Coos County Planning Department Application to Develop in a Special Flood Hazard Area

Official Use Only

Fee	2080.00
Receipt No.	132579903
Check No./Cash	
Date	03/30/23
Received By	MB
File No.	FP-23-007

The undersigned hereby makes application for a permit to develop in a designated Special Flood Hazard Area ("floodplain"). The work to be performed is described below and in attachments hereto. The undersigned agrees that all such work shall be done in accordance with the requirements of the Coos County Comprehensive Plan, Coos County Zoning and Land Development Ordinance, and any other applicable Local, State, and Federal regulations. This application does not create liability on the part of the Coos County Planning Department or any officer or employee thereof for any flood damage that results from the reliance on this application or any decision made lawfully thereunder.

Owner(s):	Scott Knox	Telephone:	541-425-1786
Address:	P.O. Box 194		
City/State:	Wedderburn, OR	Zip Code:	97491
Agent(s):	Coos Watershed Association c/o Dan Draper	Telephone:	541-888-5922 x308
Address:	P.O Box 388		
City/State:	Coos Bay, OR	Zip Code:	97420
Township:	25S	Section:	29 and 32a
Range:	12W	Tax Lot:	1500, 1600 and 1700 (Sec29) 100 and 200 (Sec 32a)
Situs Address:			
City/State:		Zip Code:	

A. Description of Work (Complete for All Proposals):

1. Proposed Development Description:

- ☐ New Building
- ☐ Improvement to Existing Building
- ☐ Manufactured Structure
- ☐ Fill
- ☒ Other Reconnecting and restoring tidal processes in a section of floodplain adjacent (East) Lillian Slough. Please see attached report for more details

2. Size and location of proposed development (a site plan must be attached):

Lillian Sough drains into the Coos River at approximately river mile 2.3, with the project being located on the east side of Lillian Slough, in Coos County, Oregon. The tax lots affected by this project include the following:

25S 12W 29 – 1500,1600 & 1700;
25S 12W 32 – 100 & 200. The property is ~120 acres with the project enhancing ~10+ acres.

3. Is the proposed development in a Special Flood Hazard Area (Zones A, AE, A1-A30, AH, AO, V, or VE)?

☒ Yes Zone: A

☐ No

4. Per the FIRM, what is the zone and panel number of the area of the proposed development?

Zone: A

Panel Number: 41011C0335F

5. Have any other Federal, State, or Local permits been obtained?

☐ Yes – Copies of all permits must be attached.
☒ No

6. Is the proposed development in an identified floodway?

☒ Yes – A "No Rise Certification" with supporting data must be attached.
☐ No

B. Complete for New Structures and Building Site:

1. Base Flood Elevation (BFE) at the site (complete one):

☐ NGVD 29 _____ feet Source: _____

☐ NAVD 88 _____ feet Source: _____

2. Required lowest floor elevation, including basement (complete one):

☐ NGVD 29 _____ feet Source: _____

☐ NAVD 88 _____ feet Source: _____

3. Number and area of flood openings (vents): _____

4. Enclosed area below BFE (in square feet): _____

C. Complete for Alterations, Additions, or Improvements to Existing Structures:

1. What is the estimated market value of the existing structure? Justification for the estimate must be attached and may include, but is not limited to, appraisals completed by private agencies or the County Assessor's office.

_____

2. What is the cost of the proposed construction? Justification for the estimate must be attached. The estimate is required to include fair market value for any work provided by the property owner or without compensation.

_____

3. If the cost of the proposed construction equals or exceeds 50 percent of the market value of the structure, then the substantial improvement provisions shall apply.

D. Complete for Non–Residential Floodproofed Construction:

1. Type of floodproofing method:

_____

_____

_____

2. The required floodproofing elevation is (complete one):

☐ NGVD 29 _____ feet Source: _____

☐ NAVD 88 _____ feet Source: _____

3. Floodproofing certification by a registered engineer must be attached.

E. Complete for Land Divisions, Subdivisions, and Planned Unit Development:

1. Does the proposal contain 50 lots or 5 acres?

☐ Yes – The plat or proposal must clearly identify base flood elevation.
☐ No

2. Are the 100-year Floodplain and Floodway delineated on the site plan?

☐ Yes
☐ No

F. Authorization: All areas must be initialed by all applicant(s) prior to the Planning Department accepting any application.

RSK
Applicant

I hereby attest that I am authorized to make the application for Application to Develop in a Special Flood Hazard Area and the statements within this application are true and correct to the best of my knowledge and belief. I affirm that this is a legally created tract, lot or parcel of land. I understand that I have the right to an attorney for verification as to the creation of the subject property. I understand that any action authorized by Coos County may be revoked if it is determined that the action was issued based upon false statements or misrepresentation.

RSK
Applicant

I understand it is the function of the Planning Department to impartially review my application and to address all issues affecting it regardless of whether the issues promote or hinder the approval of my application. In the event a public hearing is required to consider my application, I agree I bear the burden of proof. I understand that approval is not guaranteed and the applicant(s) bear the burden of proof to demonstrate compliance with the applicable review criteria.

RSK
Applicant

As applicant(s) I/we acknowledge that is in my/our desire to submit this application and staff has not encouraged or discouraged the submittal of this application.

Applicant(s) Original Signature

3/8/23
Date

Applicant(s) Original Signature

Date

Lillian Slough Habitat Complexity Project:

FLOODPLAIN ANALYSIS

MARCH 6, 2023

Prepared By:

Kilgren Water Resources, LLC

3365 East Amazon Drive

Eugene, OR 97405

Prepared on Behalf of:

Coos Watershed Association

P.O. Box 388

Coos Bay, OR 97420

COOS Watershed Association
Improving the Health of Our Watershed

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1 Introduction

1.1 Background

The Lillian Slough Habitat Complexity Project is being designed by Kilgren Water Resources (KWR) on behalf of the Coos Watershed Association (CoosWA). The proposed project is located within Coos County, Oregon and adjacent to the Coos River, near the South Coos River Lane and between Coos River river miles 2 and 3 (Figure 1 and Figure 2). The entirety of the project area is located on property owned by Robert "Scott" and Karen M Knox, identified by Coos County Tax Lot ID's:

- 25S12W29TL0170000,
- 25S12W32ATL0010000,
- 25S12W32ATL0020000,
- 25S12W29TL0160000, and
- 25S12W29TL0150000.

The project area is located within the Federal Emergency Management Agency (FEMA) delineated Special Flood Hazard Area (SFHA) Zone A mapped for the Coos River and shown on FEMA Flood Insurance Rate Map (FIRM) Map Numbers 41011C0335F (FEMA 2018a). The SFHA Zone A is used by FEMA to identify areas likely to be inundated by the 1-percent annual chance flood, as determined by approximate methods, rather than detailed studies, and do not have specified base flood elevations (BFE's) nor designated floodways. The flood mapping from the Digital Flood Insurance Rate Map (DFIRM) database for Coos County (FEMA 2018b) is shown on Figure 3 for the proposed project area.

1.2 Proposed Project

Prior uses of the property, including for agricultural pasture grazing, resulted in degraded wetland functions and habitat quality, and have led to difficulty in maintaining optimal pasturage. The proposed project is focused on voluntary working landscape improvements that combine improved agricultural outcomes with floodplain and wetland restoration actions that benefit native plant communities and wetland conditions to enhance habitat opportunities for populations of juvenile salmonids, turtles, amphibians, and waterfowl.

1.3 Purpose of Analysis

This report documents hydraulic analysis demonstrating the proposed project will maintain the flood carrying capacity of the watercourse, and with no cumulative increase in the associated base flood inundation or base flood levels per Coos County Zoning and Land Development Ordinances Chapter 4 Section 4.11.251(7b) General Standards for other development. This hydraulic analysis evaluated the existing conditions and proposed conditions for the 1-percent annual chance exceedance flood event (i.e., the base flood) conditions documented in the FEMA Flood Insurance Study (FIS) for Coos County, Oregon and Incorporated Areas (FIS Number 41011CV001C with a revised date of December 7, 2018; FEMA 2018c). The analysis and this report provide documentation and support for compliance with Coos County Zoning and Land Development Ordinances Chapter 4 Section 4.11.251(7b) General Standards for other development, and the National Flood Insurance Program (NFIP) regulations governed by Title 44 of the Code of Federal Regulations (CFR) Section 60.3(d)(3). Excerpts of these provisions are provided here for reader reference:

1.3.1 Coos County Zoning and Land Development Ordinances: Chapter 4

- Section 4.11.251 General Standards, 7. Other Development

"b. Result in a cumulative increase of more than one foot during the occurrence of the base flood discharge if the development will occur within a designated flood plain outside of a designated floodway."

1.3.2 NFIP Regulations 44 CFR 60.3 (d) (3)

"prohibit encroachments, including fill, new construction, substantial improvements and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base (100-year) flood discharge."

Figure 1. Project area location map.

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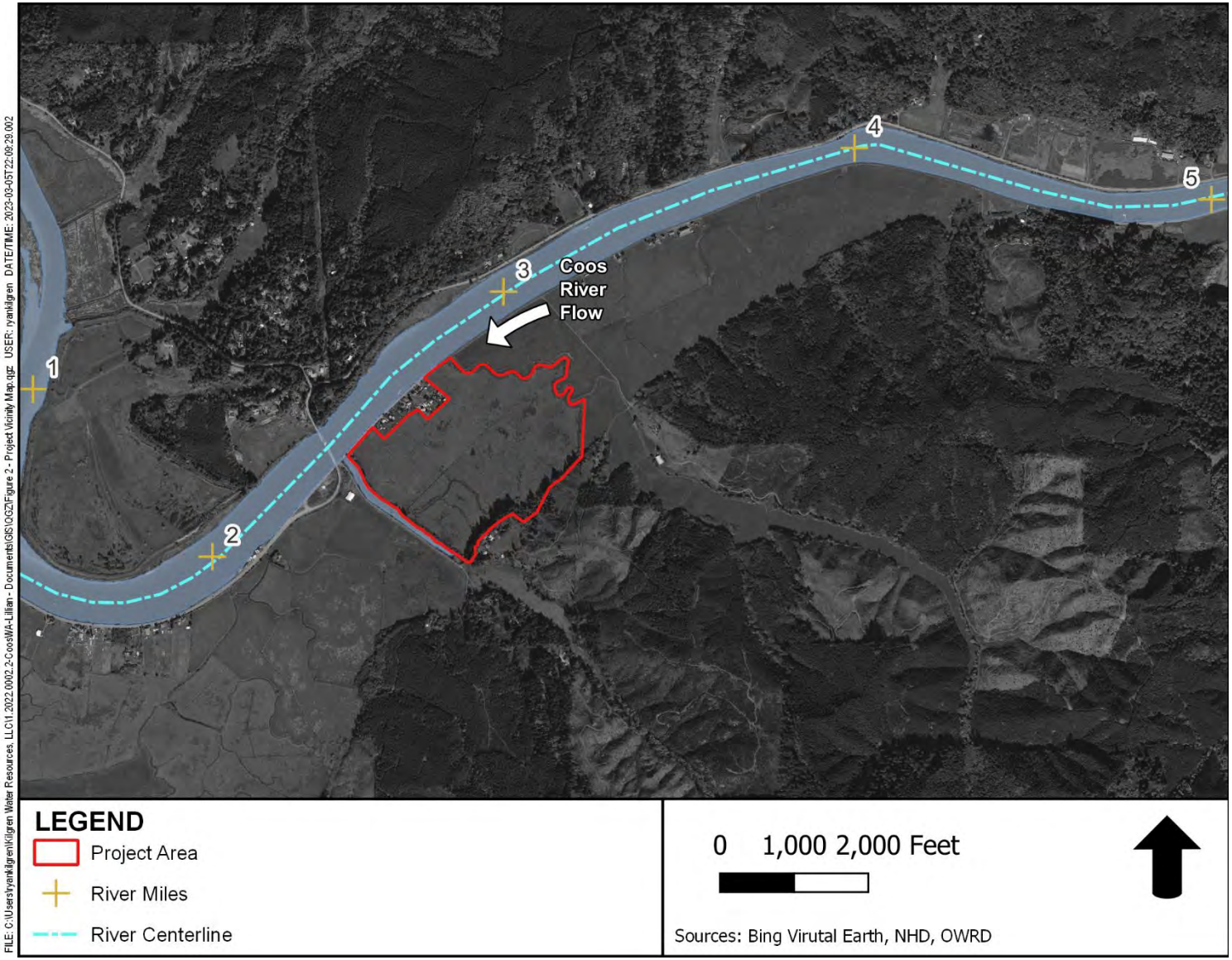

Figure 2. Project area vicinity map.

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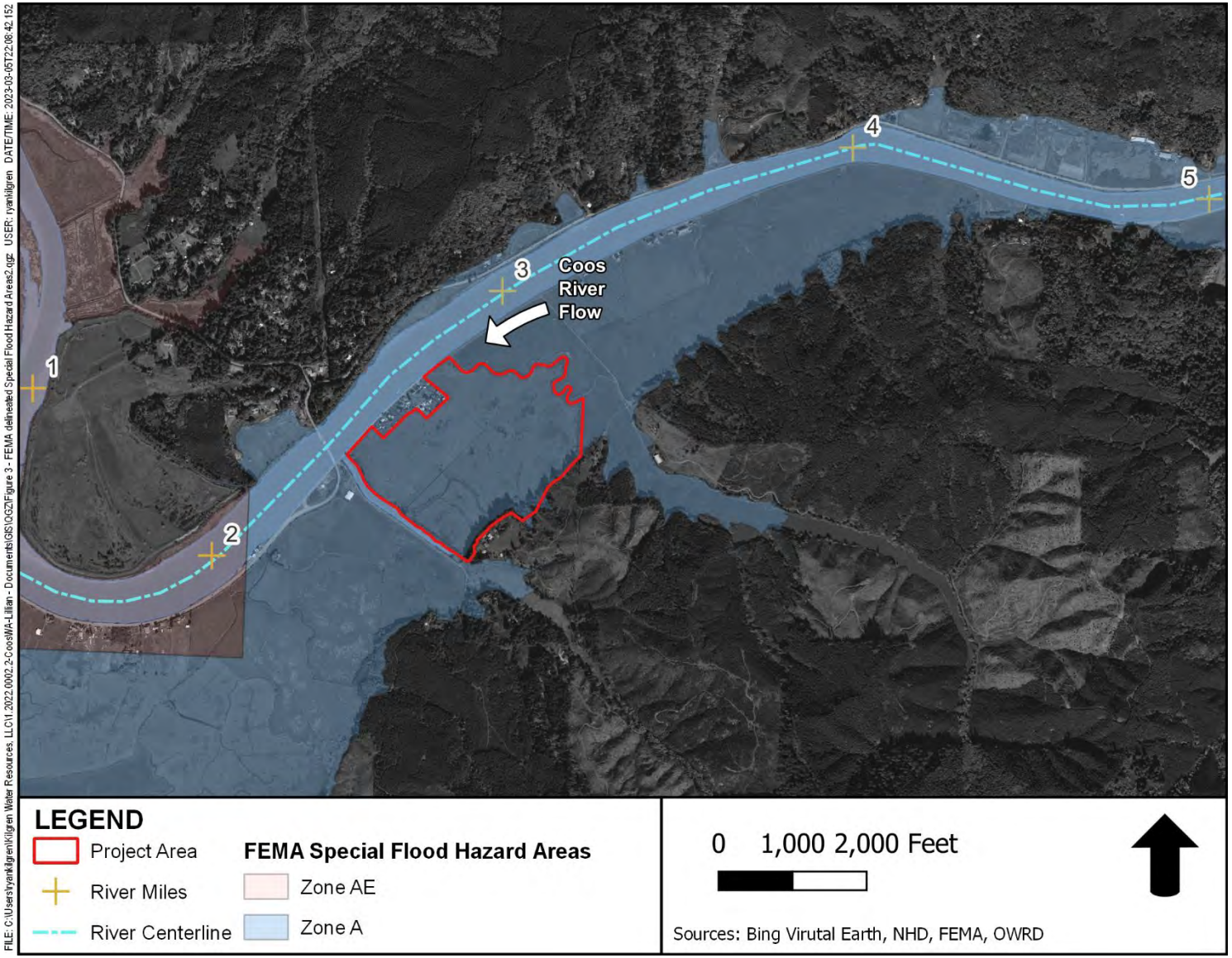

Figure 3. FEMA delineated special flood hazard areas.

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2 Hydraulic Analysis

2.1 Methodology

Hydraulic modeling analysis following FEMA guidance (FEMA 2013 and 2021b) using the U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center's River Analysis System (HEC-RAS) computer program, Version 6.3 (USACE 2022), was conducted to evaluate potential floodplain effects for the proposed project. Since the FEMA Special Flood Hazard Area delineated at the proposed project is designated as Zone A, no effective FIS HEC-RAS model is available and FEMA's floodplain area is derived by approximate methods only. For the purposes of evaluating the potential effects of the proposed project on the existing floodplain conditions, a comparative hydraulic model analysis was prepared. A total of 18 cross sections were developed for the analysis, nine (9) of which transect the property of the proposed project (Figure 4). These cross-section locations were used for both the existing conditions and proposed conditions modeling.

2.2 Project Datum

The effective study (FEMA 2018c) uses elevations that are relative to NAVD88 with units of feet. The analyses presented in relationship to the proposed project utilizes this same (i.e., NAVD88) datum for consistency.

2.3 Topographic Data

Topographic survey data have been collected at the project area and combined with LiDAR terrain datasets for the development of the proposed designs. These datasets are used for the analysis presented in this report, and include:

- Coos River bathymetry available collected by the University of Oregon (Conroy et al. 2020);
- LiDAR based bare earth elevation digital terrain model (DTM) development from the Oregon Department of Geology and Mineral Industries (DOGAMI 2009); and,
- Topographic survey data collected by CoosWA staff in 2022 and 2023.

The LiDAR data was extracted from the DOGAMI DTM (2009) for the project area and evaluated for area specific error adjustment using the CoosWA collected survey. The error adjusted LiDAR (commonly referred to as ground truthed LiDAR) was then blended with the CoosWA collected survey and survey from University of Oregon (Conroy et al. 2020) to develop an existing conditions surface representation of the project area and for development of the proposed design surface and hydraulic model analyses. The construction site plan included as Appendix B of this report shows contours for both the existing and proposed surfaces. Hydraulic model cross sections for the refined model were developed using these existing conditions and proposed conditions surfaces.

2.4 Hydrology

The hydrologic input for the flood modeling performed as part of the current analyses was obtained from the FIS and the next downstream FIRM (Map Number 41011C0331F) which has specified BFE's for a portion of the Coos River (2018a). The Coos River 1-percent annual chance exceedance flood (commonly referred to as the 100-year flood) is provided as 61,300 cubic feet per second (FEMA 2018c) and was used as the upstream boundary condition for the current analysis. The downstream boundary condition for the current analysis

assigned a known water surface elevation as 15 feet NAVD88 from the most upstream BFE shown on the next downstream FIRM Map Number 41011C0331F (FEMA 2018a).

2.5 Roughness Coefficients

Manning's coefficients were used to represent the roughness characteristics associated with the river channel and overbank areas. These roughness coefficients were derived from USACE (2022) recommended values corresponding to land cover types. Land cover types were determined for the modeled area from the National Land Cover Database 2019 (Dewitz 2021). The values generally ranged from 0.02 – 0.15 for the channel and overbank for the studied reach.

3 Hydraulic Results

A comparison of existing and proposed water surface elevations at cross sections within the extent of study is included in Table 1. The results show that the proposed conditions **do not** cause a cumulative increase the water surface elevation for the modeled 1-percent annual chance exceedance flood above the one-foot allowance per Coos County Zoning and Land Development Ordinances Chapter 4 Section 4.11.251(7b) General Standards for other development. The proposed conditions meet the Coos County General Standards for other development and will not impact the natural flood carrying capacity. The standard summary table for the existing and proposed conditions hydraulic modeling is provided in Appendix A.

4 Conclusions

The proposed actions for the Lillian Slough Habitat Complexity Project seek to restore degraded wetland functions and habitat quality and improve agricultural use conditions. The proposed project was evaluated using a hydraulic analysis for potential impacts on flooding. The results of this analysis demonstrate compliance with the requirements of the regulations referenced in Section 1.3 of this report and as summarized here:

4.1.1 Coos County Zoning and Land Development Ordinances: Chapter 4

- Section 4.11.251 General Standards, 7. Other Development

The proposed actions are located within the SFHA Zone A, only, and do not have specified BFE's or a designated floodway, as shown on FEMA FIRM Map Number 41011C0335F (FEMA 2018a). The SFHA Zone A extent in the vicinity of the proposed project are depicted on Figure 3 and in Appendix B of this report.

Pursuant to subpart b, proposed project during the base flood discharge has no cumulative effect on the flood levels.

4.1.2 NFIP Regulations 44 CFR 60.3 (d) (3)

The proposed actions are located within designated SFHA Zone A areas, only, and **do not have specified BFE's or a floodway.** These extents are shown on the FEMA FIRM Map Number 41011C0335F (FEMA 2018a).

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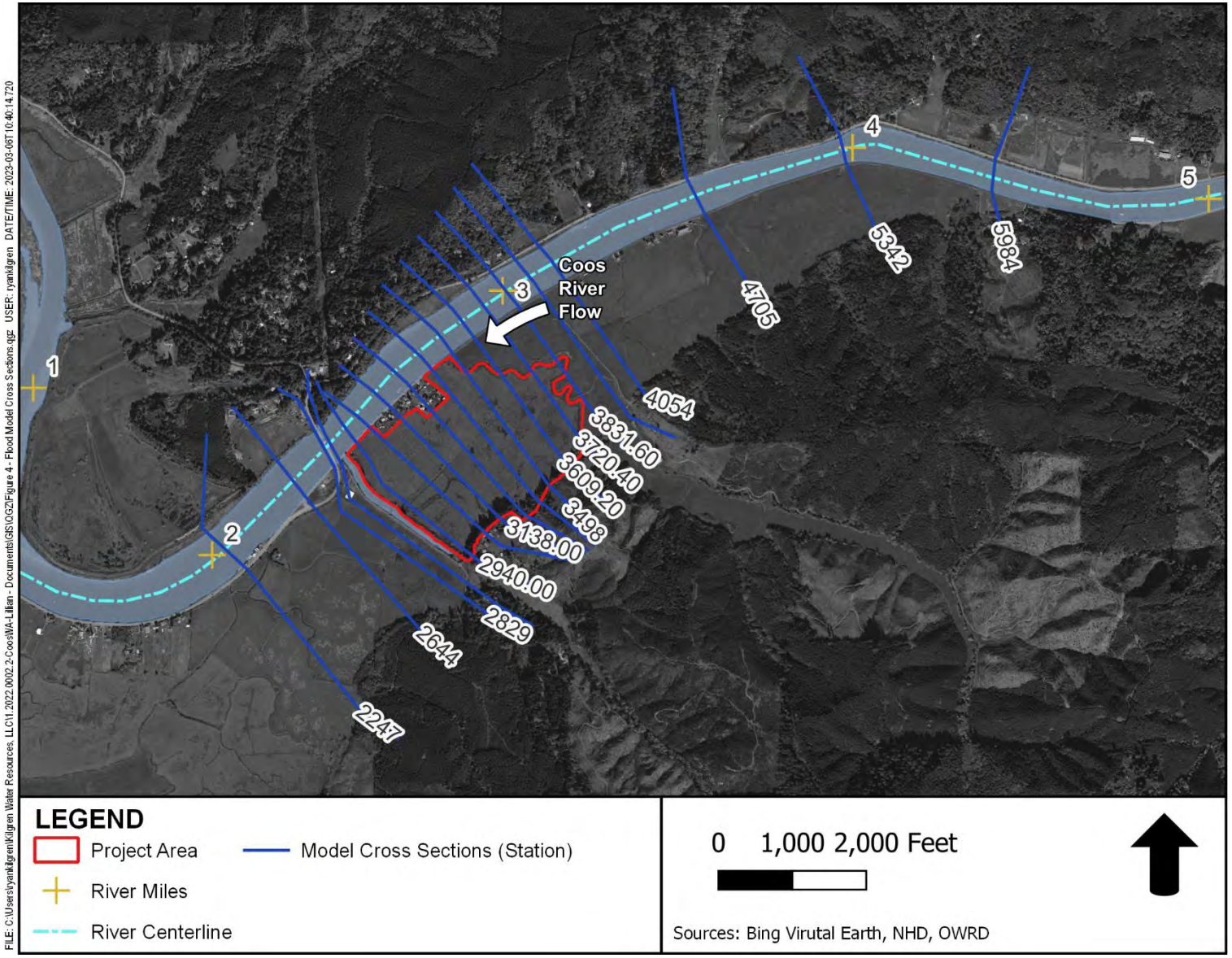

Figure 4. Hydraulic model cross sections near the project area for flood analysis.

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Table 1. A comparison of existing and proposed flood model results. Table rows with yellow highlighting correspond to flood model cross section station numbers within the property of the proposed project.

Flood model cross section station number	Water surface elevation (Feet)		Change in water surface elevation (proposed conditions minus existing conditions) [Feet]
	Existing conditions	Proposed conditions	
5984	18.03	18.03	0.00
5342	17.45	17.45	0.00
4705	17.02	17.02	0.00
4054	16.28	16.28	0.00
3942.80	16.25	16.25	0.00
3831.60	16.17	16.17	0.00
3720.40	16.07	16.08	0.01
3609.20	15.99	15.99	0.00
3498	15.93	15.94	0.01
3378.00	15.88	15.88	0.00
3258.00	15.80	15.80	0.00
3138.00	15.70	15.70	0.00
3018	15.63	15.63	0.00
2940.00	15.56	15.56	0.00
2862	15.47	15.47	0.00
2829	15.42	15.42	0.00
2644	15.23	15.23	0.00
2247	15.00	15.00	0.00

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5 State of Oregon Professional Engineer Certification

I Ryan W. Kilgren am a qualified civil engineer licensed to practice in the State of Oregon. I certify that the engineering analyses provided in this memorandum indicate compliance with the required regulations:

- Coos County Zoning and Land Development Ordinances Chapter 4 Section 4.11.251(7b) General Standards for other development; and,
- NFIP regulations governed by Title 44 of the CFR, Section 60.3(d)(3).

Signature	March 6, 2023 **Date**
Civil & Water Resources Engineer **Title**	83634PE **License No.**

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6 References

Conroy, T., D. A. Sutherland, and D. K. Ralston. 2020. Estuarine Exchange Flow Variability in a Seasonal, Segmented Estuary. Journal of Physical Oceanography. Volume 50(3). March 2020.

Coos Watershed Association (CoosWA). 2022 and 2023. Topographic Survey at the Lillian Wetland Floodplain Complexity Project Area. Performed by CoosWA staff with direction and review assistance from Kilgren Water Resources, LLC.

Dewitz, J., and U.S. Geological Survey. 2021. National Land Cover Database (NLCD) 2019 Products (ver. 2.0, June 2021): U.S. Geological Survey data release, https://doi.org/10.5066/P9KZCM54.

Federal Emergency Management Agency (FEMA). 2013. Procedures for "No-Rise" Certification For Proposed Developments in the Regulatory Floodway. US Department of Homeland Security Region X. October 2013.

FEMA. 2018a. Flood Insurance Rate Map (FIRM) Map Numbers 41011C0331F and 41011C0335F. Revised Date: December 7, 2018.

FEMA. 2018b. Digital Flood Insurance Rate Map (DFIRM) database for Coos County, Oregon and Incorporated Areas. Database Revision Date December 7, 2018.

FEMA. 2018c. Flood Insurance Study (FIS), Coos County, Oregon and Incorporated Areas. Flood Insurance Study Number 41011CV001C. Revised Date: December 7, 2018.

FEMA. 2021b. Guidance for Flood Risk Analysis and Mapping; Floodway Analysis and Mapping, Guidance Document No. 79. November 2021.

Oregon Department of Geology and Mineral Industries (DOGAMI). 2009. LiDAR Remote Sensing Data Collection; Department of Geology and Mineral Industries; South Coast, Oregon. Submitted by Watershed Sciences. May 8, 2009.

United States Army Corps of Engineers (USACE). 2022. HEC-RAS Analysis System: Hydraulic Reference Manual. Version 6.3. Available online at: http://www.hec.usace.army.mil/software/hec-ras

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Appendix A

HEC-RAS STANDARD SUMMARY TABLE FOR EXISTING CONDITIONS AND PROPOSED CONDITIONS HYDRAULIC MODELS

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HEC-RAS standard summary table for existing conditions and proposed conditions hydraulic models.

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Lillian Slough	5984	100-YEAR	Existing Conditions	61300	-1.06	18.03		18.38	0.000159	5.44	16175.15	1426.24	0.23
Lillian Slough	5984	100-YEAR	Proposed Conditions	61300	-1.06	18.03		18.38	0.000159	5.44	16177.29	1426.28	0.23
Lillian Slough	5342	100-YEAR	Existing Conditions	61300	-1.12	17.45		17.98	0.000214	6.89	19195.4	1542.34	0.3
Lillian Slough	5342	100-YEAR	Proposed Conditions	61300	-1.12	17.45		17.99	0.000214	6.88	19198.03	1542.35	0.3
Lillian Slough	4705	100-YEAR	Existing Conditions	61300	-1.16	17.02		17.11	0.000776	2.79	26013.97	2007.83	0.12
Lillian Slough	4705	100-YEAR	Proposed Conditions	61300	-1.16	17.02		17.11	0.000775	2.79	26017.85	2007.83	0.12
Lillian Slough	4054	100-YEAR	Existing Conditions	61300	-0.88	16.28		16.39	0.000193	3.5	34246.72	2846.39	0.15
Lillian Slough	4054	100-YEAR	Proposed Conditions	61300	-0.88	16.28		16.39	0.000192	3.5	34253.43	2846.4	0.15
Lillian Slough	3942.80	100-YEAR	Existing Conditions	61300	-0.88	16.25		16.3	0.000194	1.36	34599.98	2907.93	0.06
Lillian Slough	3942.80	100-YEAR	Proposed Conditions	61300	-0.88	16.25		16.31	0.000194	1.36	34606.91	2907.94	0.06
Lillian Slough	3831.60	100-YEAR	Existing Conditions	61300	-0.88	16.17		16.24	0.000151	2.91	42066.12	3627.54	0.13
Lillian Slough	3831.60	100-YEAR	Proposed Conditions	61300	-0.88	16.17		16.24	0.000151	2.91	42074.96	3627.55	0.13

HEC-RAS standard summary table for existing conditions and proposed conditions hydraulic models (Continued).

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Lillian Slough	3720.40	100-YEAR	Existing Conditions	61300	-0.88	16.07		16.18	0.000183	3.39	37646.66	3234.07	0.15
Lillian Slough	3720.40	100-YEAR	Proposed Conditions	61300	-0.88	16.08		16.18	0.000184	3.4	37585.04	3234.09	0.15
Lillian Slough	3609.20	100-YEAR	Existing Conditions	61300	-0.88	15.99		16.11	0.000174	3.58	36224.99	3017.02	0.16
Lillian Slough	3609.20	100-YEAR	Proposed Conditions	61300	-0.88	15.99		16.11	0.000176	3.59	36114.48	3017.04	0.16
Lillian Slough	3498	100-YEAR	Existing Conditions	61300	-0.88	15.93		16.04	0.000186	3.43	36940.6	3053.84	0.15
Lillian Slough	3498	100-YEAR	Proposed Conditions	61300	-0.88	15.94		16.04	0.000181	3.38	37447.14	3053.88	0.15
Lillian Slough	3378.00	100-YEAR	Existing Conditions	61300	-0.88	15.88		15.98	0.000159	3.4	39874.15	3298.17	0.15
Lillian Slough	3378.00	100-YEAR	Proposed Conditions	61300	-0.88	15.88		15.98	0.000159	3.41	39810.79	3298.18	0.15
Lillian Slough	3258.00	100-YEAR	Existing Conditions	61300	-0.91	15.8		15.92	0.000164	3.58	37311.77	3098.78	0.16
Lillian Slough	3258.00	100-YEAR	Proposed Conditions	61300	-0.91	15.8		15.92	0.000166	3.6	37124.33	3098.78	0.16
Lillian Slough	3138.00	100-YEAR	Existing Conditions	61300	-0.88	15.7		15.85	0.000224	4	32578.54	2666.76	0.18
Lillian Slough	3138.00	100-YEAR	Proposed Conditions	61300	-0.88	15.7		15.85	0.000226	4.02	32431.26	2666.76	0.18

HEC-RAS standard summary table for existing conditions and proposed conditions hydraulic models (Continued).

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Lillian Slough	3018	100-YEAR	Existing Conditions	61300	-0.88	15.63		15.76	0.000266	3.86	31210.87	2598.36	0.17
Lillian Slough	3018	100-YEAR	Proposed Conditions	61300	-0.88	15.63		15.76	0.000268	3.88	31062.53	2598.36	0.17
Lillian Slough	2940.00	100-YEAR	Existing Conditions	61300	-0.91	15.56		15.65	0.000346	3.37	35390.48	3367.65	0.15
Lillian Slough	2940.00	100-YEAR	Proposed Conditions	61300	-0.91	15.56		15.65	0.000346	3.37	35377.71	3367.65	0.15
Lillian Slough	2862	100-YEAR	Existing Conditions	61300	-0.88	15.47		15.52	0.000327	2.46	35924.1	3302.01	0.11
Lillian Slough	2862	100-YEAR	Proposed Conditions	61300	-0.88	15.47		15.52	0.000327	2.46	35924.1	3302.01	0.11
Lillian Slough	2829	100-YEAR	Existing Conditions	61300	-1.12	15.42		15.47	0.000294	2.09	38742.96	3554.86	0.09
Lillian Slough	2829	100-YEAR	Proposed Conditions	61300	-1.12	15.42		15.47	0.000294	2.09	38742.96	3554.86	0.09
Lillian Slough	2644	100-YEAR	Existing Conditions	61300	-0.88	15.23		15.34	0.000168	3.43	39416.77	3463.44	0.15
Lillian Slough	2644	100-YEAR	Proposed Conditions	61300	-0.88	15.23		15.34	0.000168	3.43	39416.77	3463.44	0.15
Lillian Slough	2247	100-YEAR	Existing Conditions	61300	-0.88	15	6.27	15.1	0.000201	3.34	37273.26	3379.05	0.15
Lillian Slough	2247	100-YEAR	Proposed Conditions	61300	-0.88	15	6.27	15.1	0.000201	3.34	37273.26	3379.05	0.15

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Appendix B

REVISED 90-PERCENT DESIGN PROPOSED GRADING PLAN

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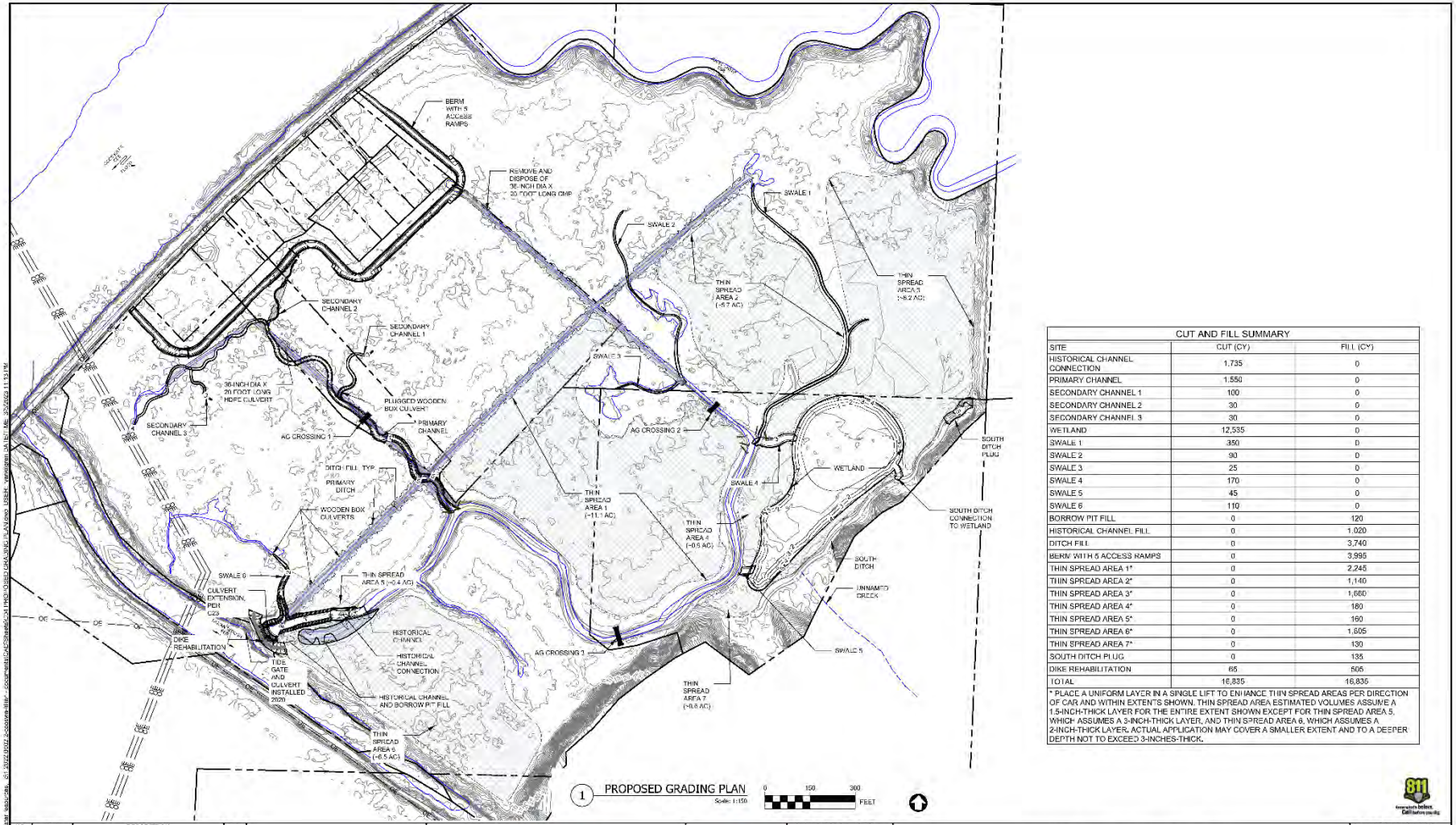

CUT AND FILL SUMMARY		
SITE	CUT (CY)	FILL (CY)
HISTORICAL CHANNEL CONNECTION	1,735	0
PRIMARY CHANNEL	1,550	0
SECONDARY CHANNEL 1	100	0
SECONDARY CHANNEL 2	30	0
SECONDARY CHANNEL 3	30	0
WETLAND	12,535	0
SWALE 1	350	0
SWALE 2	90	0
SWALE 3	25	0
SWALE 4	170	0
SWALE 5	45	0
SWALE 6	110	0
BORROW PIT FILL	0	120
HISTORICAL CHANNEL FILL	0	1,020
DITCH FILL	0	3,740
BERM WITH 5 ACCESS RAMPS	0	3,995
THIN SPREAD AREA 1*	0	2,245
THIN SPREAD AREA 2*	0	1,140
THIN SPREAD AREA 3*	0	1,660
THIN SPREAD AREA 4*	0	180
THIN SPREAD AREA 5*	0	160
THIN SPREAD AREA 6*	0	1,605
THIN SPREAD AREA 7*	0	130
SOUTH DITCH PLUG	0	135
DIKE REHABILITATION	65	505
TOTAL	16,835	16,835

* PLACE A UNIFORM LAYER IN A SINGLE LIFT TO ENHANCE THIN SPREAD AREAS PER DIRECTION OF CAR AND WITHIN EXTENTS SHOWN. THIN SPREAD AREA ESTIMATED VOLUMES ASSUME A 1.5-INCH-THICK LAYER FOR THE ENTIRE EXTENT SHOWN EXCEPT FOR THIN SPREAD AREA 5, WHICH ASSUMES A 3-INCH-THICK LAYER, AND THIN SPREAD AREA 6, WHICH ASSUMES A 2-INCH-THICK LAYER. ACTUAL APPLICATION MAY COVER A SMALLER EXTENT AND TO A DEEPER DEPTH NOT TO EXCEED 3-INCHES-THICK.

NO.	DATE	DESCRIPTION	BY

KILGREN WATER RESOURCES
3366 EAST AMAZON DRIVE, SUITE A
EUGENE, OR 97405
PHONE: 971-409-4023

COOS Watershed Association
Improving the Health of Our Watershed
COOS WATERSHED ASSOCIATION
P.O. BOX 588
COOS BAY, OR 97420
PHONE: 541-888-5922

REVISED 90% DESIGN NOT FOR CONSTRUCTION

PROJECT NO. 1.2022.0002.2
DESIGNED BY RWK
DRAWN BY RWK

LILLIAN SLOUGH HABITAT COMPLEXITY PROJECT

PROPOSED GRADING PLAN

DRAWING NO. C04
SHEET NO. 6 OF 25

IF ELECTRONIC SIGNATURE IS BROKEN OR MISSING - THIS IS NOT A LEGAL DRAWING

BAR MEASURES 1" FOR 22" X 34" PLOT

RYAN KILGREN, P.E.

Civil & Water Resources Engineer

KILGREN WATER RESOURCES, LLC.

PROFILE

Ryan Kilgren, P.E. is a civil and water resources engineer and principal owner of Kilgren Water Resources, Inc. He has over 18 years of experience applying hydrologic, hydraulic, and ecosystem sciences towards planning and design projects aimed at enhancing environmental and human landscape uses. He has specialized knowledge related to stream and wetland restoration analysis and design considerations. He is knowledgeable on a range of analysis and design software packages and field techniques, including AutoCAD Civil 3D, HEC-RAS, and topographic surveying.

CONTACT

PHONE: 971-409-4023

EMAIL:
Ryan.Kilgren@KilgrenWaterResources.com

PROFESSIONAL ENGINEER:

- Oregon #83634PE
- Washington #48091

RELEVANT EXPERTISE

- Floodplain Permitting
- Hydraulic Modeling
- Habitat Restoration Design
- Topographic Surveying

EDUCATION & SPECIAL TRAININGS

River Restoration Northwest, OR
River Sediment Dynamics Short Course, *2020*

University of California Berkeley, Sagehen Field Station, CA
Geomorphic & Ecological Fundamentals of Stream Restoration, *2014*

Oregon Health & Science University
MS Environmental Science & Engineering, *2006*

Michigan Technological University
BS Environmental Engineering, *2003*

EMPLOYMENT HISTORY

Kilgren Water Resources, LLC, Eugene, OR
Civil & Water Resources Engineer, *2021-Present*

Stillwater Sciences, Eugene, OR
Restoration Engineer, *2020-2021*

Tetra Tech, Portland and Eugene, OR
Water Resources Engineer, *2012-2020*

DHI, Portland, OR
Water Resources Engineer, *2008-2012*

AMEC, Portland, OR
Engineer in Training, *2006-2008*

SELECTED EXPERIENCE

Bronson Creek Greenway & Floodplain Enhancement, Cascade Environmental Group on behalf of Tualatin Hills Parks & Recreation District (THPRD). Bethany, OR. 2022-2023.
Role: Engineering design and hydraulic analysis

Tualatin Hills Parks & Recreation Department are proceeding with engienering designs to enhance and restore multi-species ecological functions and physical processes to the Bronson Creek Greenway at Laidlaw property. Kilgren Water Resources is supporting Cascade Environmental Group with design services. As part of this effort, Ryan led a site topographic and bathymetric field survey and developed site basemapping for use in design analysis, development of site grading plans, and permitting figures. Additionally, Ryan is responsible for floodplain hydraulic modeling using HEC-RAS for design assessment and permitting, as well as design alternative and planset support. The restoration efforts are in part focused on uplift for native turtles. Ryan prepared floodplain compliance (i.e., "no-rise") documentation and coordinated with Washington County planning staff to support project permitting.

BPA, Prosser Hatchery Acclimation, Tetra Tech Project No. 200-019968-22001. Prosser, WA. 2022-2023.
Role: Engineering design and hydraulic analysis

Bonneville Power Administration (BPA) has contracted Tetra Tech to develop proposed renovation designs for the Prosser Hatchery, located in Prosser,

Washington on the Yakima River. Kilgren WaterResources is supporting Tetra Tech with permitting services related to floodplain compliance (i.e., "no-rise"). As part of this effort, Ryan is responsible for floodplain hydraulic modeling using HEC-RAS for design assessment and permitting, as well as providing input on design development related to floodplain mitigation.

Government Island Restoration Project, Columbia River Estuary Study Taskforce (CREST)*. Astoria, OR. 2016-2020.
Role: Engineering design and hydraulic modeling

Government Island is owned and managed by the Port of Portland and the State of Oregon Parks & Recreation Department. Habitats on the island include upland forest, riparian forest, grasslands, and freshwater wetlands. A significant portion of the wetlands on the island are held as mitigation lands for the Port of Portland. This project is focused on examining the feasibility, alternatives development, and initial designs for restoration actions that could enhance wetland functionality and juvenile salmonid access at the site, while not jeopardizing the mitigation needs of the Port of Portland. Prior to establishing Kilgren Water Resources, Ryan Kilgren worked for an engineering consulting company that assisted the Columbia River Estuary Study Taskforce (CREST) with the planning and design. Ryan led the design and floodplain compliance (i.e., "no-rise") permitting process, among other tasks. Upland hibernaculum features targeting herptiles and pollinator species uplift were integral to the designs which focused on restoring hydrologic connectivity to off-channel areas and improving the coverage of native plantings. In addition to the fish focused design aspects, the designs incorporated beaver dam analogs (BDAs) identified for adaptive management implementation if post-construction conditions proved adverse to the Port's mitigation needs.

Winter Lake Estuary Restoration Project, The Nature Conservancy (TNC)*. Coquille, OR. 2014-2019.
Role: Engineering design and hydraulic modeling

Winter Lake provides combined working landscape benefits for pasture grazing and slow-water refugia off-channel habitat for coho salmonids. The site is inundated from daily tidal cycles and more significantly during seasonal high flows. The Nature Conservancy led the engineering and construction contracting to develop and implement restoration designs that targeted over winter coho habitat by hydrologically isolating the project area from other properities within BSDD, installation of muted tidal regulated culverts (during project previous a phase), and reconnection/enhancement of remnant channels and tidal wetland. Prior to establishing Kilgren Water Resources, Ryan Kilgren worked for an engineering consulting company that assisted the TNC with the planning and design. Ryan led the design and floodplain compliance (i.e., "no-rise") permitting process, among other tasks.

Willamette Confluence Preserve Restoration Project, The Nature Conservancy (TNC)*. Eugene, OR. 20014-2019.
Role: Lead habitat restoration design and construction implementation support engineer

The Willamette Confluence Preserve (WCP) is located at the confluence of the Coast Fork Willamette River and Middle Fork Willamette River, and is comprised of approximately 1,200 acres of floodplain area owned by The Nature Conservancy, Friends of Buford Park, and Oregon State Parks and Recreation Department. The properties were historically mined for gravel and as such are comprised of numerous remnant features including haul truck roads, antiquated culverts, and large previously mined gravel pits that are now ponded areas within the WCP. The site represents a unique and large-scale opportunity to create numerous off channel refugia, remove invasive and restore native plant communities, and encourage natural geomorphic and biological functions. The Nature Conservancy in partnership with the Friends of Buford Park procured engineering consulting services to prepare and evaluate restoration alternatives for the site, and following selection of the preferred restoration alternative, prepare construction ready design plans, specifications, and estimates. Ryan supported multiple project phases, including leading survey efforts to support design and modeling. He conducted two-dimensional hydraulic model analyses of the restoration alternatives using the SRH-2D model to assess the potential to improve multiple species habitat conditions with emphasis on salmonids. He also performed one-dimensional hydraulic modeling using the HEC-RAS model and prepared documentation for Lane County's "no-rise" permiting process. The modeling work was further used to support design analyses, including sediment and grade control stability criteria calculations. During the final design phase, Ryan served as the lead engineer for delivery of design plans, specifications, and cost/quantity estimates. Ryan supported three phases of construction during the summers of 2016, 2017, and 2018.

** Denotes project completed prior to establishing Kilgren Water Resources.*