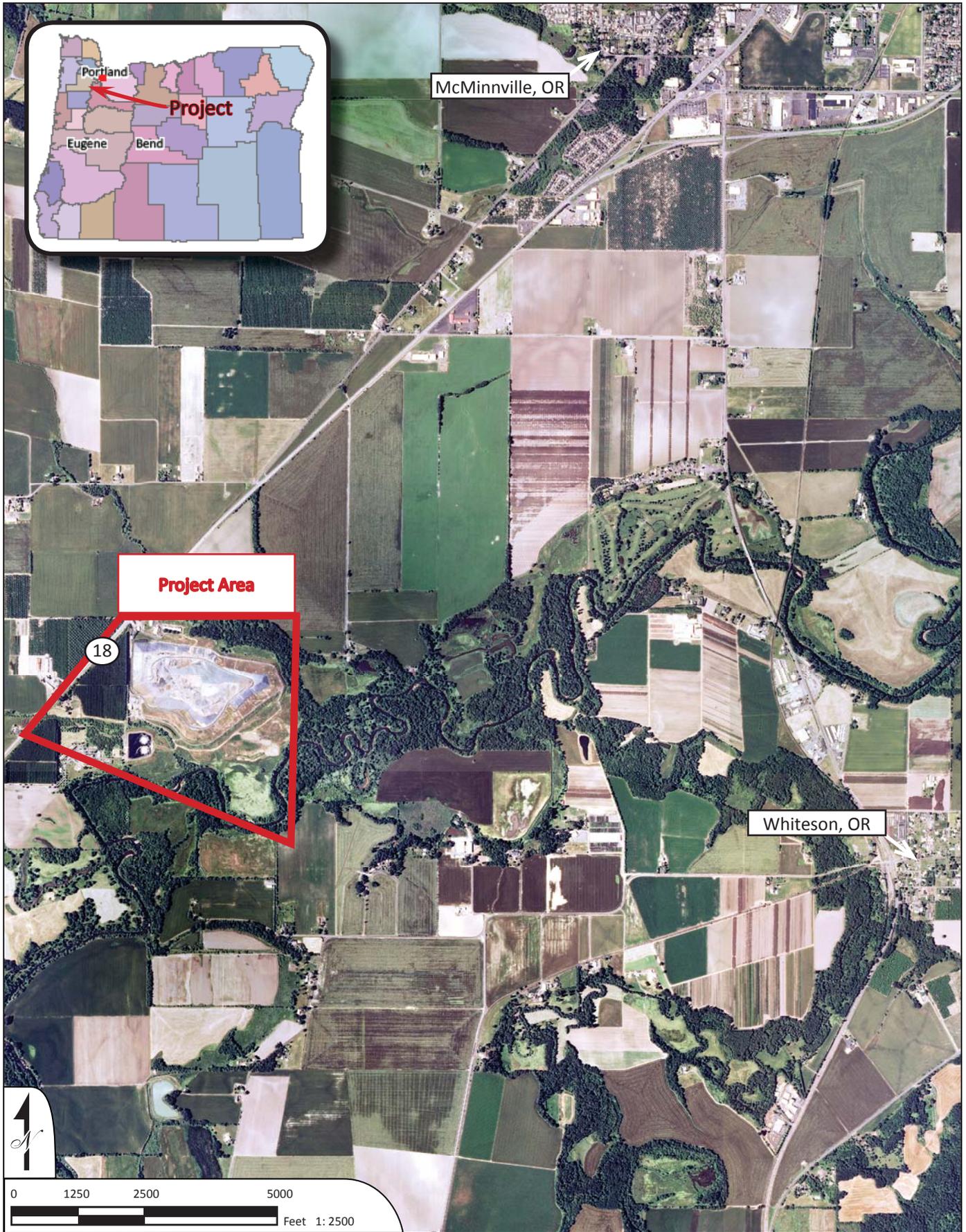
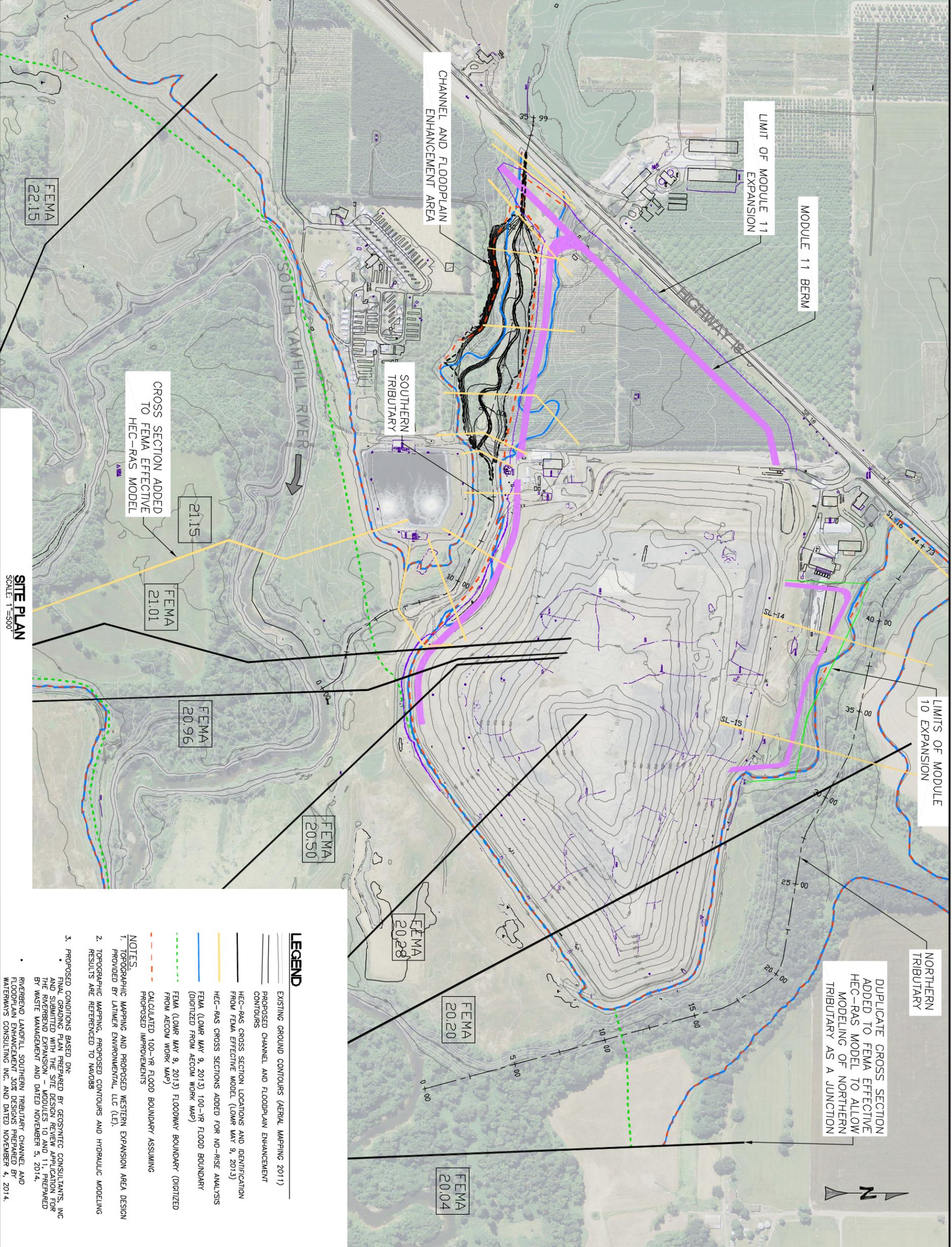


FIGURE 1

Project location for the Riverbend Landfill, located on the South Yamhill River, west of Whiteson, Oregon.



SITE PLAN
SCALE: 1"=500'

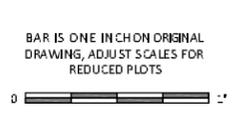
LEGEND

- EXISTING GROUND CONTOURS (AERIAL MAPPING 2011)
- PROPOSED CHANNEL AND FLOODPLAIN ENHANCEMENT CONTOURS
- HEC-RAS CROSS SECTION LOCATIONS AND IDENTIFICATION FROM FEMA EFFECTIVE MODEL (LOMR MAY 9, 2013)
- HEC-RAS CROSS SECTIONS ADDED FOR NO-RISE ANALYSIS (LOMR MAY 9, 2013) 100-YR FLOOD BOUNDARY (DIGITIZED FROM AECOM WORK MAP)
- FEMA (LOMR MAY 9, 2013) FLOODWAY BOUNDARY (DIGITIZED FROM AECOM WORK MAP)
- CALCULATED 100-YR FLOOD BOUNDARY ASSUMING PROPOSED IMPROVEMENTS

NOTES:

1. TOPOGRAPHIC MAPPING AND PROPOSED WESTERN EXPANSION AREA DESIGN PROVIDED BY LATIMER ENVIRONMENTAL, LLC (LE);
2. TOPOGRAPHIC MAPPING, PROPOSED CONTOURS AND HYDRAULIC MODELING RESULTS ARE REFERENCED TO NAD88
3. PROPOSED CONDITIONS BASED ON:
 - FINAL GRADING PLAN PREPARED BY GEOSYNTEC CONSULTANTS, INC AND SUBMITTED WITH THE SITE DESIGN REVIEW APPLICATION FOR THE RIVERBEND EXPANSION - MODULES 10 AND 11, PREPARED BY WASTE MANAGEMENT AND DATED NOVEMBER 5, 2014.
 - RIVERBEND LANDFILL SOUTHERN TRIBUTARY CHANNEL AND FLOODPLAIN ENHANCEMENT 30% DESIGN PREPARED BY WATERWAYS CONSULTING INC. AND DATED NOVEMBER 4, 2014.

Duplicate cross section added to FEMA effective HEC-RAS model to allow modeling of northern tributary as a junction



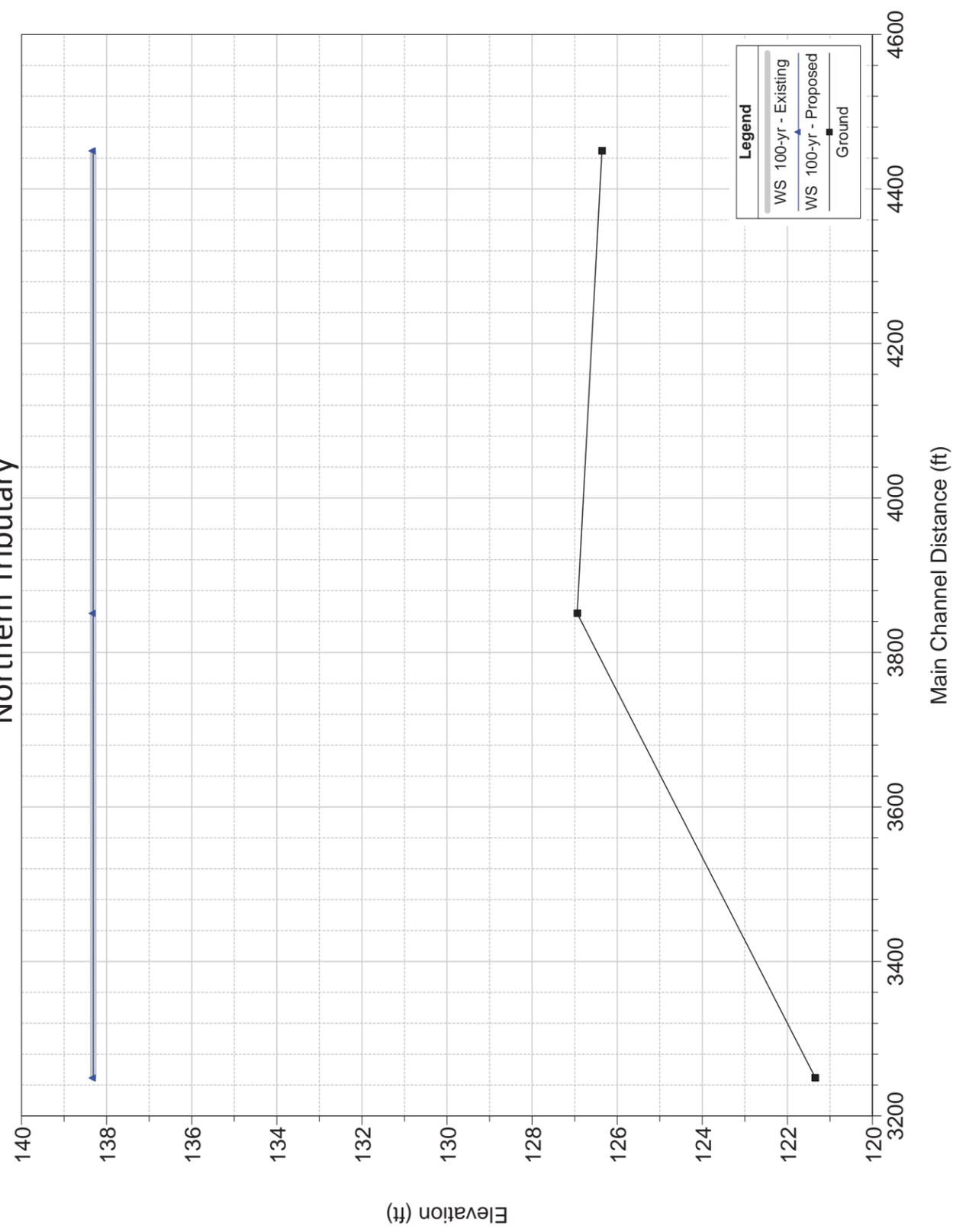
DATE: 11/17/14

RIVERBEND LANDFILL SITE PLAN AND 100-YR FLOOD BOUNDARIES

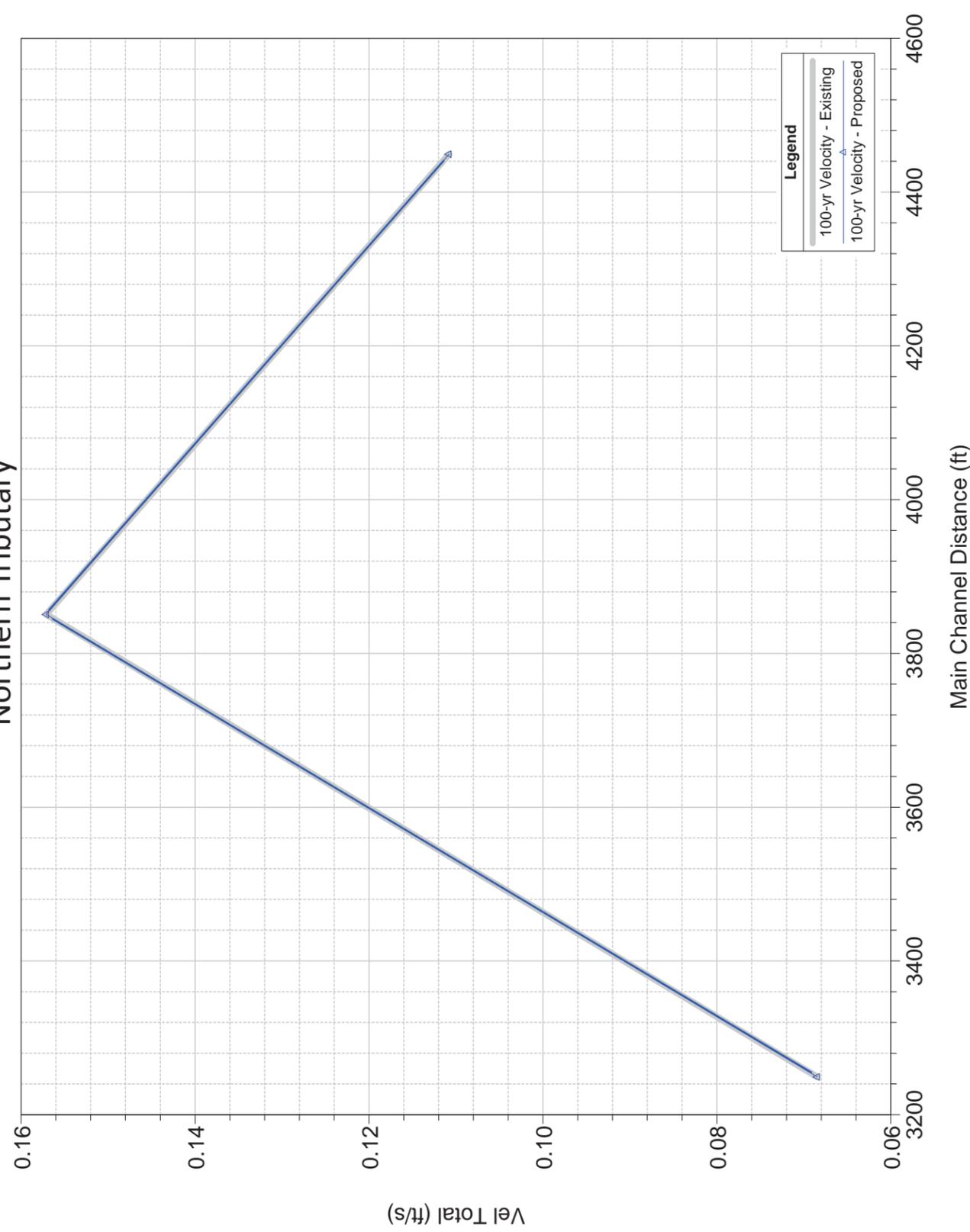
RIVERBEND LANDFILL
McMINNVILLE, OREGON



100-Year Water Surface Profile Northern Tributary



100-Year Velocity Profile Northern Tributary



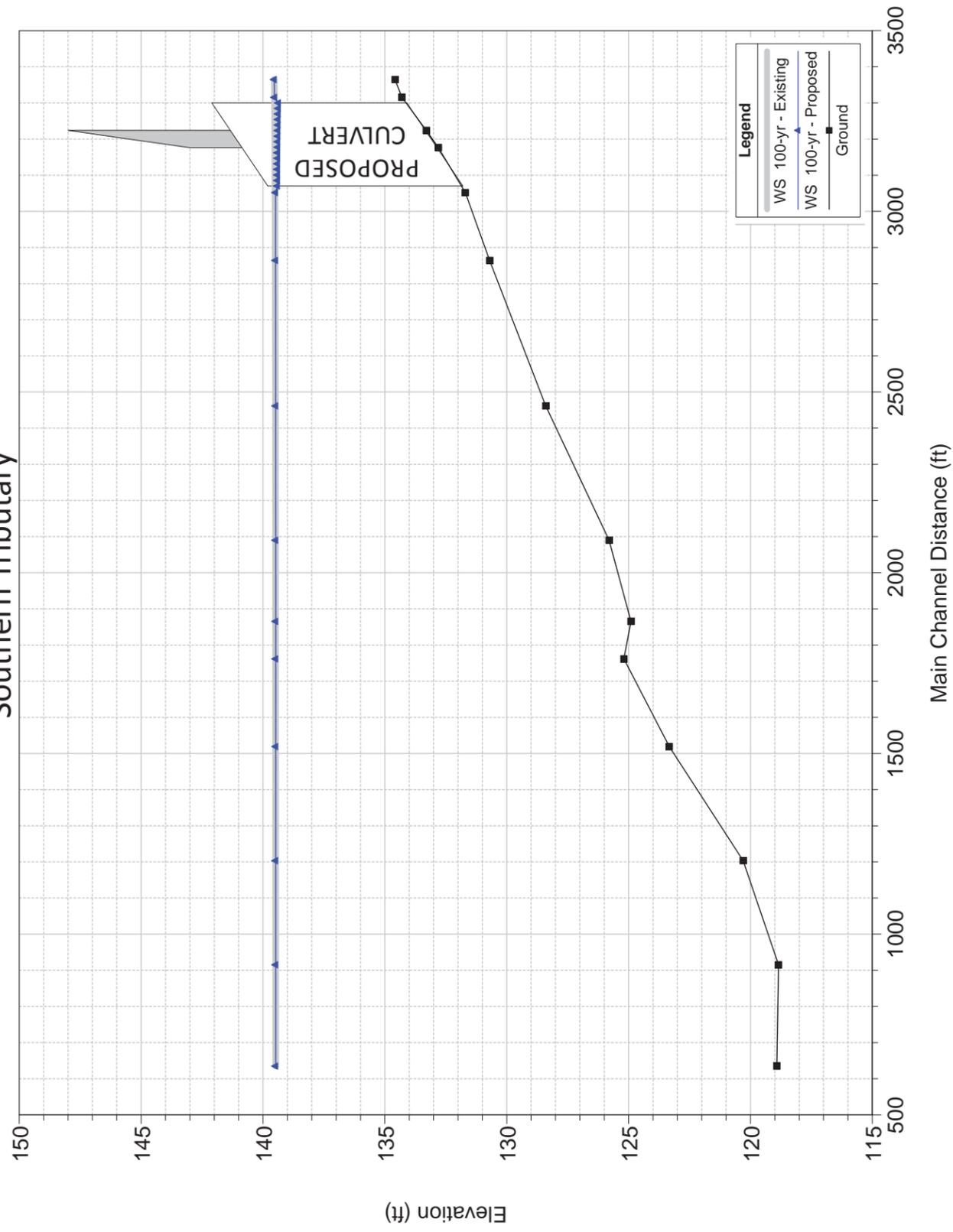
100-year water surface and velocity profiles for existing and proposed conditions on the Northern Tributary. Water surface elevations are controlled by backwatering of the South Yamhill River and are not affected by proposed Landfill Buildout conditions.

RIVERBEND LANDFILL

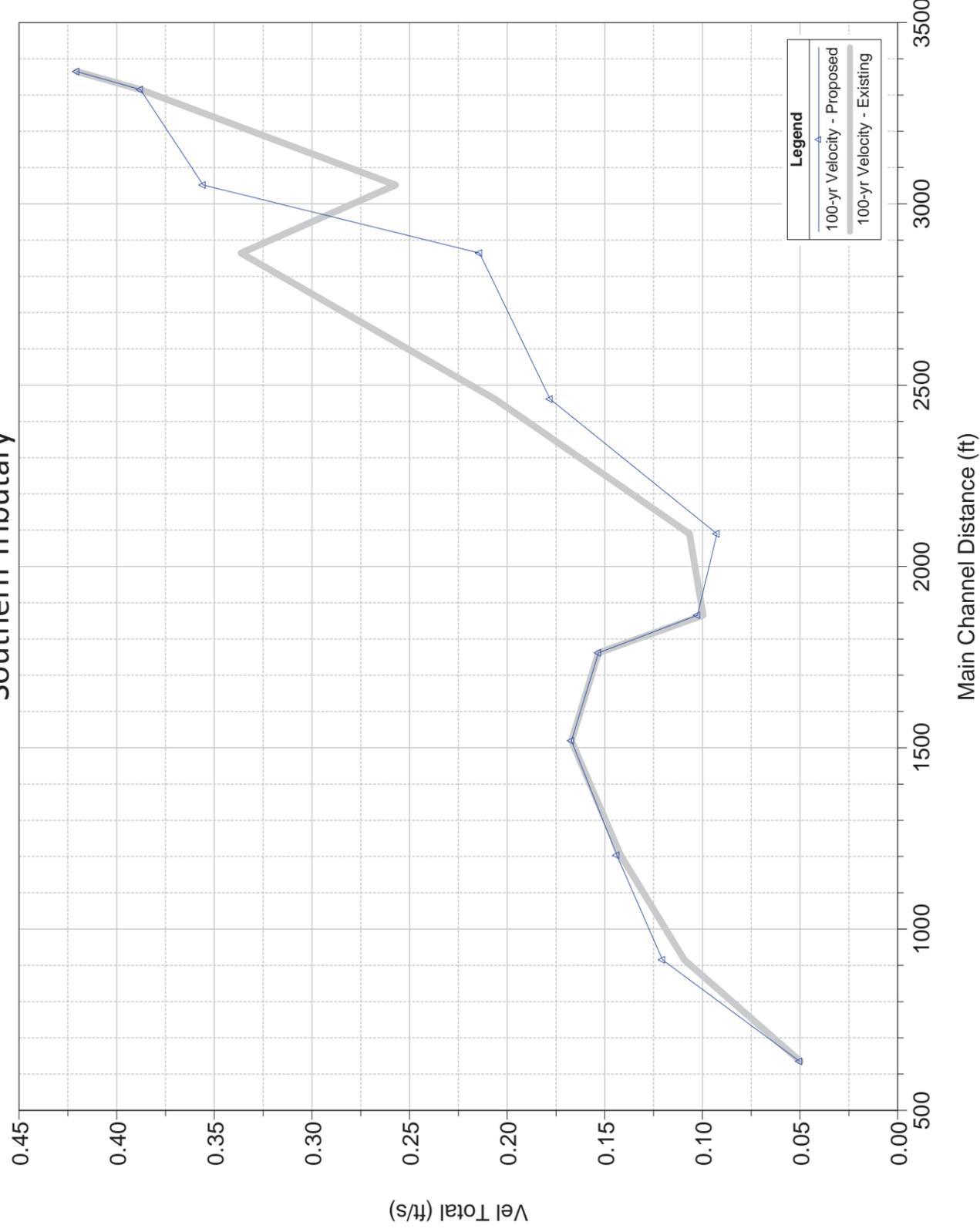
HYDRAULIC REPORT



100-Year Water Surface Profile Southern Tributary



100-Year Velocity Profile Southern Tributary



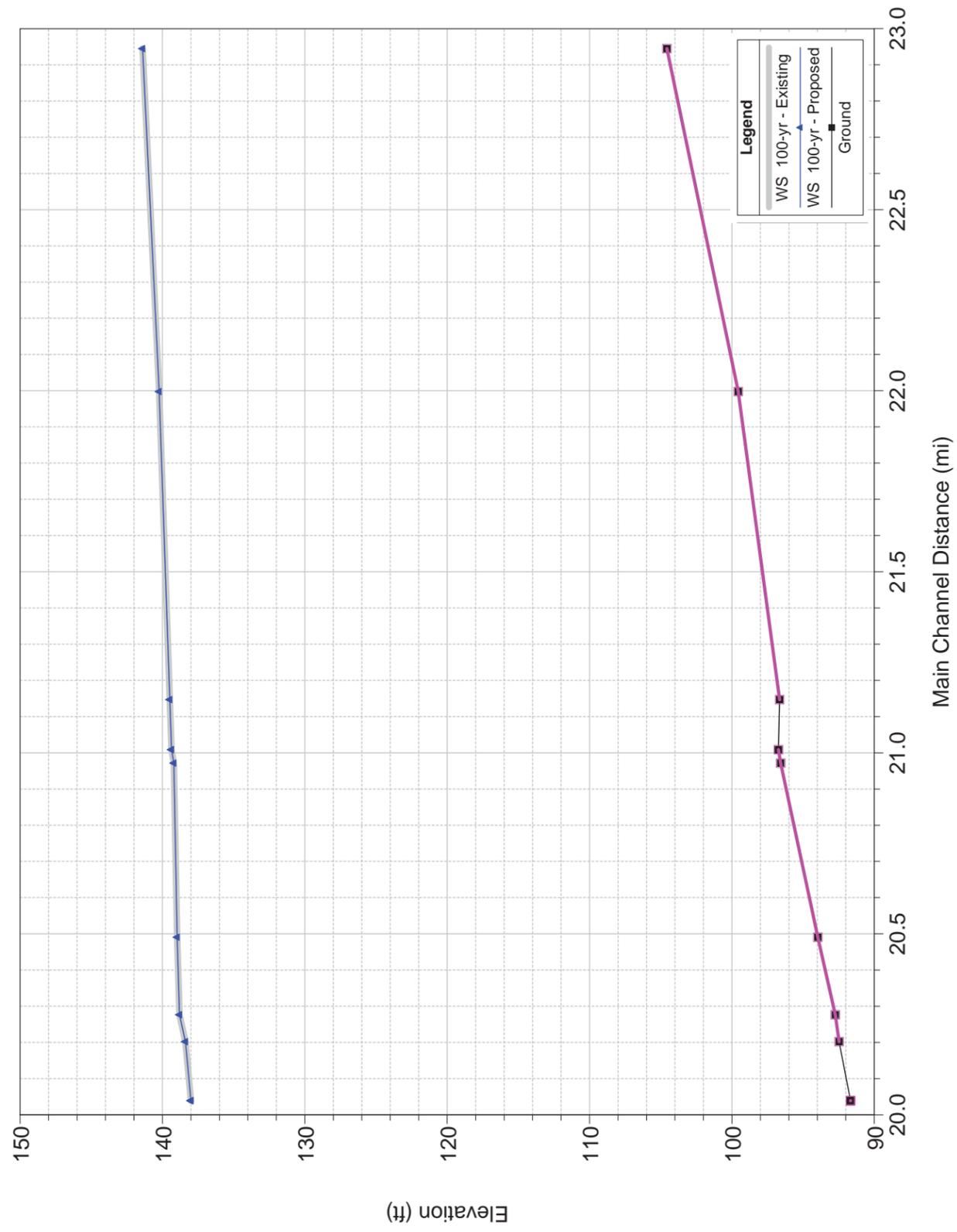
100-year water surface and velocity profiles for existing and proposed conditions on the Southern tributary. Proposed conditions results in a slight (0.02') decrease in the water surface elevation downstream of the proposed culvert. There is virtually no change to the velocity profile except for a slight increase (0.1 ft/sec) due to the proposed culvert crossing.

RIVERBEND LANDFILL

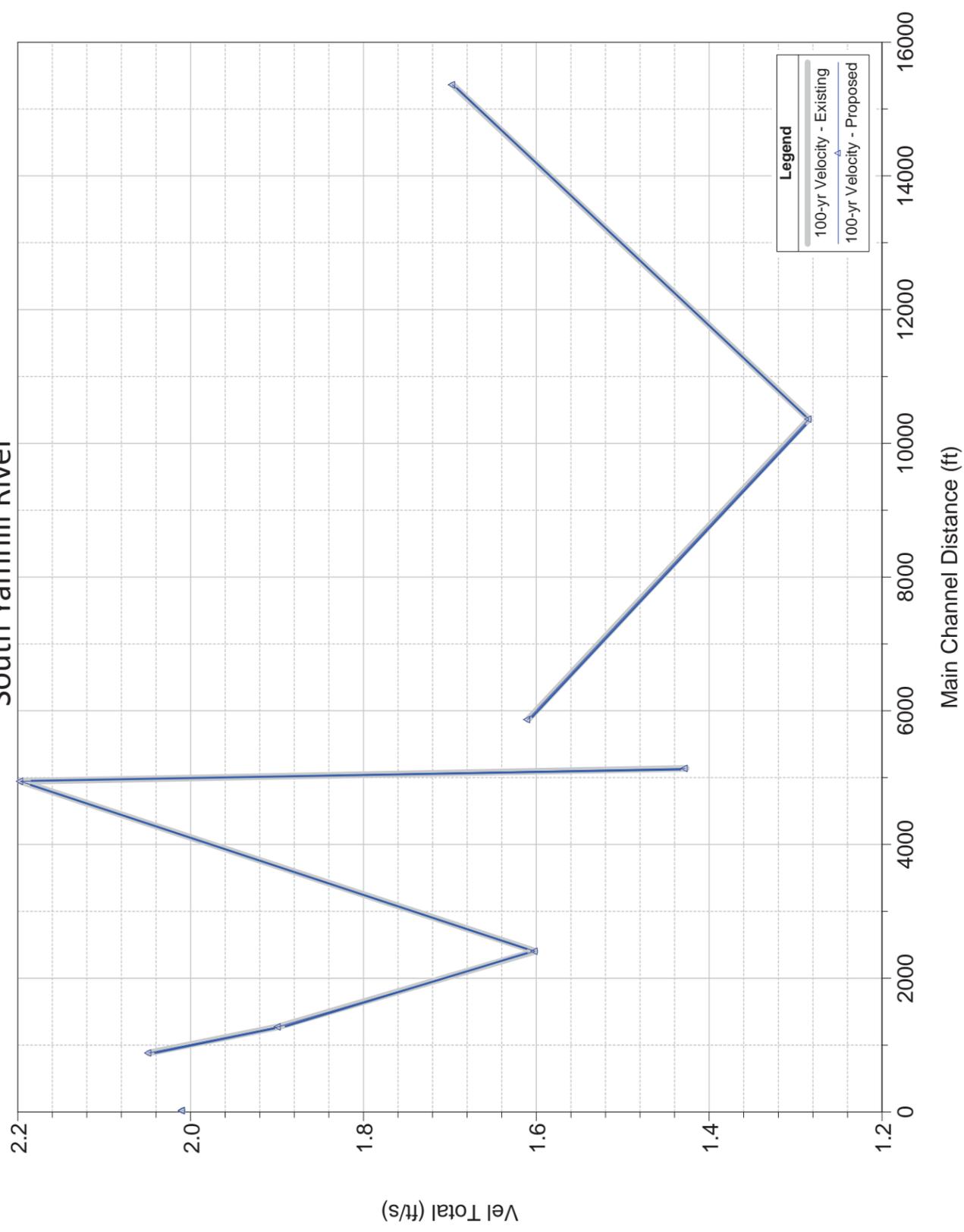
HYDRAULIC REPORT



100-Year Water Surface Profile South Yamhill River



100-Year Velocity Profile South Yamhill River



100-year water surface and velocity profiles for existing and proposed conditions on the South Yamhill River. There are no changes to the water surface elevations or channel velocities relative to existing conditions.

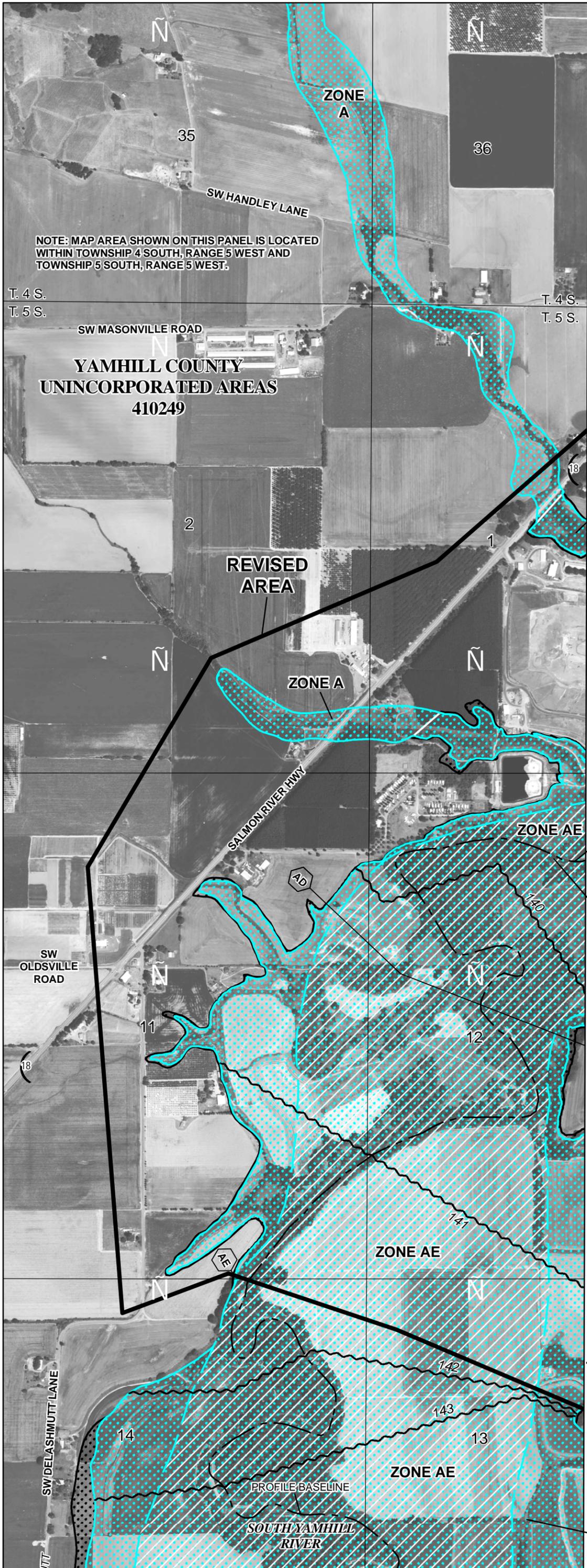
RIVERBEND LANDFILL

HYDRAULIC REPORT



Attachment A

Flood Insurance Rate Maps



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 4 SOUTH, RANGE 5 WEST AND TOWNSHIP 5 SOUTH, RANGE 5 WEST.

YAMHILL COUNTY
UNINCORPORATED AREAS
410249

560000 FT

ZONE AE
(EL 139)

18

1

2

REVISED AREA

ZONE A

JOINS PANEL 0415

PROFILE BASELINE

555000 FT

SOUTH YAMHILL RIVER

Legend

- 1% annual chance (100-Year) Floodplain
- 1% annual chance (100-Year) Floodway
- 0.2% annual chance (500-Year) Floodplain

MAP SCALE 1" = 1000'

PANEL 0395D

FIRM

FLOOD INSURANCE RATE MAP
YAMHILL COUNTY,
OREGON
AND INCORPORATED AREAS

PANEL 395 OF 675
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
YAMHILL COUNTY	410249	0395	D

REVISION TO REFLECT LOMR
EFFECTIVE:
May 9, 2013

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
41071C0395D
EFFECTIVE DATE
MARCH 2, 2010
Federal Emergency Management Agency
Attachment 3