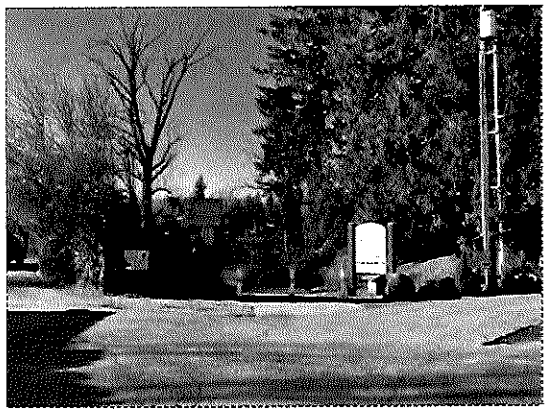
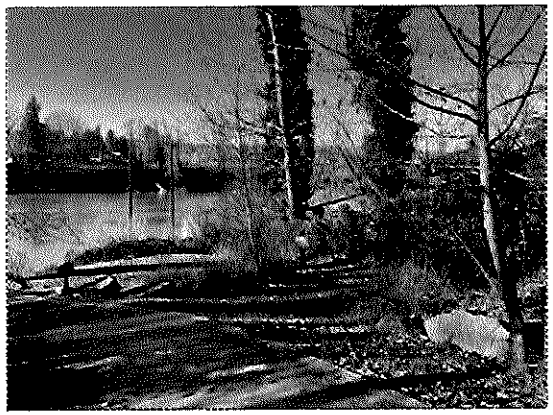
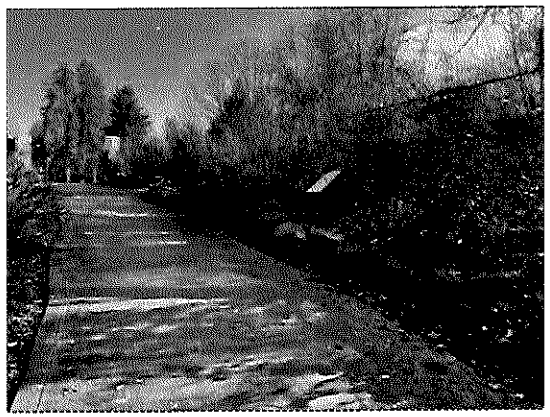
Butteville Landing—2017

Butteville Landing—2024




DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, PORTLAND DISTRICT
P.O. BOX 2946
PORTLAND, OREGON 97208-2946

July 22, 2019

Regulatory Branch
Corps No.: NWP-2018-135

Mr. Ben Williams
Friends of Historic Butteville
P.O. Box 506
Donald, Oregon 97020
Ben.Williams@liturgica.com

Dear Mr. Williams:

The U.S. Army Corps of Engineers (Corps) received your request for a Department of the Army permit to construct a dock. The project is located on the Willamette River (River Mile 42.9) at Butteville Street NE in Butteville, Marion County, Oregon at Latitude and Longitude 45.262550, -122.843822. This "Letter of Permission" (LOP) permit authorizes your project as depicted on the enclosed drawings (Enclosure 1). The time limit for completing the work authorized by this LOP ends 5 years from the date of this letter.

The work includes construction of a dock with steel anchor pile, an aluminum access gangway, and concrete abutment. In-water work in the Willamette River includes a floating dock and five, 16-inch diameter anchor pilings. The aluminum grated gangway above water will span between the dock and land for access. The encapsulated float drum dock with Eco-Grate 62 Fibregrate decking and gangway will be fabricated off site. The gangway will be a total of 118 feet long and four feet wide, and the floating dock will be 36 feet long and six feet wide. Work will be conducted from a floating barge secured by pilings. Pilings will be placed with vibratory hammer. The gangway will be set in place and secured with pilings at the top of bank.

In order for this LOP authorization to be valid, you must ensure the work is performed in accordance with the enclosed Letter of Permission General Conditions (Enclosure 2) and the following special conditions:

a. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the U.S Army Corps of Engineers, to remove, relocate, or alter the structural work or

obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

b. If human remains or cultural resources are discovered during the performance of the authorized work the permittee shall implement the Inadvertent Discovery Plan procedures (Enclosure 3) and immediately notify the U.S. Army Corps of Engineers, Portland District, Regulatory Branch.

c. Permittee shall have a Qualified Professional Archeologist meeting the requirements of 36 Code of Federal Regulations Part 61 Appendix A present to monitor for archeological objects during all portions of the project-related earthmoving disturbances, specifically for installation of the concrete walkway and excavation for the new concrete abutments behind the proposed pile.

d. Within 90 days of completing earthmoving disturbances, the permittee shall submit a brief monitoring report prepared by the professional archeologist(s) that performed the monitoring by e-mail to: cenwp.notify@usace.army.mil and orshpo.clearance@oregon.gov that describes the monitoring activities. The monitoring report shall include the following components: the permit number; name(s) and qualification(s) of archeologist(s) that did the monitoring; topographic and aerial map showing area monitored; dates of monitoring; description of activities monitored to include depth; description of cultural material identified or lack thereof; and photos of the monitoring activities.

e. Permittee shall fully implement all applicable Proposed Design Criteria (PDC) of the SLOPES IV In-water Over-water Structures programmatic opinion. A detailed list of the PDC's are enclosed (Enclosure 4). The PDC's included with the SLOPES notification for the project include numbers: 5-7, 12-13, 17-18, 21, and 30-31.

f. Permittee shall fully plant all areas immediately following completion of construction as shown in the Planting Plan (Enclosure 1, Pages 7-9).

g. All in-water work shall be performed during the in-water work period(s) of June 1 - October 31 to minimize impacts to aquatic species. Exceptions to these time periods require specific approval from the Corps and the National Marine Fisheries Service.

The requirements of the Endangered Species Act were met through a programmatic biological opinion as listed in the special condition above. The complete text of the biological opinion is available for your review at http://www.nwp.usace.army.mil/Missions/Environment/SLOPES.aspx. Please note, you must submit a SLOPES *Action Completion Report* form which is provided in Enclosure

4. We have reviewed your project pursuant to the requirements of the Endangered Species Act, the Magnuson-Stevens Fishery Conservation and Management Act and the National Historic Preservation Act. We have determined the project complies with the requirements of these laws provided you comply with all of the permit general and special conditions.

The Willamette River is a water of the U.S. If you believe this is inaccurate, you may request a preliminary or approved jurisdictional determination (JD). If one is requested, please be aware that we may require the submittal of additional information to complete the JD and work authorized in this letter may not occur until the JD has been completed.

If you object to any terms or conditions of this LOP, you may request an administrative appeal under our regulations (33 CFR Part 331) as described in the enclosed *Notification of Administrative Appeal Options and Process and Request for Appeal* form (Enclosure 5).

LOP General Condition 6 requires you to obtain the signatures(s) of the new owner(s) if you sell the property associated with this permit in order to transfer the permit to the new owner. For your convenience, the enclosed *Transfer of Permit* form (Enclosure 6) can be prepared and submitted to document the permit transfer.

This LOP permit is based on the project description and construction methods provided in your permit application. If you propose changes to the project, you must submit revised plans to this office and receive our approval of the revisions prior to performing the work. Failure to comply with all terms and conditions of this LOP invalidates this authorization and could result in a violation of Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act. You must also obtain all local, State, and other Federal permits that apply to this project.

Upon completing the authorized work, you must fill out and return the enclosed *Compliance Certification* form (Enclosure 7). We would like to hear about your experience working with the Portland District, Regulatory Branch. Please complete a customer service survey form at the following address: http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey.

If you have any questions regarding this LOP, please contact Ms. Carrie Bond at the letterhead address, by telephone at (503) 808-4387, or e-mail: Carrie.L.Bond@usace.army.mil. This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

FOR THE COMMANDER, AARON L. DORF, COLONEL, CORPS OF ENGINEERS, DISTRICT COMMANDER:

For: William D Abadie
Chief, Regulatory Branch

Enclosures

cc:

Oregon Department of State Lands (De Blasi)
Oregon Department of Environmental Quality (401applications@deq.state.or.us)
Flowing Solutions, LLC (Andrew Jansky, andrew@flowingsolutions.com)

By email from: Marc Liverman - NOAA Federal marc.liverman@noaa.gov

To: Bond, Carrie L NWP Carrie.L.Bond@usace.army.mil

RE: SLOPES IWOWS: Butteville Landing River Access, Over-water Structures & Stormwater, Willamette River, Marion Co

July 9, 2019

Ms. Bond:

I read the notification form submitted to NMFS by the Corps on Mar 26, 2018 requesting that NMFS review and confirm the action named above is consistent with the SLOPES IWOWS opinion issued to the Corps on Apr 5, 2012. The proposed action was found inconsistent with the SLOPES opinion on Jul 17, 2019. This review is based on a revised project submittal, received by NMFS on Jun 13, 2019.

The proposed project is likely to adversely affect ESA-listed species, designated critical habitat, and essential fish habitat through the following activities:

- In-water construction
- Piling installation
- Habitat modification / New floats
- Stormwater

Based on information submitted by the Corps and the Friends of Historic Butteville Landing and their consultants, the proposed action is consistent with the SLOPES IWOWS opinion for:

- Project design
- In-water work period
- Piling Installation
- Heavy equipment use
- Stormwater Management
- New Floats
- All other relevant project design criteria for construction practices

I confirm this action meets the conditions of the SLOPES IWOW programmatic biological opinion issued on April 5, 2012. A copy of all review materials is on file at NMFS' Oregon-Washington Coastal Office. Please note that the opinion requires the Corps to submit a project completion report for this project within 60-days of end of project activities.

Reinitiation of consultation on this action is required and shall be requested by the Corps where discretionary Federal involvement or control over the action has been retained or is authorized by law and (a) the amount or extent of taking specified in the Incidental Take Statement is exceeded, (b) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, (c) the identified action is subsequently modified in a manner that has an effect to the listed species or critical habitat that was not considered in the biological opinion; or (d) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16).

My point of contact for this response is Brad Rawls, who can be reached at 503-230-5414 or by email at brad.rawls@noaa.gov.

Marc Liverman
Willamette Branch Chief
West Coast Region
NOAA Fisheries Service

Oregon
Kate Brown, Governor

Parks and Recreation Department
State Historic Preservation Office
725 Summer St NE Ste C
Salem, OR 97301-1266
Phone (503) 986-0690
Fax (503) 986-0793
www.oregonheritage.org

April 20, 2018

Ms. Carrie Bond
USACE - Portland
PO Box 2946
Portland, OR 97208-2946

RE: SHPO Case No. 18-0412
NWP-2018-135, Butteville Landing River Access
New path, sign, plantings, dock
Butteville St (3S 1W 32), Butteville, Marion County

Dear Ms. Bond:

Our office recently received your application for the project referenced above. We have reviewed your application and have concerns regarding potential impacts to site 35MA394 resulting from the proposed project. Your application states that the proposed gangway-to-dock will be placed on top of site 35MA394, which while its eligibility to the National Register (NR) is currently unevaluated, the original recorder believed that the site should be considered eligible to the NR. With this in mind, what will be the potential impact on 35MA394, both directly and indirectly? Our office has a few questions regarding the project's design. They include: 1) will the construction of the gangway directly affect the existing foundation in any way? The drawings we have seen appears to show the gangway being placed above the old foundation but your letter suggests that it will be placed directly on top of it; 2) Will buried artifacts be disturbed during the construction of the pile that will be placed on land above the existing foundation?; 3) the engineering sketch suggests that new concrete abutments will be installed behind the proposed pile that will require ground disturbance. Our office believes that it is important that an archaeologist be on site to monitor the construction of the gangway and placement of any structures to be built/placed on land. If the gangway is to actually be built directly on top of the existing foundation, our office will want to receive sufficient information prior to construction that will assure us that no adverse effect to the structure will occur. If the gangway is built above the existing foundation, with no direct contact, we are less concerned about potential effect to the structure. Our office understands the liability such a foundation must have with people playing on the structure and we understand the efforts being spent to construct a new dock in the area. However, we want to be sure that the proposed construction does not result in unexpected impacts to site 35MA394 or other previously unidentified cultural remains. Upon completion of the construction, our office will expect to receive a copy of a monitoring report along with an updated archaeological site form that will include information on the changes to the surrounding landscape.

Under state law (ORS 358.905-955 & ORS 97.740) archaeological sites, objects and human remains are protected on both public and private land in Oregon. If project impacts and the degree/type of required ground disturbance changes from that outlined in your report, further consultation with our office will be required before proceeding with the proposed activity. If you have any questions regarding any future discovery, or this letter, feel free to contact our office.

Sincerely,

Dennis Griffin, Ph.D., RPA

State Archaeologist
(503) 986-0674
dennis.griffin@oregon.gov

cc: Michael DeBlasi, DSL

Site record: 17-98-1 (Butteville Landing)

Admin/Type/Location

Smithsonian	**Alt Site #s 17-98-1**				
Site name Butteville Landing	**Form type** New				
Managing office Private	**County** Marion				
NRHP status Recommended Eligible	**Role** fieldworker	**Date** September 25, 2017	**Author** Matt Goodwin		
Site type scatter	**Owner** Marion County				
Features none	**Cultural periods** Depression/WWII, Historic, Post WWII				
Length 75	**Width** 25	**Units** meter	**Area** 0.43 acres		
Depth NA					
General age Historic period					
Township 3S	**Range** 1W	**Section** 32	**¼s** se-sw-se	**Meridian** Willamette	
Type centerpoint	**East** 5012125	**North** 512273	**Method** GPS <1m	**Zone** 10	**Datum** 83
Map name/year Sherwood 7.5'	**Revision year** 2014				

Access Description:
From the intersection of SW Boones Ferry Rd. and Wilsonville Rd. in the city of Wilsonville, drive west on Wilsonville Rd. for 0.1 miles. Turn right onto the I-5 South on ramp and merge on to I-5. Travel south on I-5 for 1.2 miles and take exit 282A on to the Portland-Hubbard Hwy. Continue south for 0.7 miles on the Portland-Hubbard Hwy. to Arndt Rd. Turn right onto Arndt road and travel west for 3.5 mile to the town of Butteville. Turn left on Butteville Rd. NE and drive 0.1 miles to Butte St. NE. Turn right onto Butte St. NE and park. Butte St. NE continues a two-pronged driveway leading to two residences, Walk straight at the fork for approximately 65 m along a primitive dirt trail to the Butteville Landing site, on the southern shore of the Willamette River.

Environmental data

Province Willamette Valley
Basin Lower Willamette
Subbasin
Drainage name Willamette River
Elevation 100 feet
Aspect north
Depositional environment alluvial
Soil Description Cloquato silt loam, 0 to 3 percent slopes
Culturally signification

vegetation ferns, cedar					
Culturally signification vegetation description none					
Water source name Willamette River	**Type** river	**Stream type** perennial	**Stream class**	**Distance** 0 m	**Direction** 0 deg

Site setting:
This site is in the Willamette River watershed of the Willamette Valley physiographic province in Marion County, Oregon (Figures 1-2). The Willamette Valley is part of the pine-oak-fir *(Pinus-Quercus-Pseudotsuga)* zone (Franklin and Dyrness 1988) ecological zone. The site is on the shore of the Willamette River and the community of Butteville is immediately southwest of the site. The Butteville Landing site is on a Marion County street right-of-way and is managed and administered by the county. Most of the surrounding area is developed as residential and commercial property. The site lies on the Willamette River shoreline, rising up along the terrace tread in southeasterly direction approximately 75 meters to the top of the terrace. Portions of the site, including documented wood piling and concrete features are either seasonally or perennially inundated.

Site Description

(Dates of use) From 1851	**To** modern	**BP/AD/BC** AD	**Method** historic maps, background review and feature typology
Artifacts present: none observed	**Artifact quantity:** na	**Estimated counts historic** na	**Estimated counts prehistoric** na

WillametteCRA archaeologists were contracted to document the structural remains and features at the Butteville landing site by the Friends of Historic Butteville in anticipation of a proposed river access improvement project. The site consists of a series of concrete structural remains/ruins, partially buried iron I-beams and the remains of wood pilings/piers (Figures 3-10) along the Willamette River shoreline and up the terrace tread within the 60 foot wide right-of-way of Butte Street NE. The documented features occur over an area measuring 75 m (southeast/northwest) by 25 m (northeast/southwest). Site boundaries are based on a combination of the width of the Butte St. NE right-of-way, extent of observed features, and water. While ground visibility was limited, archaeologists did not observe any historic-period artifact on the ground surface within the site. The extent of the Butte St. NE right-of-way forms the southwest and northeast boundaries of the site. The last of a series of partially buried iron beams marks the southwest boundary, near the paved roadway/driveway. In the northeast, the river, beyond the point of the last observable wood pier remnant, is the northeastern site boundary.

A total of 4 concrete features, that appear to be in-situ, were observed at the Butteville Landing site. Additionally, WillamtteCRA archaeologists noted approximately 20-25 large pieces of concrete rubble/debris, ranging in size from 12 ft. by 6 ft. to 2 ft. by 1ft. Eight wood piling remnants, with at least some portion of the piling extending above the Willamette River water surface, were documented and mapped. Along the southwest margin of the site, a partially collapsed concrete structure/foundation extends from the edge of the terrace riser downslope into the water (see Figures 4, 6-8). The remains of the feature measure approximately 40 ft. on the long axis (NW-SE) by 15 ft. on wide (NE-SW axis). The structure appears to have been composed of three rectangular segments, with the largest being the farthest northwest segment (at the waters edge). Dirt, debris and water fill the various portions of the feature. The walls of the feature at their tallest (in the larger segment near the water) are 9 ft. 6 in. in height (see Figure 6). The concrete walls of the feature are not uniform in thickness, but are generally 12-14 in. wide. When viewing the walls from the side striations, 12-16 in. tall, are apparent that likely indicate a method of construction that involved pouring the concrete in segments or layers (see Figure 6). The concrete aggregate used in construction of the walls is comprised of rounded pebbles and sand. Remnants of large bolts, some with nuts and washers still attached, protrude from the concrete along some sections of the walls (see Figure 8). The bolts, generally, are ¾ in. thick and protrude 15-16 in. outward from the concrete. Extant nuts are 2 by 2 in. and the washers observed were 4 in. in diameter. Rubble from collapsed wall segments is apparent throughout the feature and along all sides.

Two concrete wall remnants, of similar material and construction as the larger feature, are located to the northeast along the water's edge. The first is approximately 21 ft. northeast of the larger feature and extends a distance of 14 ft. (NW-SE) along the terrace riser, downslope into the water (see Figures 4, 5 and 9). The second wall segment is approximately 30 ft. northeast of the larger feature and extends a distance 9 ft. (NW-SE) along the terrace riser, downslope into the water. Collapsed portions of the walls, in the form of concrete rubble, are littered along the terrace riser.

A fourth extant concrete feature, a square concrete footer or pier, is located approximately 20 ft. northeast of the larger feature near the top of the terrace riser (see Figures 4 and 10). The concrete footer measures 2 ft. by 2 ft. and rises 3 ft. 6 in. above the current ground surface. A large bolt, with attached nut and washer, of the same make and material as those on the larger feature is centered on the top of the footer/pier.

In addition to the concrete structural remains and the wood pilings, WillametteCRA archaeologists documented a series of iron beams and two survey markers/monuments. The beams extend up the Butte St. NE right-of-way toward the extant road and the top of the secondary terrace (see Figure 3). The beams are approximately 6 in. wide and extend, generally, about 3-4 ft. above the ground surface. A United States Coast and Geodetic Survey (USCGS) marker was documented, embedded in the southeastern-most concrete wall of the large feature and a Marion County Public Works marker was noted along the northeastern edge of the right-of-way. The USCCGS survey marker has been badly damaged and not all of the lettering is legible, so a date for the marker could not be made out.

The town of Butteville was platted in the late 1840s and was granted a United States Post Office in 1850 (McArthur and McArthur 2003). The first steamboat arrived at the Butteville landing in 1851 and for the next 20 years residents of Butteville and the surrounding communities used the riverboats that stopped at the landing to transport goods to market (Corning 1973) In 1873 the Oregon and California Railroad line was completed through the communities of Canby and Aurora, to the east of Butteville, and in 1908 the Oregon Electric line was completed, crossing the Willamette River at Wilsonville. The completion of these railroad lines led to a decline in the use of the river for the transport for goods and people. A series of ferries continued to operate from the Butteville Landing into the middle part of the 20th century (Query 2008). The completion of Interstate 5 and the opening of the Boone Bridge at Wilsonville in 1954 led to the decline of the ferries on this portion of the Willamette River.

Review of historic-period maps did not indicate any structures in the location of the recorded features; however, maps as far back as the 1851 General Land Office Map (GLO) depict a ferry crossing at this location (General Land Office 1851). Historic period photos and drawings accessed for this site record depict several iterations of docks, piers and other structures at the site of the Butteville Landing spanning the mid-late 19th and early 20th centuries (Figures 11-15). While it is not completely clear if the features recorded on this site record coincide with any of the structures depicted in the historic-period photos, many similarities in shape and scale can be observed. An 1895 US Army Corps of Engineers map of the Upper Willamette River, with detailed depictions of buildings and structure along the river shore, does not show any structures at the location of the recorded features of Site 17-98-1. An historic period photograph depicting a river boat docked at Butteville Landing, dated 1890-1895, shows smaller scale docks and pilings, but nothing matching the size and scale of the extant recorded features (see Figure 11). A large structure, at water's edge, first appears in the photographic record in 1905 (see Figure 12). Elements of this structure, and the structure shown on a 1910 photograph (see Figure 13) appear to match up with some features of the concrete structural remains documented on this form, indicating that these features may represent the remains of structures first erected sometime between 1895 and 1905.

Site Condition:

The site is in poor condition. The concrete structural remains are exposed to seasonal inundation and river erosion and are actively collapsing.

Rock art?
None

Site condition

Visit date September 25, 2017
Site condition poor
Recorder Matt Goodwin

Artifacts collected? No
Work performed site recordation
Protective measures recommended None
Impacts/impact agents erosion, recreational use

Bibliographic Information:

Corning, Howard M.
1973 *Willamette Landings, Ghosts Towns of the River*. 2nd ed. Oregon Historical Society Portland, Oregon.

Franklin, Jerry F. and C.T. Dyrness
1988 *Natural Vegetation of Oregon and Washington*. Oregon State University Press, Corvallis.

General Land Office (GLO)
1851 *Plat of Township 3 South, Range 1 West, Willamette Meridian*. Microfiche on file, USDI Bureau of Land Management, Oregon State Office, Portland.

McArthur, Lewis A., and Lewis L. McArthur
2003 *Oregon Geographic Names*. 7th edition. Oregon Historical Society Press, Portland.

Query, Charles F.
2008 *History of Oregon Ferries Since 1826*. 2nd edition. Maverick Publications, Bend, Oregon.

INTERGOVERNMENTAL CONSULTATION FORM

STATE / FEDERAL AGENCY REVIEW

A REVIEW OF A PROPOSED OUTDOOR RECREATION PROJECT WHICH FEDERAL ASSISTANCE HAS BEEN REQUESTED.

Project Name: Butteville Landing Restoration Phase 3
Project Sponsor: Friends of Historic Butteville and Marion County
Return Date: June 2019

To Agency Addressed: **This is a Federal Aid Grant. A comment is required.**
If your agency cannot respond by the return date, please notify us immediately.

PROGRAM REVIEW AND COMMENT

We have reviewed the project notice and have reached the following conclusions on its relationship to our plans and programs:

[ ] It has no effect.
[ ] We have no comment.
[ ] Effects, although measurable, would be acceptable.
[ ] It has adverse effects. (Explain in Remarks section)
[ ] We are interested, but require more information to evaluate the proposal. (Explain in Remarks section)
[X] Additional comments for project improvement. (Attach if necessary).

REMARKS:

The site requires a removal/fill from state and federal agencies. Please continue your coordination with the Army Corps of Engineers and DEQ to obtain your necessary permits.

Reviewed By: Mary Camarata Title: Project Coordinator

Email address: camarata.mary@deq.state.or.us Phone: 541-687-7435

Return to: Ben Williams
Friends of Historic Butteville

INTERGOVERNMENTAL CONSULTATION FORM

STATE AGENCY REVIEW

A REVIEW OF A PROPOSED OUTDOOR RECREATION PROJECT FOR WHICH STATE GRANT ASSISTANCE HAS BEEN REQUESTED.

Project Name: Butteville Landing Dock
Applicant Agency: Friends of Historic Butteville
Requested Return Date: May 8, 2019

To Agency Addressed: If you intend to comment, but cannot respond by the return date, please notify us immediately. If no response is received by the due date, it will be assumed that you have no comment and the file will be closed.

STATE AGENCY REVIEW AND COMMENT

We have reviewed the project notice and have reached the following conclusions on its relationship to our plans and programs:

[ ] It has no effect.
[ ] We have no comment.
[X] Effects, although measurable, would be acceptable.
[ ] It has adverse effects. (Explain in Remarks Section.)
[ ] We are interested, but require more information to evaluate the proposal. (Explain in Remarks Section.)
[ ] Additional comments for project improvement. (Attach if necessary).

REVIEW AGENCY REMARKS:
Follow the conditions and best management practices per DSL Permit No. 61011, including the appropriate timing for in-water work. If the project will be modified, please contact the local ODFW District Fish Biologist, Tom Murtagh at 971-673-6044.

Agency: Oregon Department of Fish and Wildlife _____

Reviewed By: __Joy Vaughan____ Title: _Land Use and Waterway Alterations Coordinator

Email address: _joy.r.vaughan@state.or.us_____ Phone:_503-947-6089_____

Return to: Ben Williams, Friends of Historic Butteville

INTERGOVERNMENTAL CONSULTATION FORM

STATE / FEDERAL AGENCY REVIEW

A REVIEW OF A PROPOSED OUTDOOR RECREATION PROJECT WHICH FEDERAL ASSISTANCE HAS BEEN REQUESTED.

Project Name: BUTTEVILLE LANDING RESTORATION
Project Sponsor: FRIENDS OF HISTORIC BUTTEVILLE
Return Date:

To Agency Addressed: **This is a Federal Aid Grant. A comment is required.**
If your agency cannot respond by the return date, please notify us immediately.

PROGRAM REVIEW AND COMMENT

We have reviewed the project notice and have reached the following conclusions on its relationship to our plans and programs:

[ ] It has no effect.
[ ] We have no comment.
[ ] Effects, although measurable, would be acceptable.
[ ] It has adverse effects. (Explain in Remarks section)
[ ] We are interested, but require more information to evaluate the proposal. (Explain in Remarks section)
[X] Additional comments for project improvement. (Attach if necessary).

REMARKS:

See attached

Agency: State Marine Board

Reviewed By: Janine Bellegue Title: Boating Facilities Program Manager

Return to: *Ben Williams, Friends of Historic Butteville*
buttevillefriends@gmail.com
503.568.5670

The Friends of Butteville Landing have been in discussion with us since November 2017 about developing public access at this location. Throughout the discussions they have been very receptive and responsive to our comments, questions and concerns.

The Butteville Landing paddle access facility is located in the Willamette River within the 28 mile section of the river known as "Newberg Pool" from the confluence with the Yamhill River to Willamette Falls. The Marine Board comments are made in part based on a comprehensive review of the boating facilities, boating activities, and waterway rules within the Newberg Pool. Additionally, our comments will focus on the proposed Butteville Landing recreational boating facility.

In the Newberg Pool there are seven active public facilities with 9 boat ramp lanes, 352 vehicle/boat trailer parking spaces, 110 single car parking spaces, 1024 linear feet of short term tie up docks and 108 seasonal/annual moorage slips. There are also several private floating structures including four home development dock leases with 109 annual moorage slips and 345 residential docks as of February 2019.

According to the 2017 Triennial Survey of Boaters, there are more than 80,000 boat use days in the Newberg Pool. Boating activities in the Newberg Pool include angling, cruising, paddling, and watersports such as waterskiing, tubing, wake boarding and wake surfing. Watersports is the most popular activity followed by cruising which collectively accounts for 78% of all boating activity in the pool. The peak boating season is July-September with approximately 53% of all boating activity occurring. April-June is also a popular shoulder season with 36% of the boating activities. Nearly 90% of all boating activities occur during a six month period. Additionally, the number of floating structures within the Newberg Pool has more than doubled since 1997.

In January 2019 the Marine Board's governing Board approved new boating operation rules for the Newberg Pool. Butteville Landing is located in an area that allows wakeboarding, waterskiing, tubing, angling and paddling. The facility is in a wake surfing restricted zone.

The proposed dock design extends slightly beyond the line of other adjacent floating structures. This may expose the dock to additional loading factors such as debris, wave, wake, wind, current, and impact. The facility should be designed to withstand environmental and human caused loading for this section of the Willamette River.

It is my understanding that the Oregon Dept. of State Lands permit has been issued but the U.S. Army Corps of Engineers permit is pending. If the dock size or location were to change during regulatory review for any reason, including as a result of ESA minimization or avoidance efforts, then the revised dock location or design would require further evaluation by the Marine Board to determine any possible harmful effects on public use, safety and navigation on the river.

Friends of Historic Butteville
AN OREGON NONPROFIT CORPORATION

December 4, 2020

Re: Floodplain Development/Greenway Permit Case No. 20-003

Butteville Landing - Usage and Impact Assessment

Applicant: Friends of Historic Butteville
PO Box 506, Donald, OR 97020

II. Garbage Pickup and Trash at Butteville Landing

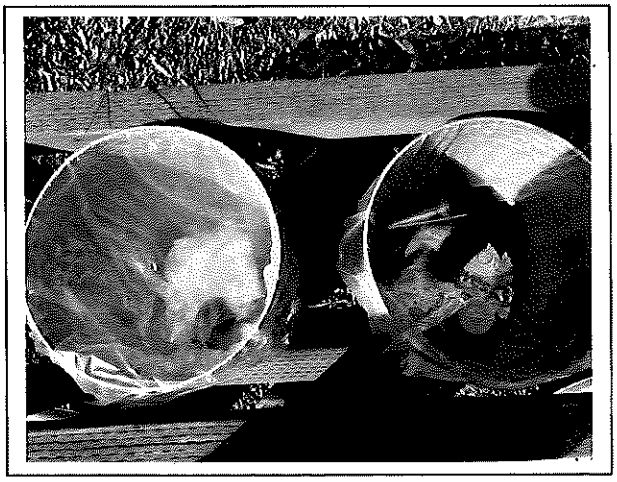
FOHB picks up garbage from the Landing's two garbage cans on Monday morning. Loose refuse or garbage (paper cups, candy wrappers) have been extremely rare, and during 2020 the two gargabe cans have never both been full after a week's time. Volumes of garbage at a property with public access can serve as an indirect indicator of people using the site.

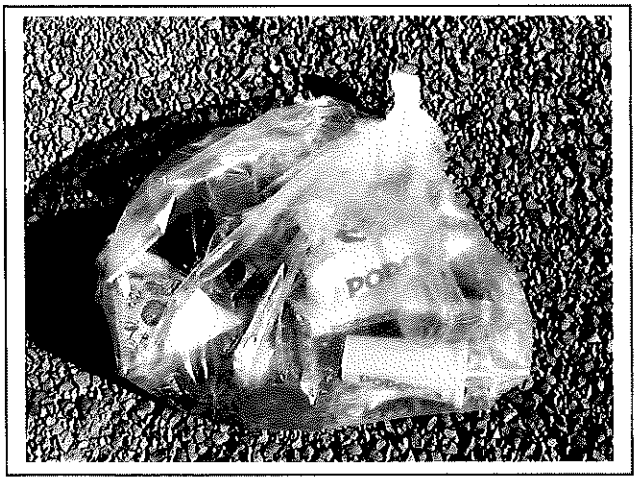
June 22, 2020 - [Previously submitted in Hearings Officer written testimony]
On Monday June 22, 2020 after a full week and following Father's Day Weekend that saw a very large turn out of visitors to Champoeg State Park, both garbage can liners at the Butteville Landing were only half full. See photo below.

There was no litter or loose trash to be found in the Landing. Trash or garbage that blows in by the wind or is carried in by the flow of the river are beyond the control of FOHB, but are picked up during FOHB's regular trash cleanup visits. Correspondingly, visits by FOHB Board members confirmed no people at the Landing the night of Saturday, June 20.

July 4th Weekend - [Previously submitted in Hearings Officer written testimony]

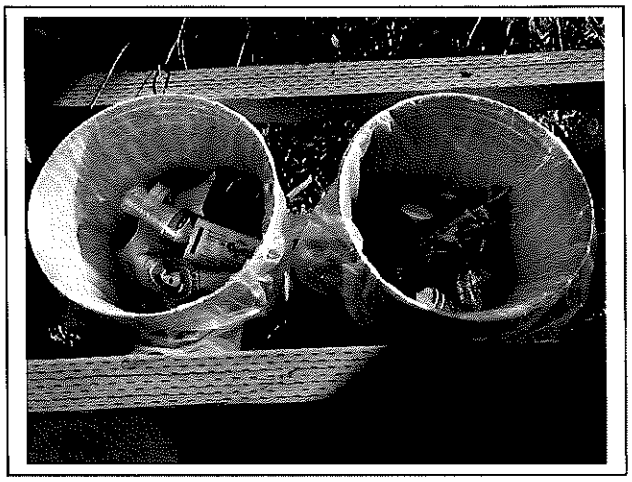
Garbage at the Landing on the morning of July 6 confirms very low usage of the site by the public in the form of two partially filled garbage can liners that consolidated into less than one full liner.





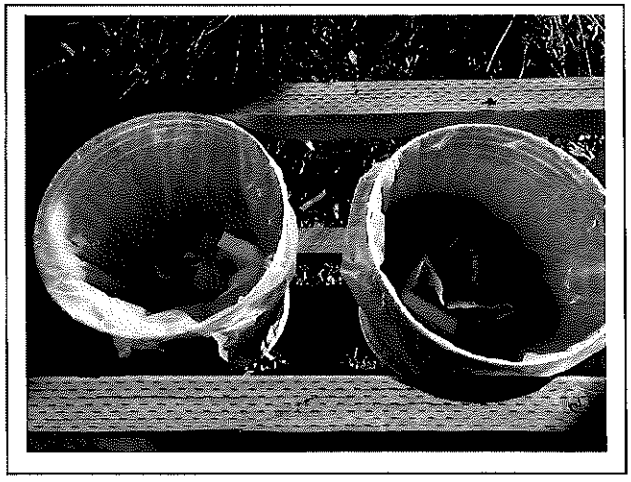
July 12th Weekend - [Previously submitted in Hearings Officer written testimony]

Garbage at the Landing the morning of July 13, again with again with two half full garbage can liners that consolidated into a single liner.



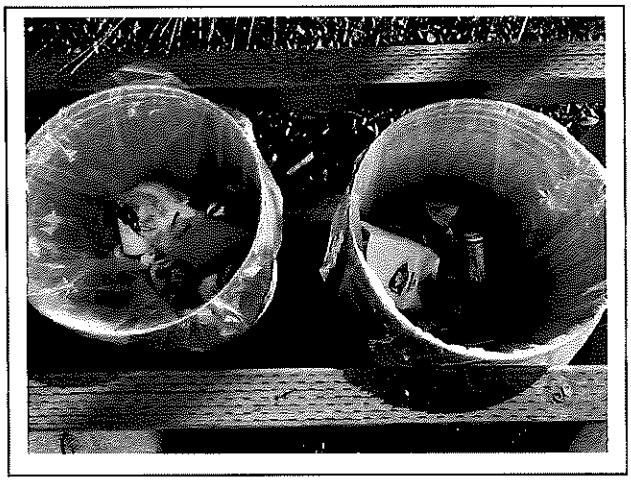
July 19th Weekend - [Previously submitted in Hearings Officer written testimony]

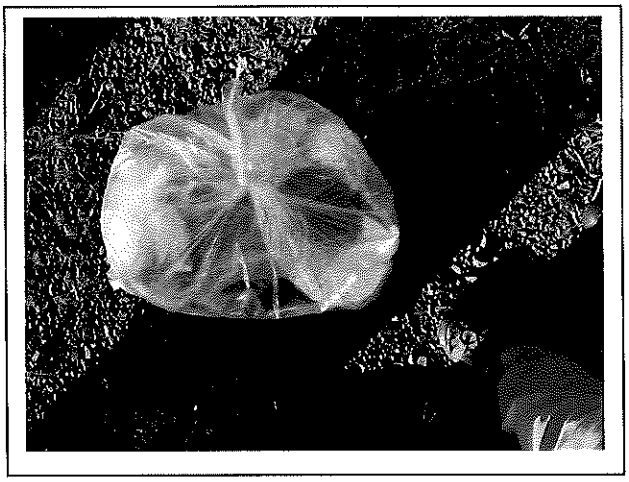
Garbage at the Landing the morning of July 20 confirms low public usage,



Garbage Pickup - July 26

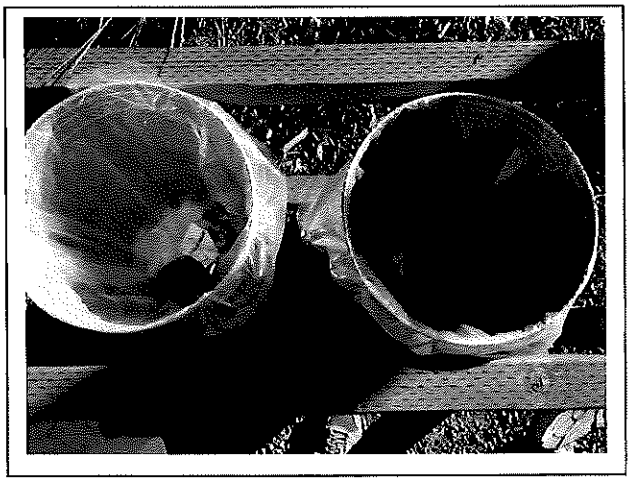
Two partially full trash liners that consolidate into a single liner less than half full.





Garbage Pickup - August 3

Two partially full trash liners that consolidate into a single liner less than half full.

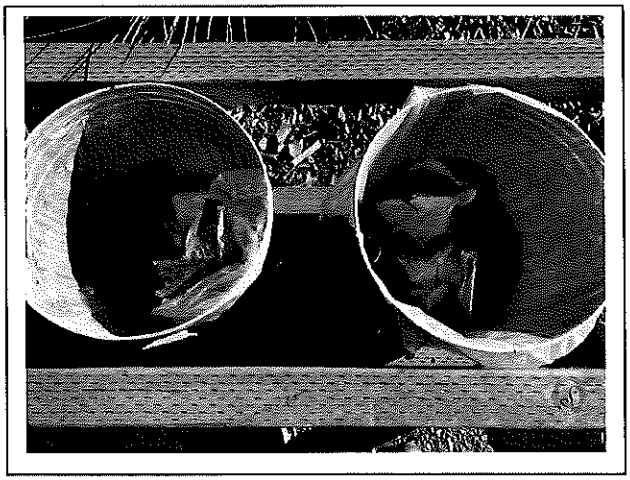


Garbage Pickup - August 10

Two partially full trash liners that consolidate into a single liner less than half full.

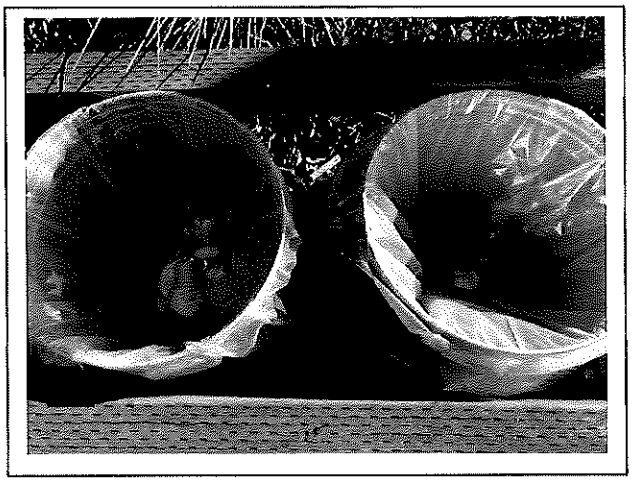
Garbage Pickup - August 17

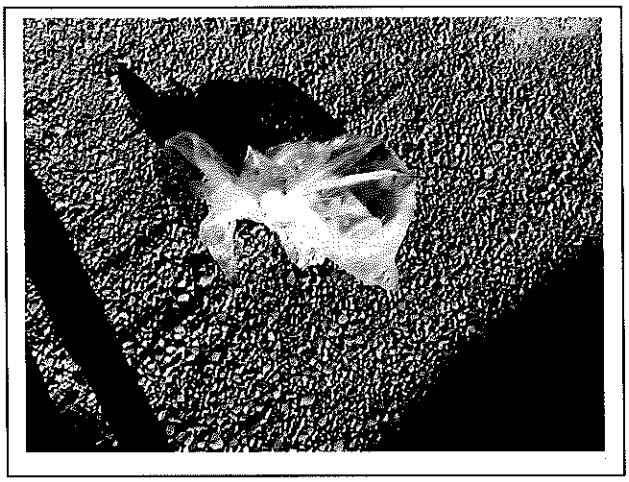
Two partially full trash liners that consolidate into a single liner less than half full.



Garbage Pickup - August 24

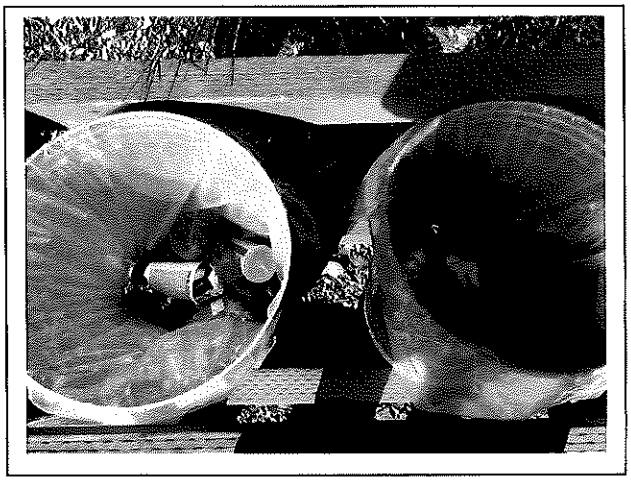
Two partially full trash liners that consolidate into a single liner less than half full.





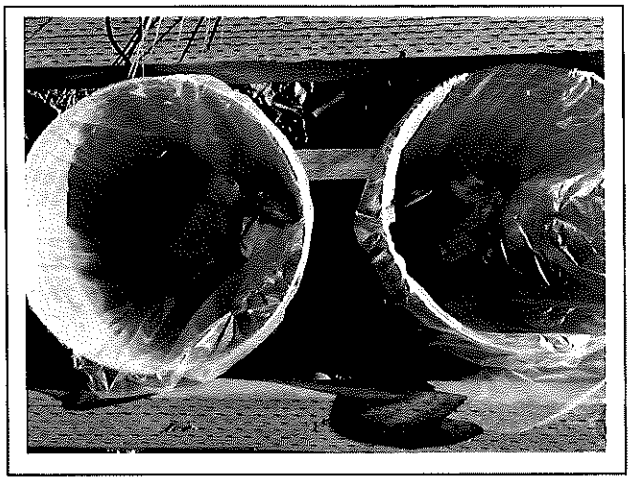
Garbage Pickup - August 31

Two partially full trash liners that consolidate into a single liner less than half full.



Garbage Pickup - September 7

Two partially full trash liners that consolidate into a single liner less than half full.



Garbage Pickup – September 14

Two partially full trash liners that consolidate into a single liner less than half full.

Garbage Pickup -September 21

Two partially full trash liners that consolidate into a single liner less than half full.

Garbage Pickup – September 28

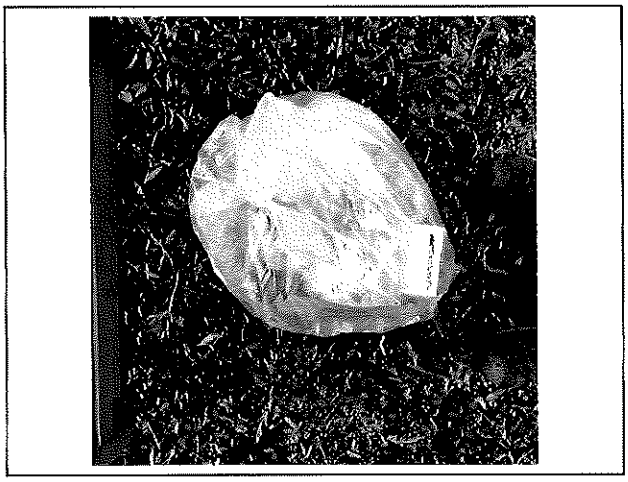
Two partially full trash liners that consolidate into a single liner less than half full.

Garbage Pickup – October 5

Two partially full trash liners that consolidate into a single liner less than half full.

Garbage Pickup – October 12

Two partially full trash liners that consolidate into a single liner less than half full.



Garbage Pickup – October 19

Two partially full trash liners that consolidate into a single liner less than half full.

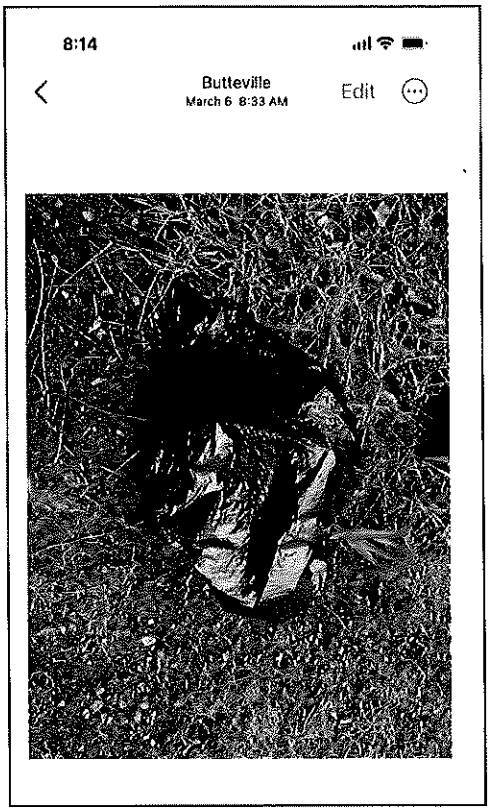
Garbage Pickup – October 26

Two partially full trash liners that consolidate into a single liner less than half full.

The weekly accumulated garbage demonstrates that the Historic Butteville Landing is a low use and low impact site.

It further supports the assertion made in written testimony during the initial Floodplain appeal, that the public disturbance and so-called criminal activity reported by the Appellants and able to be substantiated by the County Sheriff's Office, was a one-time event tied to general closure of State and County Parks, leaving the Butteville Landing one of the very few venues still open to the public.

BUTTEVILLE LANDING - WEEKLY GARBAGE COLLECTION DOCUMENTATION 2023

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April 3 8:05 AM
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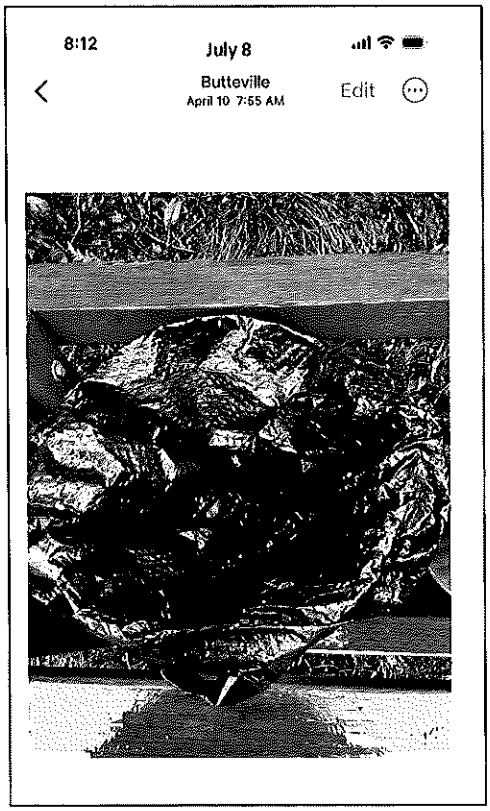
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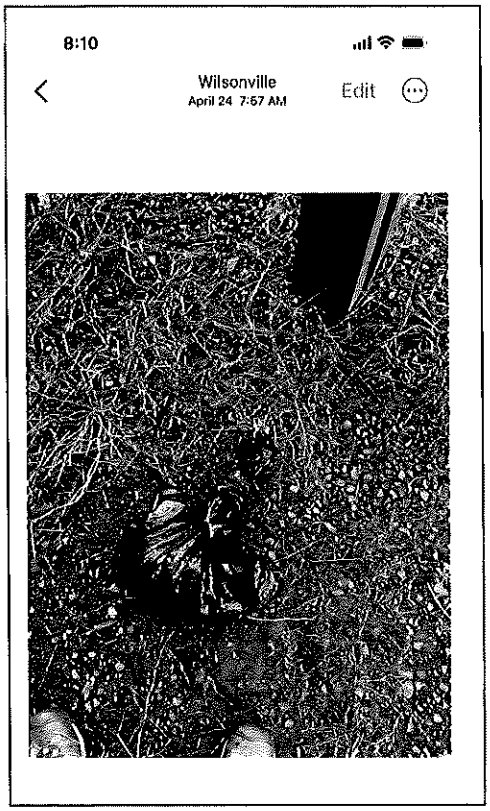
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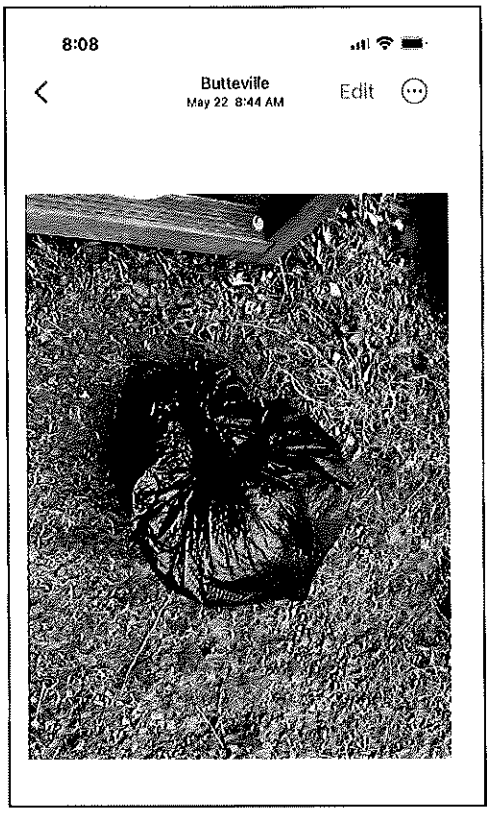
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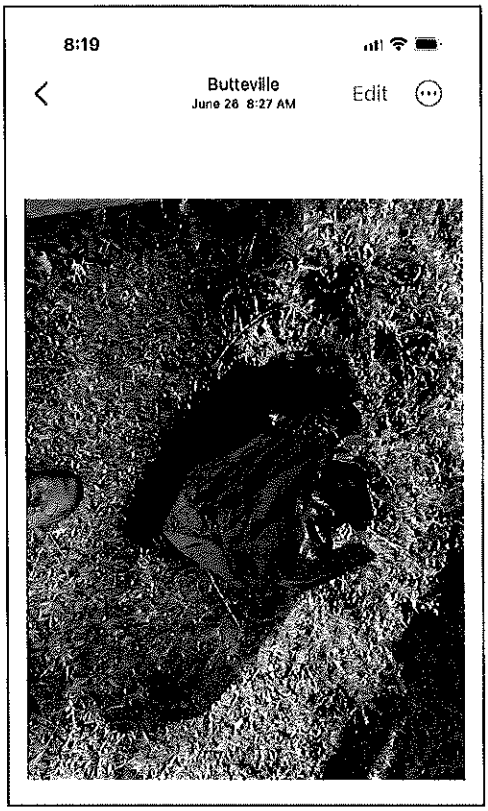
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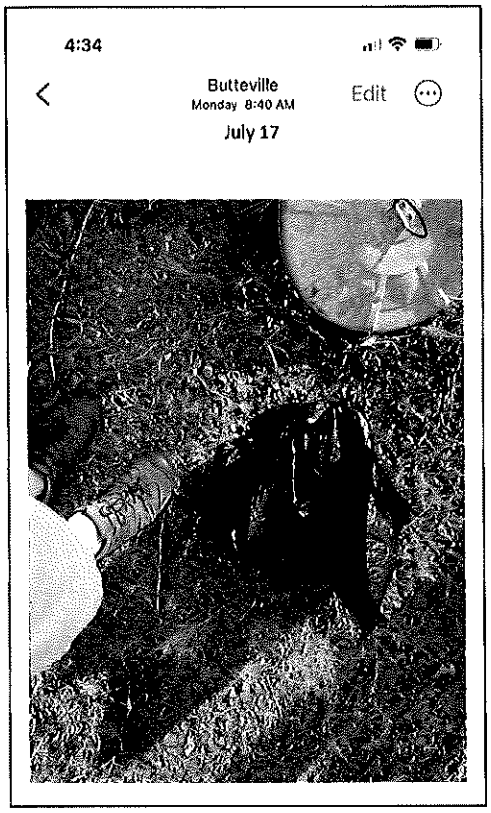
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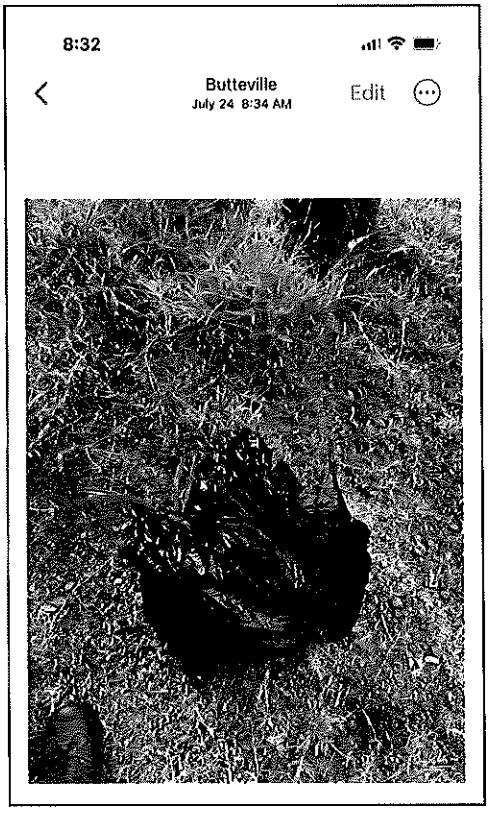
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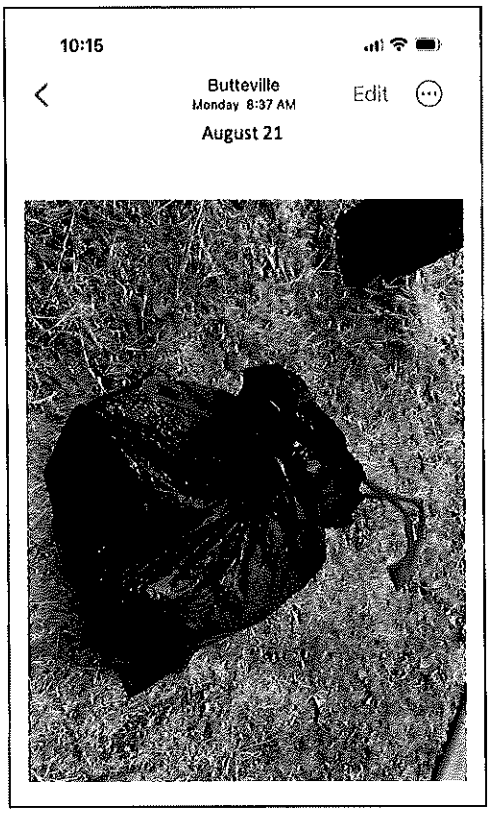
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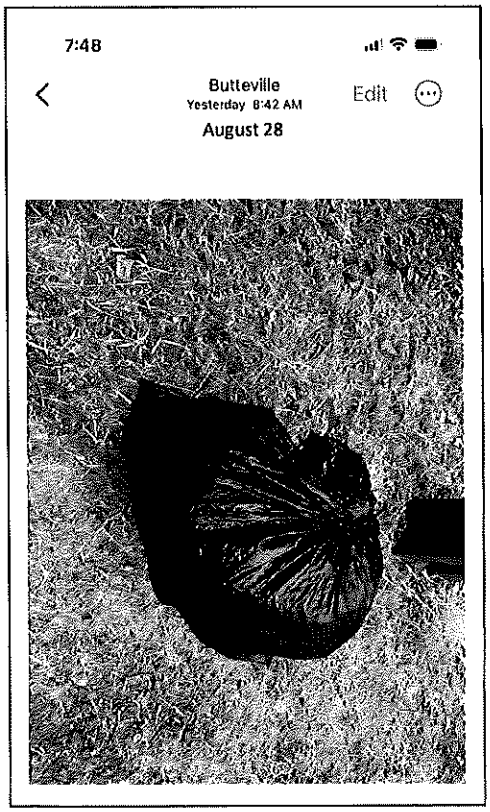
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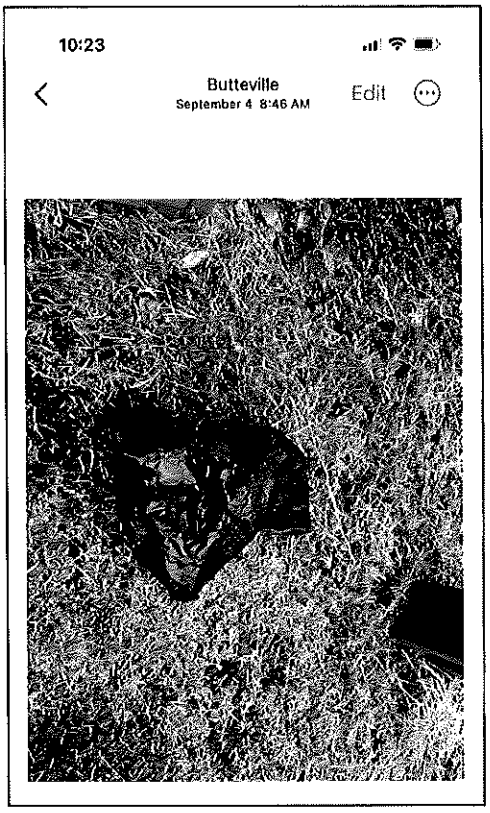
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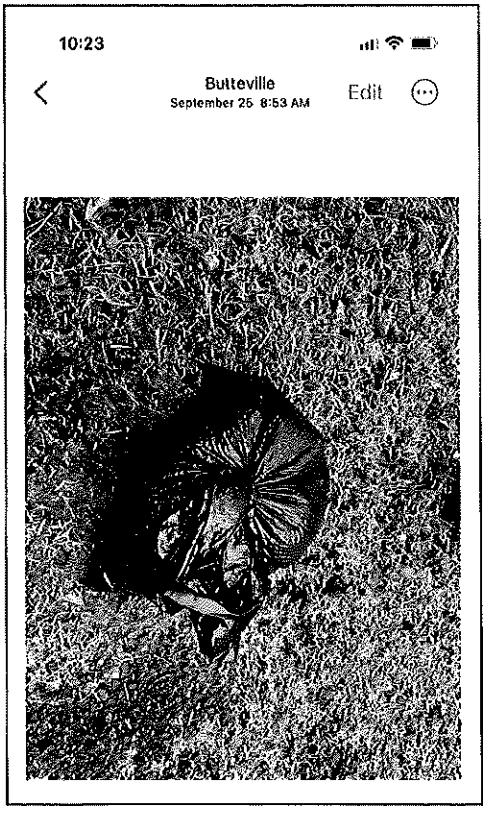
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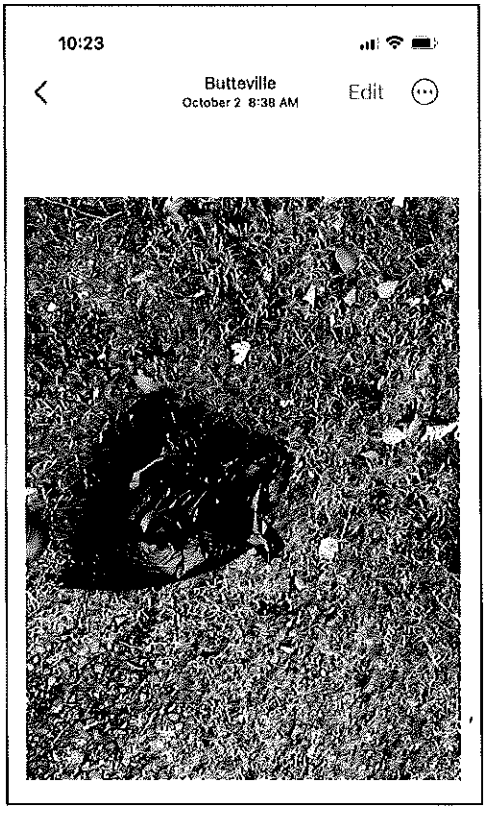
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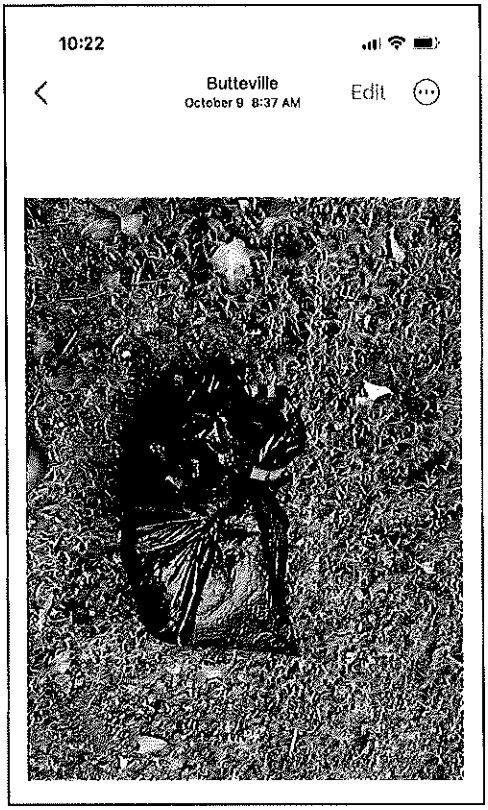
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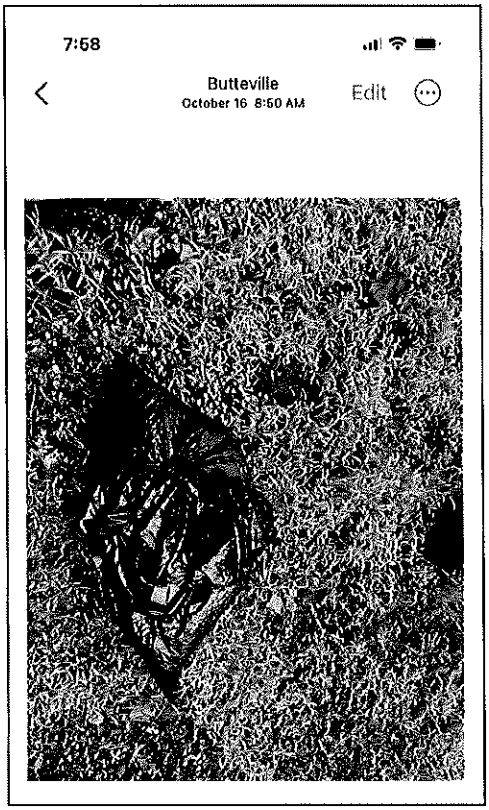
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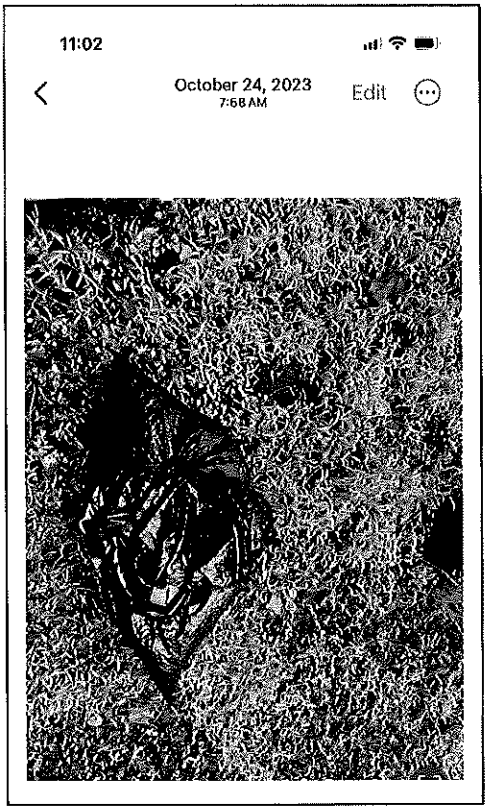
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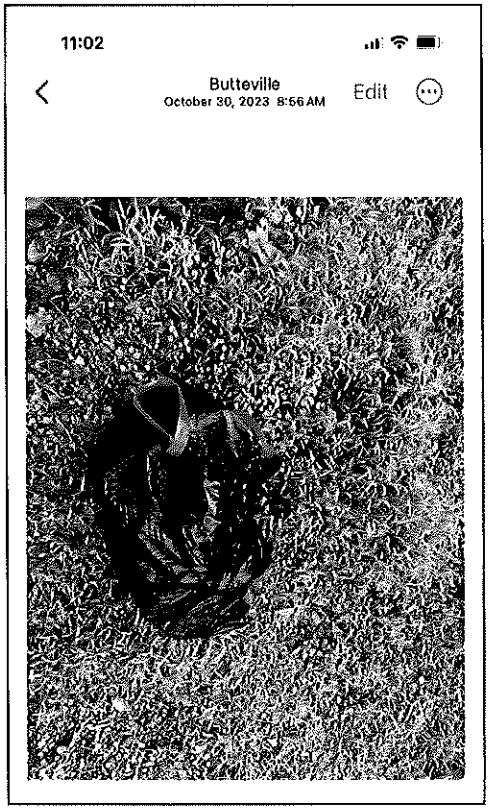
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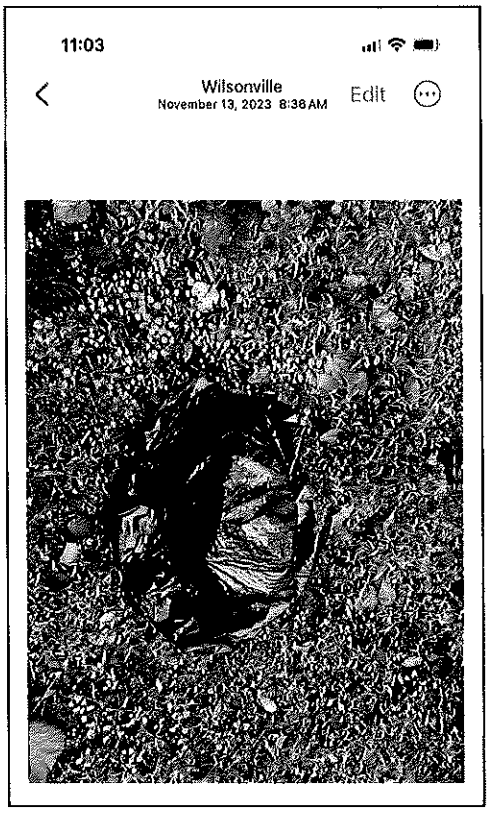
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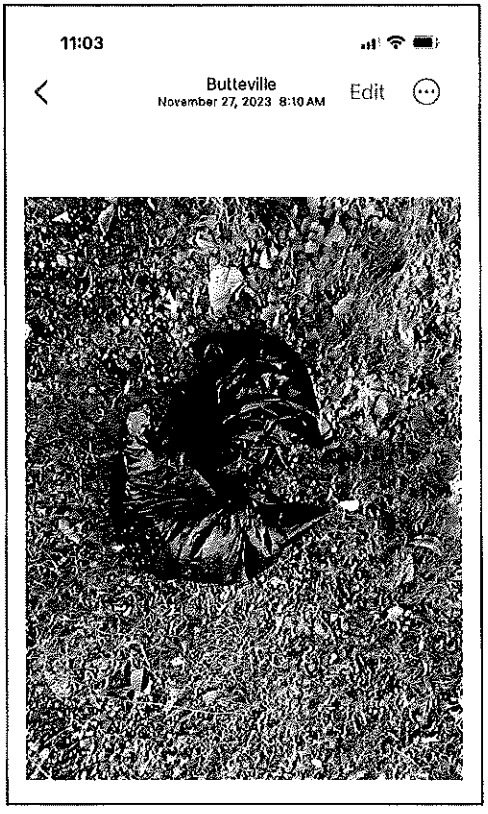
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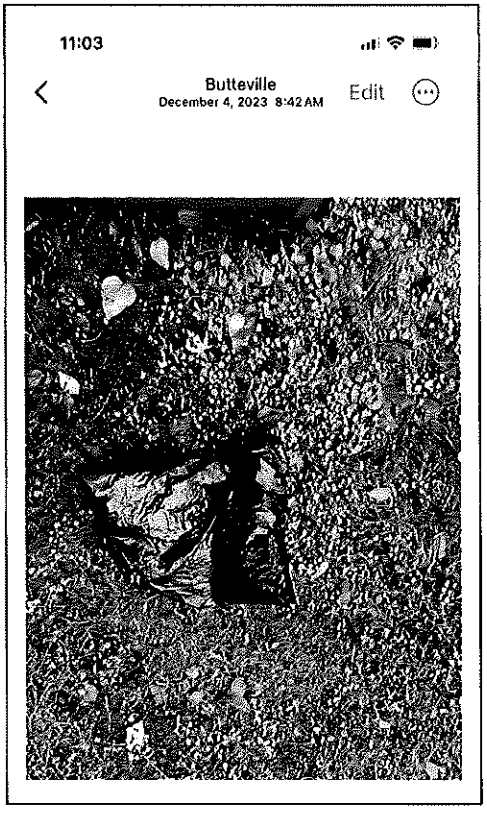
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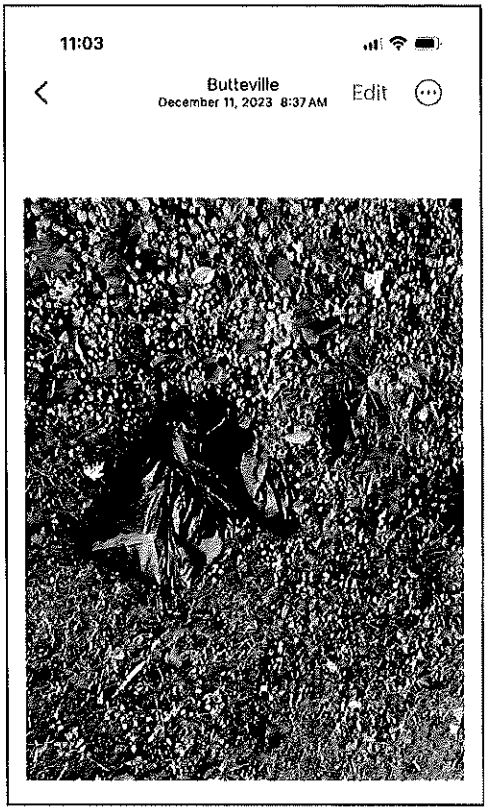
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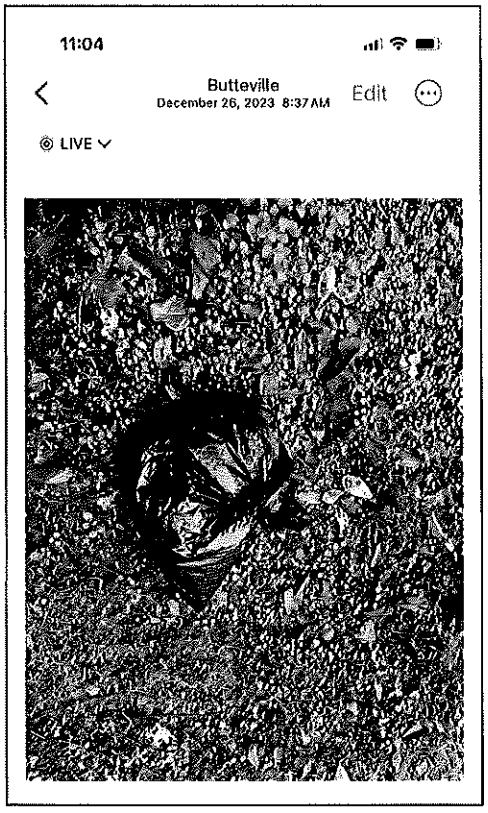
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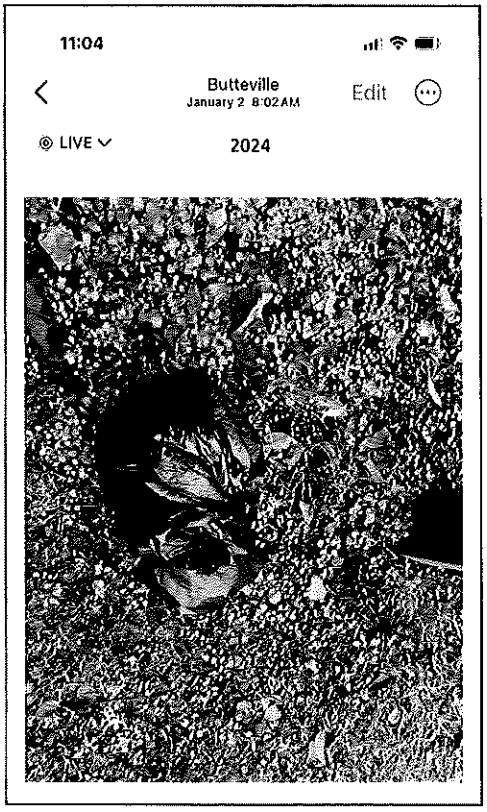

11:04
Butteville
January 2 8:02 AM
Edit
LIVE
2024

December 13, 2021

Boatwright Engineering Inc.
2613 12th ST SE, SALEM, OREGON 97302
civil engineers • land surveyors
503 363-9225 FAX 363-1051

Brandon Reich
Marion County Planning Dept.
5155 Silverton Road, NE
Salem, Oregon 97301

Re: **FLOODPLAIN DEVELOPMENT/GREENWAY PERMIT APPLICATION**
Dock & Gangway, Butteville Landing
Butte Street Public Right-of-Way
Willamette River Mile 42.93

Dear Brandon,

Following, you will find responses to items that I anticipate will be required by conditions applied to a favorable decision on the above referenced permit application. These items pertain to the construction work that would be involved at the site. This work requires certification by a registered professional engineer.

17.178.050 Conditional use procedures and requirements.

D. Prior to obtaining a building permit, commencing development or placing fill in the floodplain the applicant shall submit a certification from a registered civil engineer demonstrating that a development or fill will not result in an increase in floodplain area on other properties and will not result in an increase in erosive velocity of the stream that may cause channel scouring or reduce slope stability downstream of the development or fill.

I used HEC-RAS version 6.1.0 to model the comparison between the existing flood elevation and velocity and the resultant flood elevation and velocity that will exist once the proposed improvements are constructed.

This site is located on the right bank of the Willamette River in north Marion County. To evaluate the location, I had to determine the base flood elevation and the river flow velocity at river mile 42.93 which is the most upstream point on the proposed dock installation. I obtained LIDAR bare earth topography from the Oregon Department of Geology and Mineral Industries (DOGAMI) encompassing both banks of the river from river mile 42.66 to 43.30. I also utilized the cross-section provided by Flowing Solutions on Sheet 6 of their Butteville Landing River Access plans, dated 5/8/19. All of this data is on NAVD88 datum which I then converted to NGVD29 to match the standard currently used by Marion County and FEMA.

I did not have any data source for the shape for the Willamette River bottom. I set the bottom elevations at cross-sections C, D and E, per page 108P of the Flood Insurance Study (FIS) for Marion

County (FIS No. 41047CV003B), dated October 18, 2019. I then looked at the floodway data for the Willamette River and used the Floodway Width, Floodway Elevation, Floodway Water Surface, and, the Floodway Cross-Sectional Area from Table 6 in Volume 1 of the FIS study noted above. Using trial and error calculations of the shape of the river bottom, I derived the configuration that matched all of the parameters of the Floodway Data in said Table 6, with the exception of the Floodway Mean Velocity. My velocities at the C, D, and E cross-sections were slightly faster. See my Calculations Chart, attached. The only way to slow the velocity down to meet the FIS numbers would be to enlarge the cross-sectional area, or change the bank coefficient, which would increase the height of the base flood elevation. I chose to leave the velocity at the rate I calculated.

I then checked the 10, 50, and 100-year flood elevations for the associated cross-sections and compared those to the flood profile (page 108P referred to above). When doing this, all elevations matched FEMA's levels. This gave me the 100-year BFE at river mile 42.93.

The ninety-degree angle of the cross sections, relative to the water flow, finds that the pilings are not in alignment. They are slightly off, so that the two tallest pilings, located at the north and south ends of the improvement, and which extend the furthest into the river, are not in line with any other pilings or components. Some of the shorter pilings, located between the tall end pilings, fall in paired alignment with the concrete pad/abutment. Other intermediate pilings do not line up with each other, or anything else, perpendicular to the line of flow. These last two scenarios have a much smaller effect on the water level than that which the end pilings cause. I did not include the flotation components since they will rise with the water level. I also evaluated the six trees that were recently removed at the site, which totaled 8.25 feet of width. I found that they were not in the same cross-section as the piling placements and could not be included in the study area, but would have had some impact on the river flow.

The cross-sectional area impacted by the pilings at the south end of the project produces a 0.02-foot increase in vertical elevation of the floodplain surface. This is below the 0.1-foot threshold that FEMA can monitor. To address the 0.02-foot rise, I looked at FEMA's Conveyance Compensation Analysis which involves removing some material from the same cross section wherein the partial obstruction from the pilings is located. In this case, excavation will compensate for the pilings and related improvements to ensure that there is no net rise in the river level at the base flood stage.

Because the tall pilings have the greater impact, their heights and locations establish the end area of the proposed compensatory excavation. The Conveyance Compensation Analysis calculations demonstrate that excavation of a 20.0 square foot cross sectional area on the upstream end and a 41.5 square foot cross sectional area on the downstream end will ensure no net rise during a flood. The proposed excavation across the entire south-to-north length of the dock improvement area will transition between 20.0 square feet on the south to 41.5 square feet on the north. This will fully compensate for the impact of the pilings and the concrete dock support being placed. The excavation will total 41.1 cubic yards, removed to an off-site location, which will meet the FEMA conveyance calculation requirement for no rise.

The intermediate pilings are shorter in height and the calculations show that no compensating excavation is needed for these.

I certify that the installation of the proposed pilings and the soil removal based on the Conveyance Compensation Analysis will not produce an increase in floodplain area on other properties.

Using the US Army Corps of Engineers' *Rule of Thumb* for *Scour at Vertical Piles for Small Diameter Piles* and the Corps' *Scour at Vertical Piles, Scour by Currents-Small Diameter Piles* formula, the limits of potential scouring for the piles at this site, that are located in the main channel, could be 2.0 to 3.5 feet in depth and could extend out from the piling at a 1:1 slope for a maximum radius about the piling of 2.5 to 4.0 feet. The two piles outside of the main channel, where the flow velocity is less than 2.5 ft/sec, will not produce any scouring.

I certify that this development may cause localized scouring but will not produce channel scouring and will not reduce slope stability downstream of the development site. The area where the soil has been removed should resist scouring provided the ground cover has been reestablished.

17.178.060 Flood protection standards.
In all areas of identified floodplain (which includes all areas of special flood hazard), the following requirements apply:

J. Floodways. Located within areas of floodplain established in MCC 17.178.030 are areas designated as floodways. Since the floodway is an extremely hazardous area due to the velocity of floodwaters which carry debris, potential projectiles and erosion potential the following provisions shall apply in addition to the requirement in subsection (I) of this section:

1. Prohibit encroachments, including fill, new construction, substantial improvements and other development within the adopted regulatory floodway unless certification by a registered professional civil engineer is provided demonstrating through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment shall not result in any increase in flood levels within the community during the occurrence of the base flood discharge.

2. If subsection (J)(1) of this section is satisfied all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of this section.

3. The area below the lowest floor shall remain open and unenclosed to allow the unrestricted flow of floodwaters beneath the structure.

Based on my HEC-RAS 6.1.0 modeling of this reach of the Willamette River for the encroachment of the gangway, dock, and related structures and supports, I can certify that this construction will not result in any increase in flood level during the occurrence of the base flood discharge. If you require additional data from my HEC-RAS analysis, please let me know.

The proposed dock and gangplank will float on the water, and the flow of floodwaters will not be restricted beneath these structures. The proposed concrete abutment at the east end of the gangplank is not within the floodway.

The information provided in response to 17.178.050 D., above, for the cross-sectional area impacted by the pilings, along with the Conveyance Compensation Analysis, demonstrates that no net rise shall

occur due to this construction.

I certify that the installation of the proposed pilings will not produce an increase in flood levels within the community during the occurrence of the base flood discharge.

The compensatory removal should be done after the winter rains and when the river level is below the work area. All of the existing riprap in the removal area should be set aside and replaced in the same area from which it came. A silt fence must be installed prior to any work commencing and maintained until grass seed has developed to a fully protective groundcover.

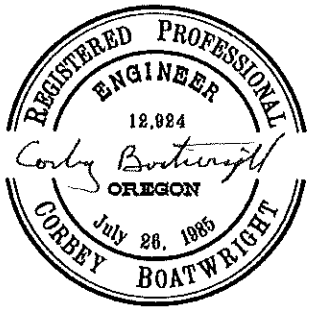
The Cross Section shown on Sheet 3 of 3 is at the south tall pier and does not reflect the cross section where the concrete abutment is located. The concrete abutment shown on this section view is downstream and is only included to portray the location within the typical river cross section.

Any issues that arise from Marion County Code MCC 17.178.060(C), (D)(1), (E), (F) are addressed per the letter dated 29 May 2020 from Kelly D. LaFave, PE.

Please contact me if you have any questions.

Sincerely,

Corbey Boatwright, PE



Renewal Date: December 31, 2021

Attachments:
- Copy of letter from LaFave to Reich, 29 May 2020
- FEMA FIRMette
- FIS, Marion County, Table 4, Table 6, & Page 108P
- HEC-RAS Butteville Dock cross-sections
- HEC-RAS 5.0.1 Output Results
- HEC-RAS Pre-Dock Output
- HEC-RAS Post-Dock Output
- Engineering Plans (3 sheets)
- Conveyance Calculations

CC: Ben Williams, president, Friends of Historic Butteville

MARINE STRUCTURES ENGINEERING, INC.

1004 Commercial Avenue, #364 Anacortes, WA 98221 (360) 466-8627 Fax: (360) 230-2310

29 May 2020

Mr. Brandon Reich
Marion Planning Department
5155 Silverton Road NE
Salem, Oregon 97301

RE: Floodplain Development/Greenway Permit Case No. 20-003
Dock and Gangway, Butteville Landing
Butte Street Public Right-of-Way
Willamette River Mile 42.93

Dear Brandon:

Based on the review of the pile supports and gangway plans prepared by me and review of the float plans prepared by others,

I certify that the conditions applicable to pile supported, floating dock and walkway structures of Marion County Code Chapter 17.178, Floodplain Overlay Zone, specifically subchapter 17.178.60 Flood Protection Standards, sections (C), (D1), (E) and (F) will be met by the proposed design.

It is my understanding based on review of the project drawings and discussions with the contractor, that there will be at least twenty (20) feet of clearance between the proposed float and the existing nearest downstream float.

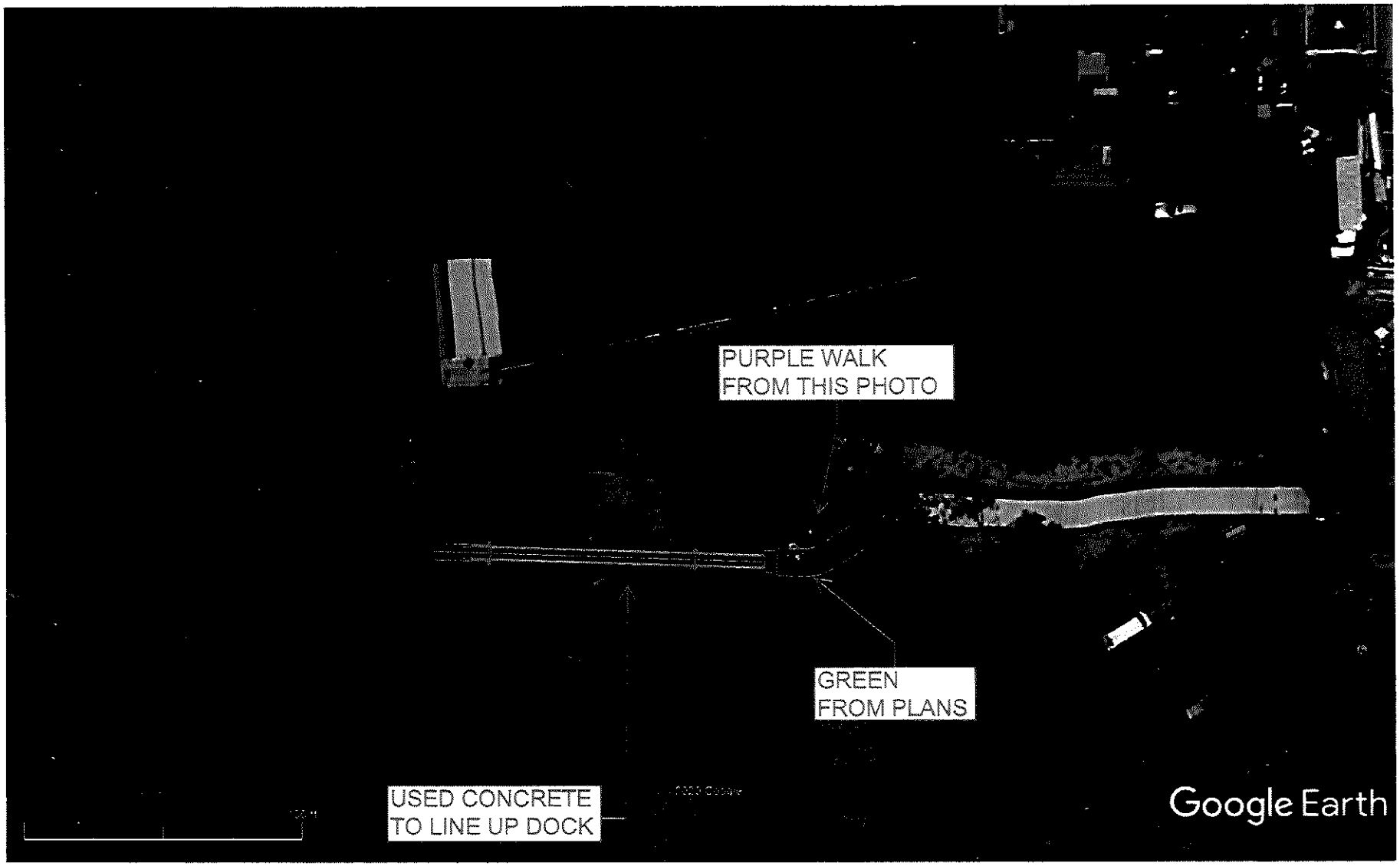
Please let me know if you have any questions or need any additional information.

Sincerely,

MARINE STRUCTURES ENGINEERING, INC.

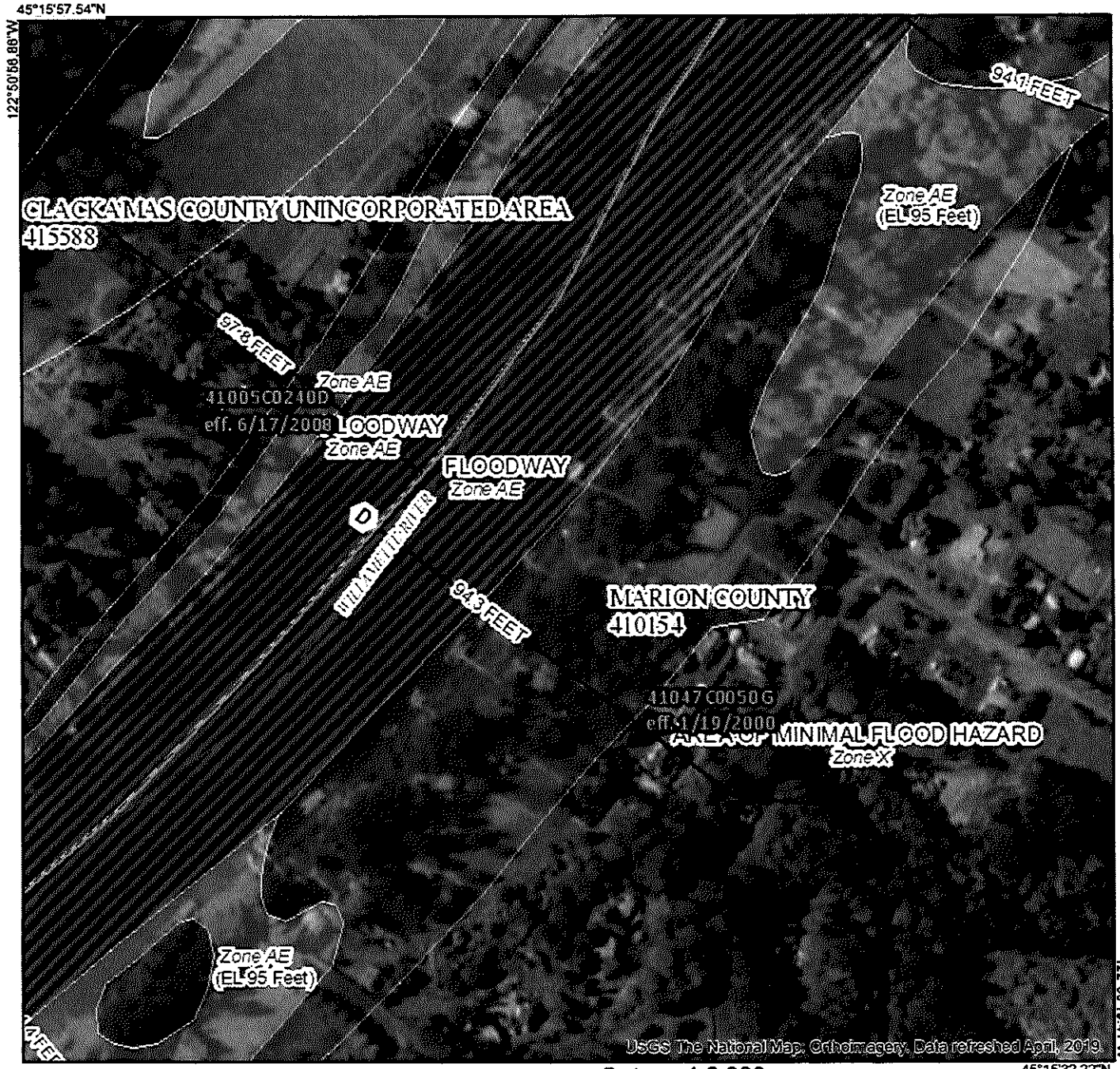
Kelly D. LaFave, P.E.
President

Exp 31 DEC 2020


PURPLE WALK
FROM THIS PHOTO
GREEN
FROM PLANS
USED CONCRETE
TO LINE UP DOCK
Google Earth

National Flood Hazard Layer FIRMette

FEMA



Feet

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

1:6,000

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, 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
- 513 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 represen 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 4/2/2020 at 6:00:27 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.

Table 4. Summary of Discharges (Cont'd)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
West Fork Pringle Creek					
At mouth	3.2	500[2]	650[2]	730[2]	880[2]
Approximately 450 feet downstream of flood control structure	3.1	460	590	665	800
Just downstream of Pringle Road	2.6	400	515	580	695
Just upstream of Commercial Street (Highway 99E)	1.9	325	420	470	565
Willamette River					
At Butteville	8,380	182,000	260,000	302,000	445,000
At Salem	7,280	190,000	250,000	280,000	363,000

[1]Data not determined
[2]Urbanized runoff from Pringle Creek basin

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Willamette River								
A	42.03	710/370	43,332	6.6	93.7	93.7	94.6	0.9
B	42.35	730/440	43,718	6.6	93.9	93.9	94.8	0.9
C	42.66	700/385	43,336	6.6	94.1	94.1	94.9	0.8
D	42.99	709/374	43,605	6.6	94.3	94.3	95.1	0.8
E	43.30	680/381	39,287	7.4	94.4	94.4	95.2	0.8
F	43.76	680/370	39,838	7.2	94.7	94.7	95.6	0.9
G	44.15	700/415	40,368	7.1	95.0	95.0	95.9	0.9
H	44.46	750/430	41,438	6.9	95.3	95.3	96.0	0.7
I	46.44	2,100/1,690	47,272	6.1	96.2	96.2	97.0	0.8
J	47.64	3,000/2,525	56,285	5.1	97.5	97.5	98.1	0.6
K	48.41	3,000/2,540	46,825	6.1	97.5	97.5	98.2	0.7
L	48.46	3,000/2,550	47,512	6.0	97.5	97.5	98.4	0.9
M	49.07	4,400/4,070	77,593	3.7	98.5	98.5	99.3	0.8
N	50.65	8,000/7,380	139,912	2.1	99.3	99.3	100.1	0.8
O	51.59	8,000/6,050	129,683	2.2	99.5	99.5	100.4	0.9
P	52.48	7,700/7,375	82,487	3.5	99.5	99.5	100.4	0.9
Q	54.17	6,380/4,910	78,889	3.6	100.5	100.5	101.4	0.9
R	54.58	5,380/2,260	112,389	2.5	101.4	101.4	102.3	0.9
S	55.17	4,500/625	74,363	3.4	101.4	101.4	102.3	0.9
T	55.71	4,100/840	76,317	3.3	101.8	101.8	102.6	0.8
U	56.44	3,600/3,240	88,098	2.9	102.2	102.2	103.0	0.8
V	57.53	7,000/6,760	144,467	1.8	102.6	102.6	103.4	0.8
W	58.47	8,000/7,755	210,016	1.2	102.9	102.9	103.8	0.9
X	59.06	7,400/7,100	172,084	1.5	102.9	102.9	103.8	0.9
Y	59.42	7,800/7,260	199,965	1.3	103.3	103.3	104.1	0.8
Z	59.77	8,100/5,965	218,569	1.2	103.6	103.6	104.4	0.8

[1]Miles above mouth [2]Total width/width within Marion County

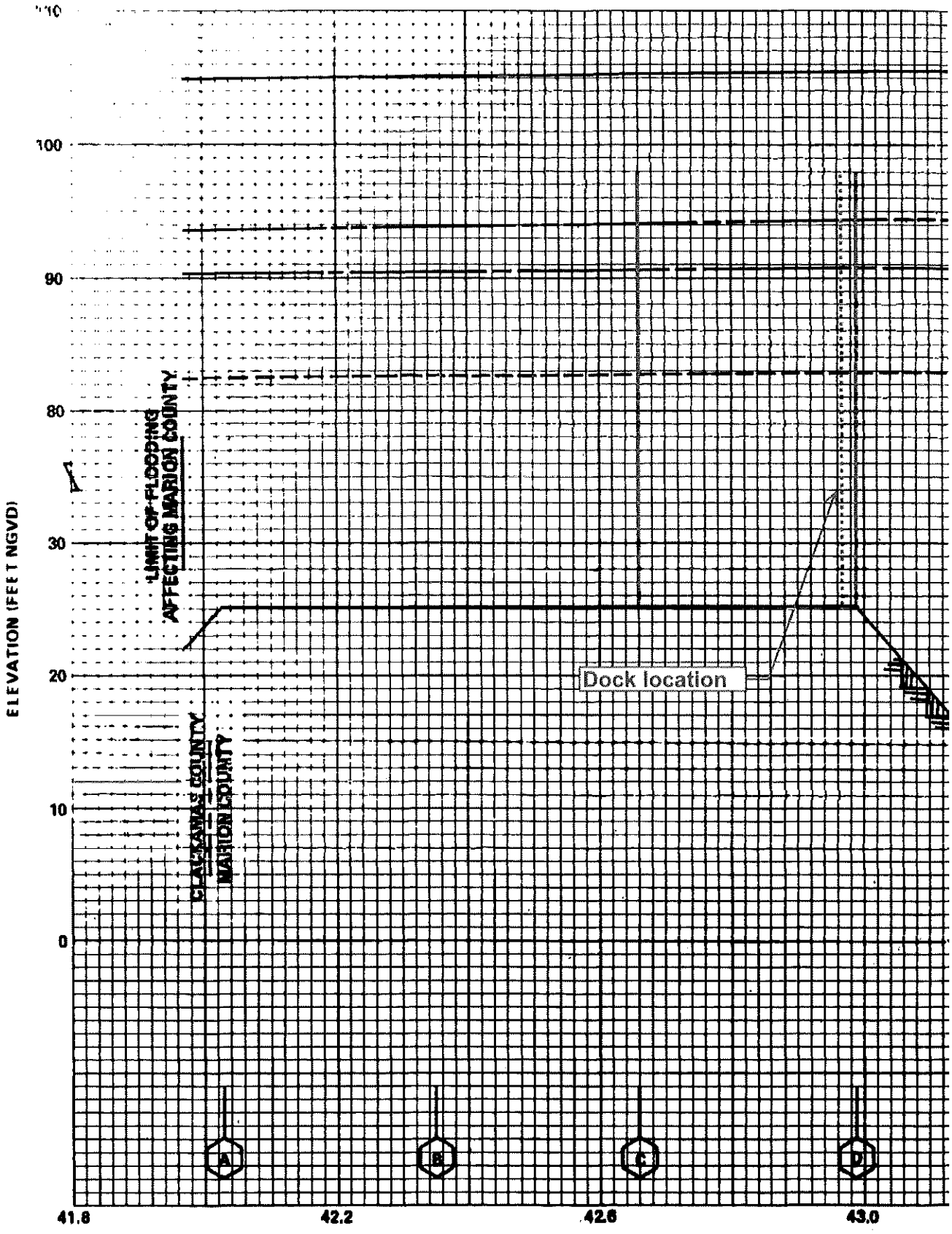
TABLE 6

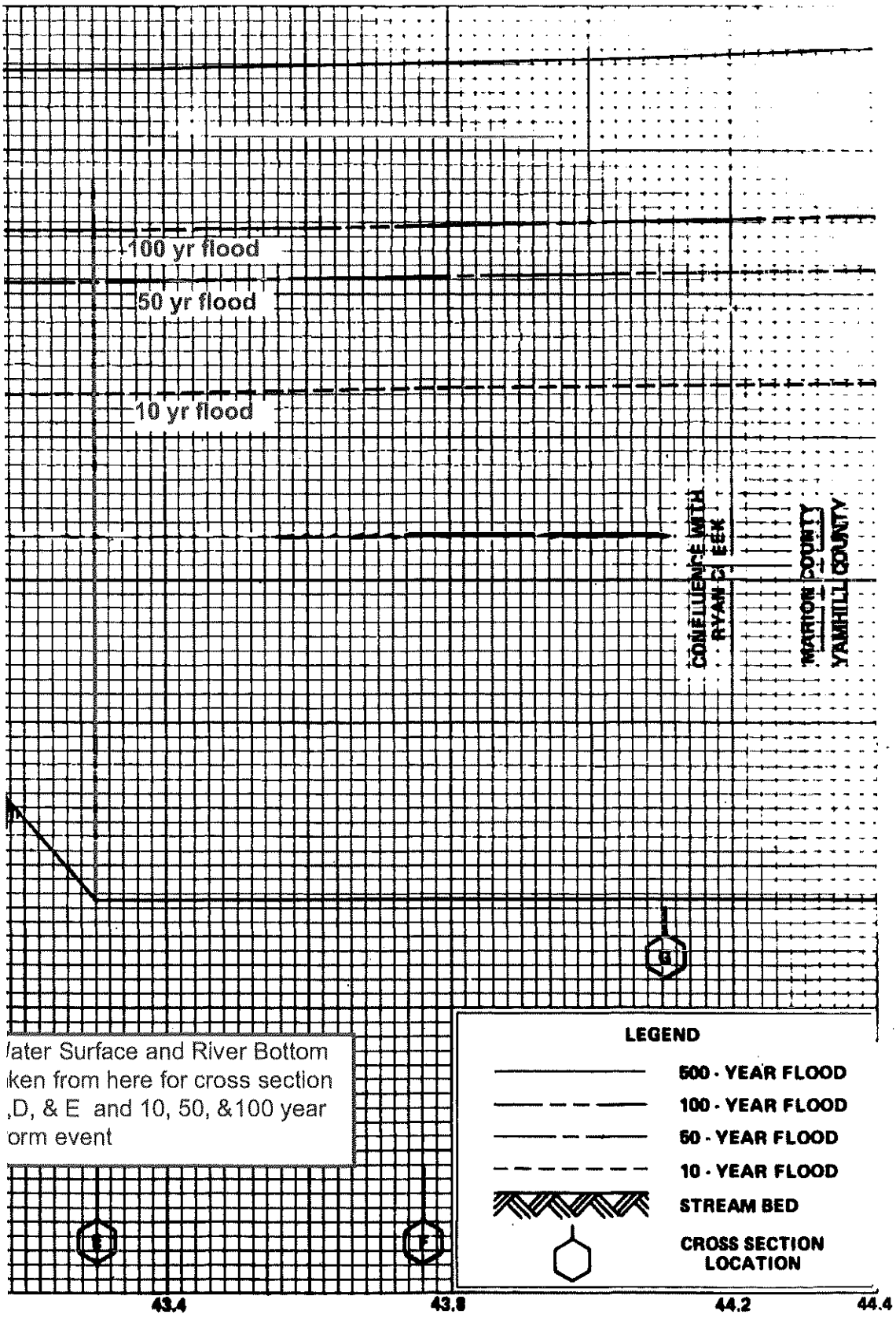
FEDERAL EMERGENCY MANAGEMENT AGENCY

MARION COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

WILLAMETTE RIVER


110
100
90
80
30
20
10
0
ELEVATION (FEET NGVD)
LIMIT OF FLOODING
AFFECTING MARION COUNTY
CLACKAMAS COUNTY
MARION COUNTY
Dock location
A
B
C
D
41.8
42.2
42.6
43.0
STREAM DISTANCE IN M



/ater Surface and River Bottom
ken from here for cross section
,D, & E and 10, 50, &100 year
orm event

S ABOVE MOUTH

from FIS Marion County Vol 3 FIS Study Number 41047CV003B

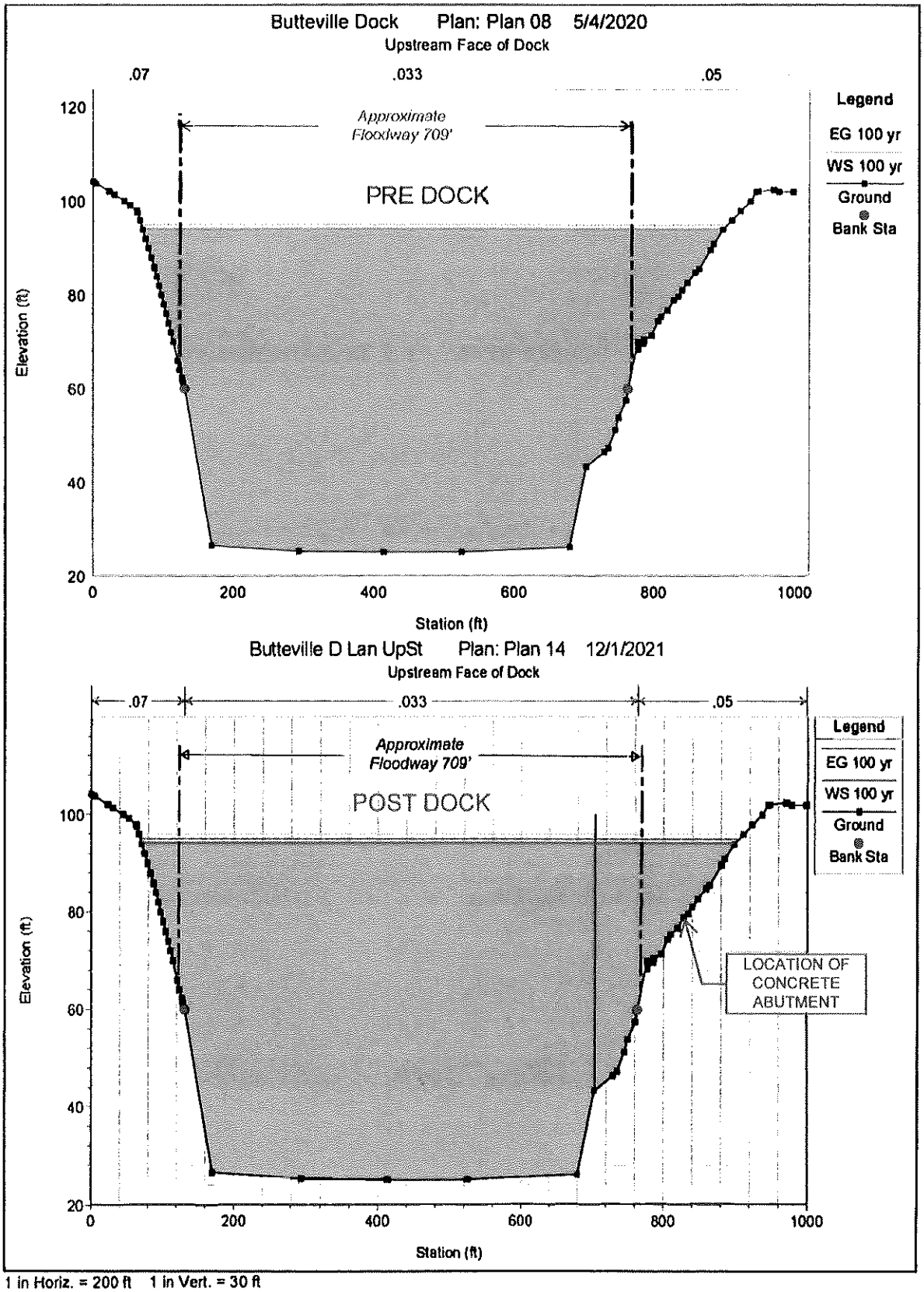
FLOOD PROFILES

WILLAMETTE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARION COUNTY, OR
AND INCORPORATED AREAS

108P



1 in Horiz. = 200 ft 1 in Vert. = 30 ft

Boatwright Engineering Inc.
2613 12th St SE
Salem, Oregon 97302
Ph 503-363-9225

rev. 12-01-2021

HEC-RAS 5.0.1 OUTPUT RESULTS

Dock & Gangway, Butteville Landing
Butte Street Public Right-of-Way
Willamette River Mile 42.93

Match Infonnation FIS Vol 1 of 3 Marion County FLoodway Data Willamette RiverTable 6

HEC-RAS Plan: floodway River: Willamett eR Reach: Butteville Profile: 100 yr

	Reach	River Sta	Profile	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)	Vel Total (ft/s)	Vel Right (ft/s)
E	Butteville	43.30	100 yr	302000.00	7.50	95.17		98.11	0.000135	7.26	39287.18	680.00	7.69	1.26
D	Butteville	42.99	100 yr	302000.00	25.20	95.07		95.67	0.000101	7.26	43605.06	709.00	6.93	2.11
	Butteville	42.93	100 yr	302000.00	25.10	95.05		95.84	0.000100	7.18	43556.15	707.40	6.93	1.83
C	Butteville	42.66	100 yr	302000.00	25.10	94.90	47.66	95.70	0.000100	7.19	43335.82	700.00	6.97	1.83

FIS Vol 3 of 3 Marion County Information from Flood Profile page 108P

	Reach	River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)
	Butteville	43.30	10 yr	182000.00	83.0
E	Butteville	43.30	50 yr	260000.00	90.8
	Butteville	43.30	100 yr	302000.00	94.4
	Butteville	42.99	10 yr	182000.00	82.9
D	Butteville	42.99	50 yr	260000.00	90.9
	Butteville	42.99	100 yr	302000.00	94.3
	Butteville	42.93	10 yr	182000.00	
	Butteville	42.93	50 yr	260000.00	
	Butteville	42.93	100 yr	302000.00	
	Butteville	42.66	10 yr	182000.00	82.8
C	Butteville	42.66	50 yr	260000.00	90.7
	Butteville	42.66	100 yr	302000.00	94.1

All elevation
NGVD 29 Datum

RENEWAL DATE: 12/31/2021

Pre Dock

HEC-RAS Plan: FLoodplain River: Willamette R Reach: Butteville

	Reach	River Sta	Profile	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)	Vel Total (ft/s)	Vel Right (ft/s)
	Butteville	43.30	10 yr	182000.00	7.50	83.00		83.54	0.000108	5.90	31841.77	750.49	5.75	1.44
E	Butteville	43.30	50 yr	260000.00	7.50	90.96		91.74	0.000128	7.15	3775.908	790.70	6.89	1.66
	Butteville	43.30	100 yr	302000.00	7.50	94.39		95.32	0.000138	7.80	40819.21	894.68	7.43	1.88
	Butteville	42.99	10 yr	182000.00	25.20	82.92		83.37	0.000073	5.39	35324.48	791.21	5.15	1.10
D	Butteville	42.99	50 yr	260000.00	25.20	90.88		91.53	0.000093	6.65	42034.19	878.75	6.19	1.50
	Butteville	42.99	100 yr	302000.00	25.20	94.28		95.09	0.000103	7.28	45088.32	903.52	6.70	1.76
	Butteville	42.93	10 yr	182000.00	25.10	82.91		83.34	0.000072	5.32	35108.96	755.00	5.17	1.04
	Butteville	42.93	50 yr	260000.00	25.10	90.84		91.50	0.000092	6.58	41408.23	807.24	6.28	1.53
	Butteville	42.93	100 yr	302000.00	25.10	(94.26)		95.05	0.000103	(7.22)	44234.86	829.74	(6.83)	(1.76)
	Butteville	42.66	10 yr	182000.00	25.10	82.80	41.60	83.24	0.000072	5.33	35035.79	741.12	5.19	1.17
C	Butteville	42.66	50 yr	260000.00	25.10	90.70	45.71	91.37	0.000092	6.60	41048.49	781.45	6.33	1.60
	Butteville	42.66	100 yr	302000.00	25.10	94.10	47.66	94.91	0.000103	7.25	43736.08	800.35	6.91	1.80

Post Dock Upstream

HEC-RAS Plan: Plan 100 River: WillametteR Reach: Butteville

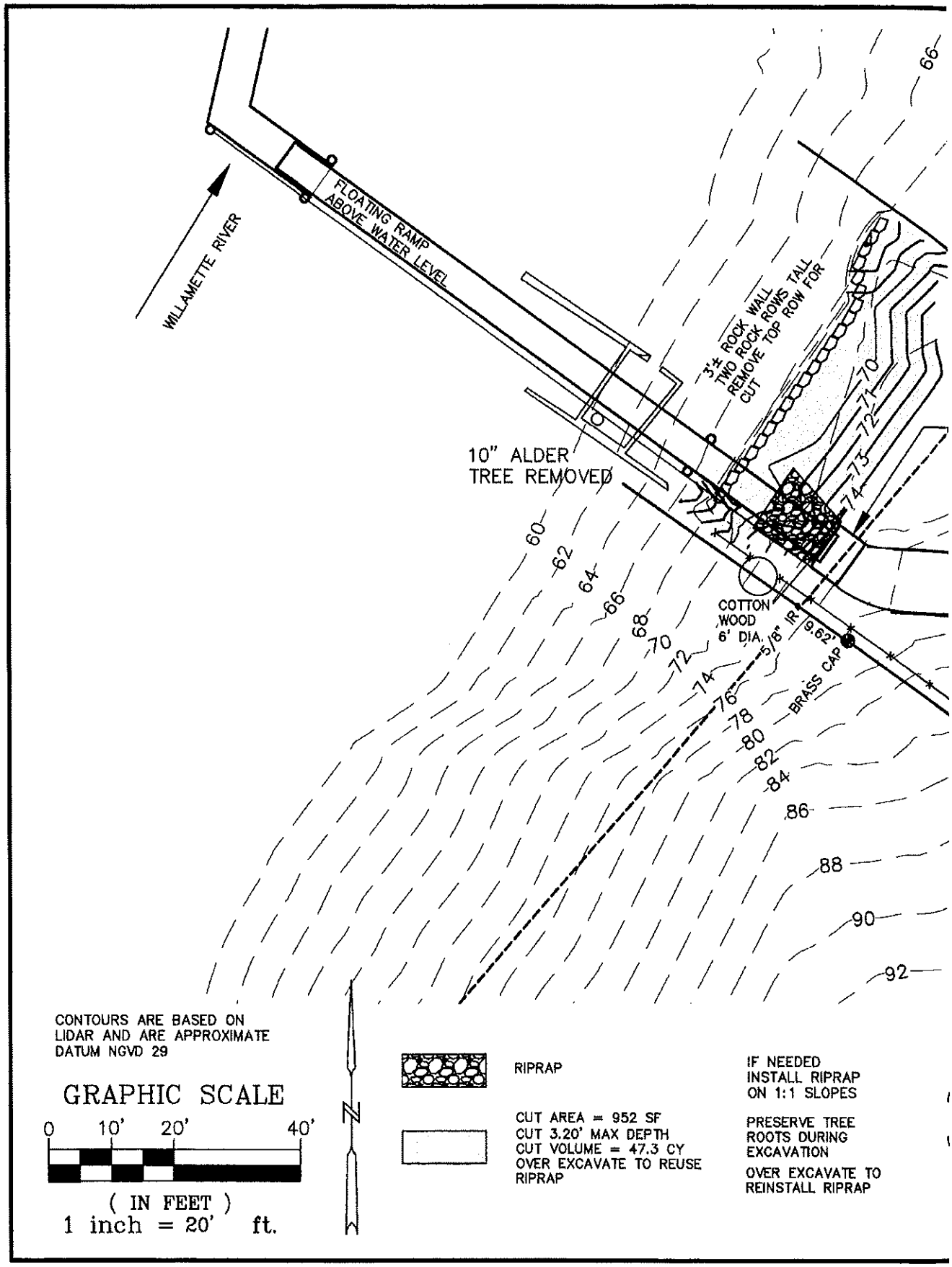
	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Vel Total (ft/s)	Vel Right (ft/s)
	Butteville	43.30	10 yr	182000.00	7.50	83.01		83.55	0.000108	5.89	31849.12	750.54	5.75	1.44
E	Butteville	43.30	50 yr	260000.00	7.50	90.97		91.76	0.000126	7.15	37771.12	790.81	6.88	1.66
	Butteville	43.30	100 yr	302000.00	7.50	94.41		95.34	0.000138	7.79	40835.84	895.06	7.43	1.88
	Butteville	42.99	10 yr	182000.00	25.20	82.93		83.38	0.000073	5.39	35332.25	791.42	5.15	1.10
D	Butteville	42.99	50 yr	260000.00	25.20	90.88		91.55	0.000093	6.64	42047.84	878.86	6.18	1.50
	Butteville	42.99	100 yr	302000.00	25.20	94.30		95.11	0.000103	7.27	45103.23	903.65	6.70	1.76
Upstream Piling	Butteville	42.93	10 yr	182000.00	25.10	82.91		83.35	0.000084	5.52	3516.5.31	754.96	5.18	1.13
	Butteville	42.93	50 yr	260000.00	25.10	90.85		91.51	0.000110	6.58	41371.35	808.31	6.28	1.67
	Butteville	42.93	100 yr	302000.00	25.10	(94.27)		95.07	0.000124	(7.21)	44167.65	826.39	(6.84)	(1.94)
	Butteville	42.66	10 yr	182000.00	25.10	82.80	41.60	83.24	0.000072	5.33	35035.79	741.12	5.19	1.17
C	Butteville	42.66	50 yr	260000.00	25.10	90.70	45.71	91.37	0.000092	6.60	41048.49	781.45	6.33	1.60
	Butteville	42.66	100 yr	302000.00	25.10	94.10	47.66	94.91	0.000103	7.25	43736.08	800.35	6.91	1.80

Post Dock Downstream

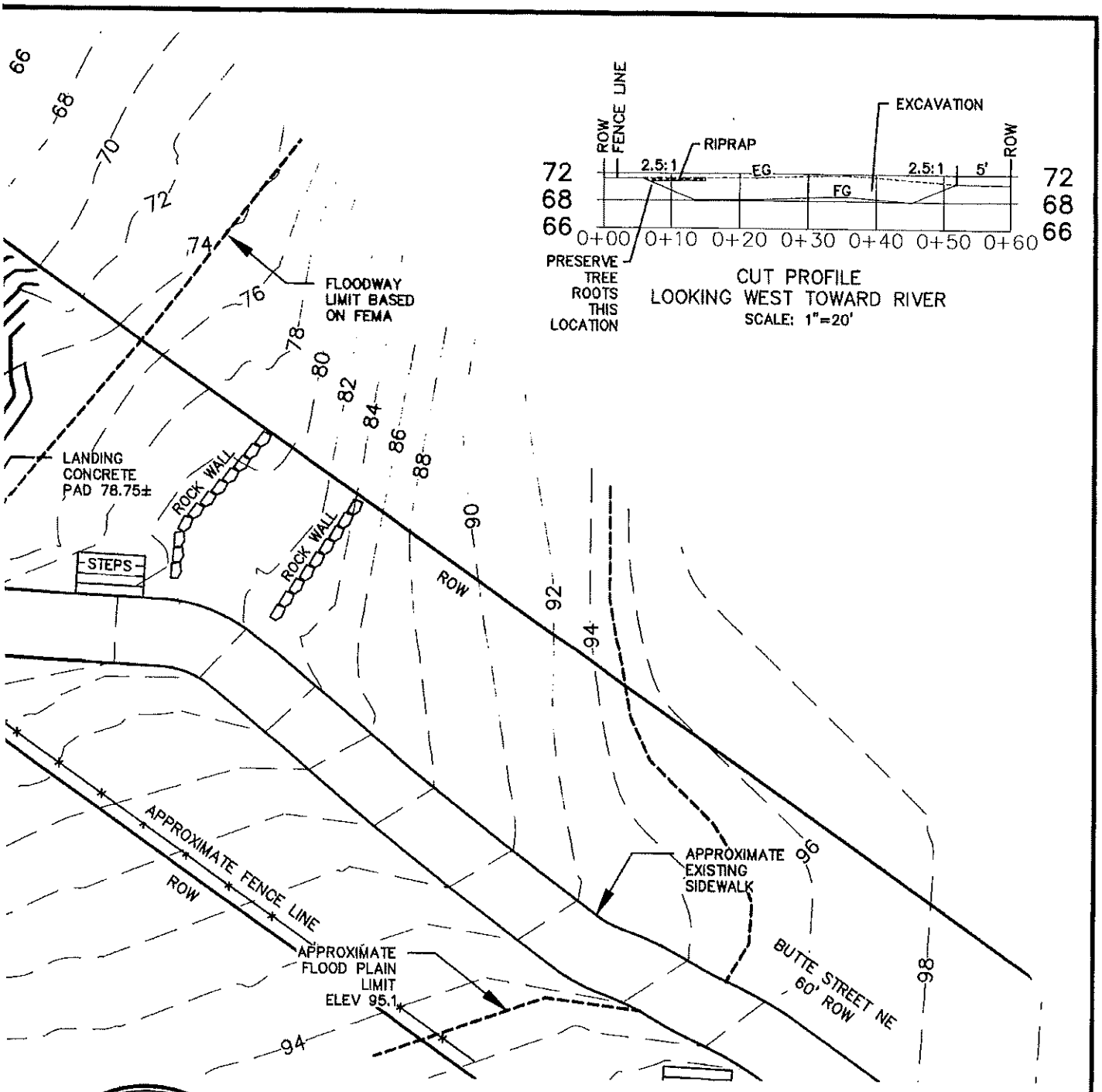
HEC-RAS Plan: Plan 100 River: Willamette R Reach: Butteville

	Reach	River Sta	Profile	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)	Vel Total (ft/s)	Vel Right (ft/s)
	Butteville	43.30	10 yr	182000.00	7.50	83.01		83.55	0.000108	5.89	31850.95	750.55	5.75	1.44
E	Butteville	43.30	50 yr	260000.00	7.50	90.97		91.76	0.000126	7.15	37773.59	790.84	6.88	1.66
	Butteville	43.30	100 yr	302000.00	7.50	94.41		95.34	0.000138	7.79	40839.04	895.14	7.43	1.88
	Butteville	42.99	10 yr	182000.00	25.20	82.93		83.38	0.000073	5.39	35334.20	791.47	5.15	1.10
D	Butteville	42.99	50 yr	260000.00	25.20	90.88		91.55	0.000093	6.64	42050.43	878.68	6.18	1.50
	Butteville	42.99	100 yr	302000.00	25.20	94.31		95.11	0.000103	7.27	45106.47	903.88	6.70	1.76
Downstream Piling	Butteville	42.93	10 yr	182000.00	25.10	82.91		83.35	0.000087	5.52	35156.39	754.97	5.18	1.15
	Butteville	42.93	50 yr	260000.00	25.10	90.85		91.52	0.000114	6.58	41363.14	808.33	6.29	1.70
	Butteville	42.93	100 yr	302000.00	25.10	(94.28)		95.07	0.000129	(7.21)	44160.11	828.41	(6.84)	(1.97)
	Butteville	42.66	10 yr	182000.00	25.10	82.80	41.60	83.24	0.000072	5.33	35035.79	741.12	5.19	1.17
C	Butteville	42.66	50 yr	260000.00	25.10	90.70	45.71	91.37	0.000092	6.60	41048.49	781.45	6.33	1.60
	Butteville	42.66	100 yr	302000.00	25.10	94.10	47.66	94.91	0.000103	7.25	43736.08	800.35	6.91	1.80

100 yr Flood	WS Elev	Velocity Total	Velocity Channel	Velocity Right
Pre Dock	94.26	7.22 ft/s	6.83 ft/s	1.76 ft/s
Post Dock Upstream	94.27	7.21 ft/s	6.84 ft/s	1.94 ft/s
Post Dock Downstream	94.28	7.21 ft/s	6.84 ft/s	1.97 ft/s



BUTTEVILLE DOCK BARE EARTH 5-1-20.DWG



REGISTERED PROFESSIONAL ENGINEER
18,024
Corbey Boatwright
OREGON
July 26, 1985
CORBEY BOATWRIGHT

EXPIRES: 12/31/2021

BUTTEVILLE LANDING

BUTTE STREET PUBLIC ROW CONVEYANCE CUT

SW 1/4 Sec. 32, T.3S., R.1W., W.M. MARION COUNTY, OREGON

Scale: 1" = 20'	Date: Nov. 8, 2021	Revised: Nov. 30, 21
Design: CFB	**Boatwright Engineering, Inc.**	Job No.
Drawn: SDW	2613 12th Street SE, SALEM, OREGON 97302	Sheet 1 of 3
Chkd: CFB	TEL: (503) 363-9225 • FAX: (503) 363-1051	

Pre-Dock

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Butteville Dock
Project File : ButtevilleDock.prj
Run Date and Time: 5/3/2020 1:30:28 PM

Project in English units

PLAN DATA

Plan Title: Plan 08
Plan File : p:\2020 Small Jobs\Butterville Landing\HEC-RAS\ButtevilleDock.p08

Geometry Title: floodplain site adjusted bottom L
Geometry File : p:\2020 Small Jobs\Butterville Landing\HEC-RAS\ButtevilleDock.g07

Flow Title : Precondition adj bottom to FEMA
Flow File : p:\2020 Small Jobs\Butterville Landing\HEC-RAS\ButtevilleDock.f02

Plan Summary Information:

Number of:	Cross Sections	= 4	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance	= 0.01
Critical depth calculation tolerance	= 0.01
Maximum number of iterations	= 20
Maximum difference tolerance	= 0.3
Flow tolerance factor	= 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Precondition adj bottom to FEMA
Flow File : p:\2020 Small Jobs\Butterville Landing\HEC-RAS\ButtevilleDock.f02

Flow Data (cfs)

River	Reach	RS	10 yr	50 yr	100 yr
Willamette R	Butteville	43.30	182000	260000	302000

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Willamette R	Butteville	10 yr		Known WS = 82.8
Willamette R	Butteville	50 yr		Known WS = 90.7
Willamette R	Butteville	100 yr		Known WS = 94.1

GEOMETRY DATA

Geometry Title: floodplain site adjusted bottom L
Geometry File : p:\2020 Small Jobs\Butterville Landing\HEC-RAS\ButtevilleDock.g07

CROSS SECTION

RIVER: Willamette R
REACH: Butteville RS: 43.30

INPUT
Description: E Section
Station Elevation Data num= 77

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	105.46	9.09	104.27	11.03	104	11.35	104	30.85	102.58
36.08	102.2	38.88	102	43.2	100.36	43.77	100.09	44.12	100
49.1	98.05	49.23	98	54.27	96.03	54.34	96	59.37	94.03
59.46	94	64.46	92.04	64.57	92	69.54	90.06	69.68	90
74.58	88.08	74.8	88	79.51	86.16	79.91	86	80.99	85.52
83.57	84	85.37	83.02	86.34	82.57	87.58	82	88.1	81.76
88.42	81.62	90.19	80.91	92	80.2	92.35	80	94.2	78.93
95.61	78	96.6	77.35	98.65	76	100.88	74.54	101.7	74
104.61	72.09	104.74	72	105.52	71.49	107.64	70.29	108.15	70
110.31	68.78	111.68	68	112.68	67.43	113.99	66.69	114.67	66.37
115.43	66	116.26	65.6	116.59	65.45	118.69	64	119.32	63.57
121.6	62	124.24	60.22	124.56	60	192.4	52	294.3	42
420	7.5	500	7.5	600	41.87	702	52	742.8	54
787.47	60	788.86	60.5	793.05	62	794.08	62.37	807.6	70
820.4	80	853.4	90	881.9	96	900	96.6	917.8	96
944.5	94	1018.2	92						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	124.56	.033	787.47	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
124.56	787.47	1583.2	1636.8 1756.1	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	83.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.53	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	83.00	Reach Len. (ft)	1583.20	1636.80	1756.10
Crit W.S. (ft)		Flow Area (sq ft)	428.97	30759.60	549.33
E.G. Slope (ft/ft)	0.000105	Area (sq ft)	428.97	30759.60	549.33
Q Total (cfs)	182000.00	Flow (cfs)	415.74	180797.10	787.17
Top Width (ft)	750.50	Top Width (ft)	39.15	662.91	48.44
Vel Total (ft/s)	5.73	Avg. Vel. (ft/s)	0.97	5.88	1.43
Max Chl Dpth (ft)	75.50	Hydr. Depth (ft)	10.96	46.40	11.34
Conv. Total (cfs)	17784260.0	Conv. (cfs)	40623.9	17666720.0	76918.8
Length Wtd. (ft)	1637.17	Wetted Per. (ft)	45.52	675.21	53.71
Min Ch El (ft)	7.50	Shear (lb/sq ft)	0.06	0.30	0.07
Alpha	1.04	Stream Power (lb/ft s)	0.06	1.75	0.10
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	48.75	2562.11	56.00
C & E Loss (ft)	0.03	Cum SA (acres)	4.08	49.43	5.71

CROSS SECTION OUTPUT Profile #50 yr

E.G. Elev (ft)	91.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.78	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	90.96	Reach Len. (ft)	1583.20	1636.80	1756.10
Crit W.S. (ft)		Flow Area (sq ft)	807.21	36033.63	1014.84
E.G. Slope (ft/ft)	0.000125	Area (sq ft)	807.21	36033.63	1014.84
Q Total (cfs)	260000.00	Flow (cfs)	1023.03	257099.20	1877.83
Top Width (ft)	790.72	Top Width (ft)	57.32	662.91	70.48
Vel Total (ft/s)	6.87	Avg. Vel. (ft/s)	1.27	7.13	1.85
Max Chl Dpth (ft)	83.46	Hydr. Depth (ft)	14.08	54.36	14.40
Conv. Total (cfs)	23258100.0	Conv. (cfs)	91514.6	22998600.0	167980.0
Length Wtd. (ft)	1637.59	Wetted Per. (ft)	65.40	675.21	77.21
Min Ch El (ft)	7.50	Shear (lb/sq ft)	0.10	0.42	0.10
Alpha	1.07	Stream Power (lb/ft s)	0.12	2.97	0.19
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	86.79	2954.26	115.40
C & E Loss (ft)	0.03	Cum SA (acres)	5.55	49.43	8.76

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	95.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.93	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	94.39	Reach Len. (ft)	1583.20	1636.80	1756.10
Crit W.S. (ft)		Flow Area (sq ft)	1019.04	38308.94	1388.29
E.G. Slope (ft/ft)	0.000137	Area (sq ft)	1019.04	38308.94	1388.29
Q Total (cfs)	302000.00	Flow (cfs)	1443.04	297958.90	2598.01
Top Width (ft)	894.73	Top Width (ft)	66.11	662.91	165.71
Vel Total (ft/s)	7.42	Avg. Vel. (ft/s)	1.42	7.78	1.87
Max Chl Dpth (ft)	86.89	Hydr. Depth (ft)	15.41	57.79	8.38
Conv. Total (cfs)	25815010.0	Conv. (cfs)	123351.6	25469580.0	222078.5
Length Wtd. (ft)	1637.83	Wetted Per. (ft)	74.84	675.21	175.22
Min Ch El (ft)	7.50	Shear (lb/sq ft)	0.12	0.48	0.07
Alpha	1.09	Stream Power (lb/ft s)	0.16	3.77	0.13
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	106.87	3123.31	149.40
C & E Loss (ft)	0.04	Cum SA (acres)	6.20	49.43	11.51

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Willamette R
REACH: Butteville RS: 42.99

INPUT
Description: D Section
Station Elevation Data num= 100

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	110.01	6.48	110.01	6.55	110	6.58	110	6.6	110
6.78	109.98	19.56	108.6	23.01	108.26	25.45	108	25.95	107.93
32.85	106	36.92	104.83	39.83	104	43.5	102.95	49.84	101.14
53.81	100	56.1	99.34	60.79	98	62.25	97.58	67.78	96
68.27	95.86	70.96	95.09	73.59	94	74.03	93.82	78.42	92
79.49	91.56	83.25	90	84.79	89.36	88.08	88	89.98	87.21
92.91	86	95.11	85.09	97.74	84	100.18	82.99	102.57	82
105.2	80.91	107.41	80	110.2	78.84	112.24	78	115.18	76.78
117.07	76	120.13	74.73	121.9	74	125.07	72.69	126.73	72
128.7	71.18	131.56	70	134.01	68.99	136.39	68	139.61	66.67
141.22	66	145.92	64.05	146.05	64	146.33	63.88	146.55	63.85
147.74	63.74	148.83	63.53	156.85	62.4	159.67	62	169	60.68
173.81	60	211	28.52	294.3	26	414.3	25.2	525.1	25.2
629.2	26	729	28.06	793.47	60	794.55	60.48	799.77	62
799.91	62.04	807.67	64	820.15	67.16	823.47	68	830.91	70
841.29	74	851.68	78	856.88	80	857.06	80.07	857.98	80.22
866.14	81.52	874.77	82	888.63	82.76	911.1	84	930.42	85.06

935.17	86	936.33	86.22	945.36	88	949.91	88.89	955.54	90
965.32	91.92	965.68	92	965.84	92.03	975.09	94	978.32	94.69
984.79	96	989.73	97.11	993.89	98	1002.24	98.9	1002.6	98.98

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	173.81	.033	793.47	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
173.81	793.47	316.3	316.4	316.8	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	83.37	Element			
Vel Head (ft)	0.45	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	82.92	Reach Len. (ft)	316.30	316.40	316.80
Crit W.S. (ft)		Flow Area (sq ft)	1014.12	33401.13	909.23
E.G. Slope (ft/ft)	0.000073	Area (sq ft)	1014.12	33401.13	909.23
Q Total (cfs)	182000.00	Flow (cfs)	1022.74	179979.50	997.74
Top Width (ft)	791.21	Top Width (ft)	73.47	619.66	98.09
Vel Total (ft/s)	5.15	Avg. Vel. (ft/s)	1.01	5.39	1.10
Max Chl Dpth (ft)	57.72	Hydr. Depth (ft)	13.80	53.90	9.27
Conv. Total (cfs)	21267500.0	Conv. (cfs)	119511.7	21031400.0	116590.5
Length Wtd. (ft)	316.40	Wetted Per. (ft)	77.53	638.74	101.45
Min Ch El (ft)	25.20	Shear (lb/sq ft)	0.06	0.24	0.04
Alpha	1.08	Stream Power (lb/ft s)	0.06	1.29	0.04
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	22.53	1356.67	26.60
C & E Loss (ft)	0.00	Cum SA (acres)	2.04	25.34	2.76

CROSS SECTION OUTPUT Profile #50 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	91.53	Element			
Vel Head (ft)	0.67	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	90.86	Reach Len. (ft)	316.30	316.40	316.80
Crit W.S. (ft)		Flow Area (sq ft)	1673.45	38320.38	2040.36
E.G. Slope (ft/ft)	0.000093	Area (sq ft)	1673.45	38320.38	2040.36
Q Total (cfs)	260000.00	Flow (cfs)	2264.47	254679.30	3056.19
Top Width (ft)	878.75	Top Width (ft)	92.63	619.66	166.45
Vel Total (ft/s)	6.19	Avg. Vel. (ft/s)	1.35	6.65	1.50
Max Chl Dpth (ft)	65.66	Hydr. Depth (ft)	18.07	61.84	12.26
Conv. Total (cfs)	26995760.0	Conv. (cfs)	235120.0	26443320.0	317323.7
Length Wtd. (ft)	316.40	Wetted Per. (ft)	98.27	638.74	170.43
Min Ch El (ft)	25.20	Shear (lb/sq ft)	0.10	0.35	0.07
Alpha	1.13	Stream Power (lb/ft s)	0.13	2.31	0.10
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	41.71	1557.31	53.82
C & E Loss (ft)	0.00	Cum SA (acres)	2.82	25.34	3.98

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	95.09	Element			
Vel Head (ft)	0.80	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	94.28	Reach Len. (ft)	316.30	316.40	316.80
Crit W.S. (ft)		Flow Area (sq ft)	2004.83	40442.36	2639.12
E.G. Slope (ft/ft)	0.000103	Area (sq ft)	2004.83	40442.36	2639.12
Q Total (cfs)	302000.00	Flow (cfs)	3049.82	294295.30	4654.92
Top Width (ft)	903.52	Top Width (ft)	100.91	619.66	182.95
Vel Total (ft/s)	6.70	Avg. Vel. (ft/s)	1.52	7.28	1.76
Max Chl Dpth (ft)	69.08	Hydr. Depth (ft)	19.87	65.27	14.43
Conv. Total (cfs)	29685940.0	Conv. (cfs)	299790.5	28928580.0	457568.7
Length Wtd. (ft)	316.40	Wetted Per. (ft)	107.23	638.74	187.28
Min Ch El (ft)	25.20	Shear (lb/sq ft)	0.12	0.41	0.09
Alpha	1.15	Stream Power (lb/ft s)	0.18	2.98	0.16
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	51.91	1643.74	68.22
C & E Loss (ft)	0.00	Cum SA (acres)	3.17	25.34	4.48

CROSS SECTION

RIVER: Willamette R
REACH: Butteville RS: 42.93

INPUT
Description: Upstream Face of Dock
Station Elevation Data num= 73

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	104.14	4.34	103.73	22.37	102	23.41	102	29.9	101.36
30.63	101.32	45.05	100	53.06	99.14	62.22	98	63.11	98
63.66	97.63	66.99	96	71.06	94	75.13	92	79.2	90
83.27	88	87.34	86	87.82	85.77	90.85	84	94.29	82
97.6	80	101.05	78	104.51	76	107.98	74	111.44	72
114.9	70	114.94	69.98	121.01	66	124.06	64	127.33	62.35
127.81	62	128.85	61.47	131.25	60	170	26.52	294.3	25.3
414.3	25.1	525.1	25.1	680	26.15	703.68	43.38	729.2	46.47
735.26	47.34	745.49	51.32	750.05	53.89	760.64	57.56	763.5	59.8
763.63	60	776.59	70.01	777.55	68.41	785.38	69.7	786.02	70.57
796.82	71.4	806.08	74.49	810.33	75.46	819.71	76.78	828.27	78.93
834.82	79.7	840.199	81.11	847.62	82.71	859.14	84.92	864.18	85.61
880.6	89.7	885.18	90.96	898.11	94	911.16	96	923.22	98
937.25	100	945.28	102	948.35	102.11	970.48	102.44	971.36	102.39
978.01	102	998.15	102	999.16	102				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	131.25	.033	763.63	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
131.25	763.63	1404	1426	1448	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	83.34	Element			
Vel Head (ft)	0.44	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	82.91	Reach Len. (ft)	1404.00	1426.00	1448.00
Crit W.S. (ft)		Flow Area (sq ft)	439.17	33992.04	767.75
E.G. Slope (ft/ft)	0.000072	Area (sq ft)	439.17	33992.04	767.75
Q Total (cfs)	182000.00	Flow (cfs)	361.89	180838.00	800.15
Top Width (ft)	755.90	Top Width (ft)	38.52	632.38	85.01
Vel Total (ft/s)	5.17	Avg. Vel. (ft/s)	0.82	5.32	1.04
Max Chl Dpth (ft)	57.81	Hydr. Depth (ft)	11.40	53.75	9.03
Conv. Total (cfs)	21462150.0	Conv. (cfs)	42675.1	21325120.0	94356.5
Length Wtd. (ft)	1426.03	Wetted Per. (ft)	44.84	653.62	91.29
Min Ch El (ft)	25.10	Shear (lb/sq ft)	0.04	0.23	0.04
Alpha	1.05	Stream Power (lb/ft s)	0.04	1.24	0.04
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	17.25	1111.91	20.50
C & E Loss (ft)	0.00	Cum SA (acres)	1.63	20.79	2.09

CROSS SECTION OUTPUT Profile #50 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	91.50	Element			
Vel Head (ft)	0.66	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	90.84	Reach Len. (ft)	1404.00	1426.00	1448.00
Crit W.S. (ft)		Flow Area (sq ft)	802.80	39007.99	1597.43
E.G. Slope (ft/ft)	0.000092	Area (sq ft)	802.80	39007.99	1597.43
Q Total (cfs)	260000.00	Flow (cfs)	898.88	256660.70	2440.39
Top Width (ft)	807.24	Top Width (ft)	53.75	632.38	121.10
Vel Total (ft/s)	6.28	Avg. Vel. (ft/s)	1.12	6.58	1.53
Max Chl Dpth (ft)	65.74	Hydr. Depth (ft)	14.93	61.68	13.19
Conv. Total (cfs)	27172700.0	Conv. (cfs)	93942.1	26823710.0	255045.8
Length Wtd. (ft)	1426.06	Wetted Per. (ft)	62.03	653.62	128.28
Min Ch El (ft)	25.10	Shear (lb/sq ft)	0.07	0.34	0.07
Alpha	1.08	Stream Power (lb/ft s)	0.08	2.24	0.11
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	32.72	1276.47	40.59
C & E Loss (ft)	0.00	Cum SA (acres)	2.29	20.79	2.94

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	95.05	Element			

Vel Head (ft)	0.80	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	94.26	Reach Len. (ft)	1404.00	1426.00	1448.00
Crit W.S. (ft)		Flow Area (sq ft)	998.49	41170.18	2036.18
E.G. Slope (ft/ft)	0.000103	Area (sq ft)	998.49	41170.18	2036.18
Q Total (cfs)	302000.00	Flow (cfs)	1264.90	297147.70	3587.41
Top Width (ft)	829.24	Top Width (ft)	60.71	632.38	136.15
Vel Total (ft/s)	6.83	Avg. Vel. (ft/s)	1.27	7.22	1.76
Max Chl Dpth (ft)	69.16	Hydr. Depth (ft)	16.45	65.10	14.96
Conv. Total (cfs)	29826480.0	Conv. (cfs)	124925.5	29347250.0	354303.6
Length Wtd. (ft)	1426.08	Wetted Per. (ft)	69.78	653.62	143.72
Min Ch El (ft)	25.10	Shear (lb/sq ft)	0.09	0.40	0.09
Alpha	1.10	Stream Power (lb/ft s)	0.12	2.91	0.16
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	41.01	1347.35	51.22
C & E Loss (ft)	0.00	Cum SA (acres)	2.58	20.79	3.32

CROSS SECTION

RIVER: Willamette R
REACH: Butteville RS: 42.66

INPUT
Description: C section
Station Elevation Data num= 56

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	98.73	8.85	96	15.33	94	21.82	92	34.8	88
38.86	86.75	41.29	86	47.78	84	54.26	82	60.75	80
60.82	80	68.07	78.3	68.78	78	69.39	77.84	69.51	77.81
69.82	77.7	71.07	77.32	75.18	76	75.8	75.79	81.09	74
86.94	72	92.2	70	101.89	66	102.82	65.62	106.55	64
111.01	62.2	111.05	62	111.25	61.88	113.92	60.22	114.31	60
187	29.5	294.3	25.5	414.3	25.1	525.1	25.1	629.2	26
705	29.06	751.96	60	759.12	64	766.29	68	773.45	72
780.61	76	787.78	80	794.94	84	802.1	88	810.09	92
813.49	93.66	814.93	94	823.48	96	832.03	98	849.12	102
854.84	103.34	859.57	103.4	875.15	103.03	877.1	103.05	881.32	102.91
894.09	102.64								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	114.31	.033	751.96	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
114.31	751.96	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	83.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	82.80	Reach Len. (ft)			
Crit W.S. (ft)	41.60	Flow Area (sq ft)	631.26	33939.06	465.47
E.G. Slope (ft/ft)	0.000072	Area (sq ft)	631.26	33939.06	465.47
Q Total (cfs)	182000.00	Flow (cfs)	508.62	180947.10	544.29
Top Width (ft)	741.12	Top Width (ft)	62.64	637.65	40.83
Vel Total (ft/s)	5.19	Avg. Vel. (ft/s)	0.81	5.33	1.17
Max Chl Dpth (ft)	57.70	Hydr. Depth (ft)	10.08	53.23	11.40
Conv. Total (cfs)	21402630.0	Conv. (cfs)	59812.1	21278810.0	64006.9
Length Wtd. (ft)		Wetted Per. (ft)	66.94	653.21	46.77
Min Ch El (ft)	25.10	Shear (lb/sq ft)	0.04	0.23	0.04
Alpha	1.05	Stream Power (lb/ft s)	0.03	1.25	0.05
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #50 yr

E.G. Elev (ft)	91.37	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.67	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	90.70	Reach Len. (ft)			
Crit W.S. (ft)	45.71	Flow Area (sq ft)	1227.34	38976.49	844.66

E.G. Slope (ft/ft)	0.000092	Area (sq ft)	1227.34	38976.49	844.66
Q Total (cfs)	260000.00	Flow (cfs)	1389.15	257257.50	1353.35
Top Width (ft)	781.45	Top Width (ft)	88.27	637.65	55.53
Vel Total (ft/s)	6.33	Avg. Vel. (ft/s)	1.13	6.60	1.60
Max Chl Dpth (ft)	65.60	Hydr. Depth (ft)	13.90	61.13	15.21
Conv. Total (cfs)	27084710.0	Conv. (cfs)	144710.2	26799020.0	140981.4
Length Wtd. (ft)		Wetted Per. (ft)	93.76	653.21	63.46
Min Ch El (ft)	25.10	Shear (lb/sq ft)	0.08	0.34	0.08
Alpha	1.07	Stream Power (lb/ft s)	0.09	2.27	0.12
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	94.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.81	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	94.10	Reach Len. (ft)			
Crit W.S. (ft)	47.66	Flow Area (sq ft)	1546.22	41144.50	1045.34
E.G. Slope (ft/ft)	0.000103	Area (sq ft)	1546.22	41144.50	1045.34
Q Total (cfs)	302000.00	Flow (cfs)	2000.54	298121.30	1878.14
Top Width (ft)	800.35	Top Width (ft)	99.30	637.65	63.40
Vel Total (ft/s)	6.91	Avg. Vel. (ft/s)	1.29	7.25	1.80
Max Chl Dpth (ft)	69.00	Hydr. Depth (ft)	15.57	64.53	16.49
Conv. Total (cfs)	29710820.0	Conv. (cfs)	196813.8	29329240.0	184771.5
Length Wtd. (ft)		Wetted Per. (ft)	105.30	653.21	72.07
Min Ch El (ft)	25.10	Shear (lb/sq ft)	0.09	0.41	0.09
Alpha	1.09	Stream Power (lb/ft s)	0.12	2.94	0.17
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Willamette R

Reach	River Sta.	n1	n2	n3
Butteville	43.30	.07	.033	.05
Butteville	42.99	.07	.033	.05
Butteville	42.93	.07	.033	.05
Butteville	42.66	.07	.033	.05

SUMMARY OF REACH LENGTHS

River: Willamette R

Reach	River Sta.	Left	Channel	Right
Butteville	43.30	1583.2	1636.8	1756.1
Butteville	42.99	316.3	316.4	316.8
Butteville	42.93	1404	1426	1448
Butteville	42.66			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Willamette R

Reach	River Sta.	Contr.	Expan.
Butteville	43.30	.1	.3
Butteville	42.99	.1	.3
Butteville	42.93	.1	.3

Butteville 42.66 .1 .3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)									
				(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Butteville	43.30	10 yr	182000.00	7.50	83.00		83.54	0.000105	5.88	31737.90	750.50	0.15
Butteville	43.30	50 yr	260000.00	7.50	90.96		91.74	0.000125	7.13	37855.68	790.72	0.17
Butteville	43.30	100 yr	302000.00	7.50	94.39		95.32	0.000137	7.78	40716.27	894.73	0.18
Butteville	42.99	10 yr	182000.00	25.20	82.92		83.37	0.000073	5.39	35324.48	791.21	0.13
Butteville	42.99	50 yr	260000.00	25.20	90.86		91.53	0.000093	6.65	42034.18	878.75	0.15
Butteville	42.99	100 yr	302000.00	25.20	94.28		95.09	0.000103	7.28	45086.30	903.52	0.16
Butteville	42.93	10 yr	182000.00	25.10	82.91		83.34	0.000072	5.32	35198.96	755.90	0.13
Butteville	42.93	50 yr	260000.00	25.10	90.84		91.50	0.000092	6.58	41408.23	807.24	0.15
Butteville	42.93	100 yr	302000.00	25.10	94.26		95.05	0.000103	7.22	44204.84	829.24	0.16
Butteville	42.66	10 yr	182000.00	25.10	82.80	41.60	83.24	0.000072	5.33	35035.79	741.12	0.13
Butteville	42.66	50 yr	260000.00	25.10	90.70	45.71	91.37	0.000092	6.60	41048.49	781.45	0.15
Butteville	42.66	100 yr	302000.00	25.10	94.10	47.66	94.91	0.000103	7.25	43736.06	800.35	0.16

WITH DOCK

HEC-RAS HEC-RAS 6.1.0 September 2021
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X     X
X     X  X        X           X   X     X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X                    X  X      X    X        X
X     X  X        X    X      X   X     X    X    X        X
X     X  XXXXXX    XXXX       X    X    X    X    XXXXX
```

PROJECT DATA
Project Title: Butteville D Lan UpSt
Project File : ButtevilleDockLan.prj
Run Date and Time: 12/13/2021 9:32:07 AM

Project in English units

Project Description:
Upstream Face of Dock

PLAN DATA

Plan Title: Plan 14
Plan File : p:\2020 Small Jobs\Butterville Landing\HEC-RAS\ButtevilleDockLan.p14

Geometry Title: floodplain+dock site adjusted bottom L
Geometry File : p:\2020 Small Jobs\Butterville Landing\HEC-RAS\ButtevilleDockLan.g08

Flow Title : Precondition adj bottom to FEMA
Flow File : p:\2020 Small Jobs\Butterville Landing\HEC-RAS\ButtevilleDockLan.f02

Plan Description:
case with 12" piler upstream

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Precondition adj bottom to FEMA
Flow File : p:\2020 Small Jobs\Butterville Landing\HEC-RAS\ButtevilleDockLan.f02

Flow Data (cfs)

River	Reach	RS	10 yr	50 yr	100 yr
Willamette R	Butteville	43.30	182000	260000	302000

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Willamette R	Butteville	10 yr		Known WS = 82.8
Willamette R	Butteville	50 yr		Known WS = 90.7
Willamette R	Butteville	100 yr		Known WS = 94.1

GEOMETRY DATA

Geometry Title: floodplain+dock site adjusted bottom L
Geometry File : p:\2020 Small Jobs\Butterville Landing\HEC-RAS\ButtevilleDockLan.g08

CROSS SECTION

RIVER: Willamette R
REACH: Butteville RS: 43.30

INPUT
Description: E Section
Station Elevation Data num= 77

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	105.46	9.09	104.27	11.03	104	11.35	104	30.85	102.58
36.08	102.2	38.88	102	43.2	100.36	43.77	100.09	44.12	100
49.1	98.05	49.23	98	54.27	96.03	54.34	96	59.37	94.03
59.46	94	64.46	92.04	64.57	92	69.54	90.06	69.68	90
74.58	88.08	74.8	88	79.51	86.16	79.91	86	80.99	85.52
83.57	84	85.37	83.02	86.34	82.57	87.58	82	88.1	81.76
88.42	81.62	90.19	80.91	92	80.2	92.35	80	94.2	78.93
95.61	78	96.6	77.35	98.65	76	100.88	74.54	101.7	74
104.61	72.09	104.74	72	105.52	71.49	107.64	70.29	108.15	70
110.31	68.78	111.68	68	112.68	67.43	113.99	66.69	114.67	66.37
115.43	66	116.26	65.6	116.59	65.45	118.69	64	119.32	63.57
121.6	62	124.24	60.22	124.56	60	192.4	52	294.3	42
425.5	7.5	500	7.5	600	41.87	702	52	742.8	54
787.47	60	788.86	60.5	793.05	62	794.08	62.37	807.6	70
828.4	80	853.4	90	881.9	96	900	96.6	917.8	96
944.5	94	1018.2	92						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	124.56	.033	787.47	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
124.56	787.47	1583.2	1636.8	1756.1	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	83.55	Element			
Vel Head (ft)	0.54	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	83.01	Reach Len. (ft)	1583.20	1636.80	1756.10
Crit W.S. (ft)		Flow Area (sq ft)	429.29	30670.11	549.72
E.G. Slope (ft/ft)	0.000106	Area (sq ft)	429.29	30670.11	549.72
Q Total (cfs)	182000.00	Flow (cfs)	418.06	180790.40	791.55
Top Width (ft)	750.54	Top Width (ft)	39.17	662.91	48.46

Vel Total (ft/s)	5.75	Avg. Vel. (ft/s)	0.97	5.89	1.44
Max Chl Dpth (ft)	75.51	Hydr. Depth (ft)	10.96	46.27	11.34
Conv. Total (cfs)	17702060.0	Conv. (cfs)	40662.6	17584410.0	76989.8
Length Wtd. (ft)	1637.17	Wetted Per. (ft)	45.54	675.02	53.73
Min Ch El (ft)	7.50	Shear (lb/sq ft)	0.06	0.30	0.07
Alpha	1.04	Stream Power (lb/ft s)	0.06	1.77	0.10
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	48.78	2559.88	56.04
C & E Loss (ft)	0.03	Cum SA (acres)	4.08	49.41	5.72

CROSS SECTION OUTPUT Profile #50 yr

E.G. Elev (ft)	91.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.79	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	90.97	Reach Len. (ft)	1583.20	1636.80	1756.10
Crit W.S. (ft)		Flow Area (sq ft)	807.96	35947.40	1015.76
E.G. Slope (ft/ft)	0.000126	Area (sq ft)	807.96	35947.40	1015.76
Q Total (cfs)	260000.00	Flow (cfs)	1028.09	257085.20	1886.71
Top Width (ft)	790.81	Top Width (ft)	57.36	662.91	70.55
Vel Total (ft/s)	6.88	Avg. Vel. (ft/s)	1.27	7.15	1.86
Max Chl Dpth (ft)	83.47	Hydr. Depth (ft)	14.09	54.23	14.40
Conv. Total (cfs)	23170980.0	Conv. (cfs)	91622.4	22911210.0	168141.8
Length Wtd. (ft)	1637.60	Wetted Per. (ft)	65.44	675.02	77.27
Min Ch El (ft)	7.50	Shear (lb/sq ft)	0.10	0.42	0.10
Alpha	1.07	Stream Power (lb/ft s)	0.12	2.99	0.19
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	86.85	2952.07	115.51
C & E Loss (ft)	0.03	Cum SA (acres)	5.55	49.41	8.76

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	95.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.93	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	94.41	Reach Len. (ft)	1583.20	1636.80	1756.10
Crit W.S. (ft)		Flow Area (sq ft)	1020.11	38224.77	1390.97
E.G. Slope (ft/ft)	0.000138	Area (sq ft)	1020.11	38224.77	1390.97
Q Total (cfs)	302000.00	Flow (cfs)	1449.94	297939.20	2610.93
Top Width (ft)	895.06	Top Width (ft)	66.15	662.91	166.00
Vel Total (ft/s)	7.43	Avg. Vel. (ft/s)	1.42	7.79	1.88
Max Chl Dpth (ft)	86.91	Hydr. Depth (ft)	15.42	57.66	8.38
Conv. Total (cfs)	25727040.0	Conv. (cfs)	123518.3	25381100.0	222421.7
Length Wtd. (ft)	1637.84	Wetted Per. (ft)	74.88	675.02	175.53
Min Ch El (ft)	7.50	Shear (lb/sq ft)	0.12	0.49	0.07
Alpha	1.09	Stream Power (lb/ft s)	0.17	3.80	0.13
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	106.95	3121.19	149.58
C & E Loss (ft)	0.04	Cum SA (acres)	6.20	49.41	11.52

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Willamette R
REACH: Butteville RS: 42.99

INPUT
Description: D Section
Station Elevation Data num= 100

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	110.01	6.48	110.01	6.55	110	6.58	110	6.6	110
6.78	109.98	19.56	108.6	23.01	108.26	25.45	108	25.95	107.93
32.85	106	36.92	104.83	39.83	104	43.5	102.95	49.84	101.14
53.81	100	56.1	99.34	60.79	98	62.25	97.58	67.78	96
68.27	95.86	70.96	95.09	73.59	94	74.03	93.82	78.42	92
79.49	91.56	83.25	90	84.79	89.36	88.08	88	89.98	87.21
92.91	86	95.11	85.09	97.74	84	100.18	82.99	102.57	82
105.2	80.91	107.41	80	110.2	78.84	112.24	78	115.18	76.78

117.07	76	120.13	74.73	121.9	74	125.07	72.69	126.73	72
128.7	71.18	131.56	70	134.01	68.99	136.39	68	139.61	66.67
141.22	66	145.92	64.05	146.05	64	146.33	63.88	146.55	63.85
147.74	63.74	148.83	63.53	156.85	62.4	159.67	62	169	60.68
173.81	60	211	28.52	294.3	26	414.3	25.2	525.1	25.2
629.2	26	729	28.06	793.47	60	794.55	60.48	799.77	62
799.91	62.04	807.67	64	820.15	67.16	823.47	68	830.91	70
841.29	74	851.68	78	856.88	80	857.06	80.07	857.98	80.22
866.14	81.52	874.77	82	888.63	82.76	911.1	84	930.42	85.06
935.17	86	936.33	86.22	945.36	88	949.91	88.89	955.54	90
965.32	91.92	965.68	92	965.84	92.03	975.09	94	978.32	94.69
984.79	96	989.73	97.11	993.89	98	1002.24	98.9	1002.6	98.98

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	173.81	.033	793.47	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
173.81	793.47	316.3	316.4	316.8	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	83.38	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.45	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	82.93	Reach Len. (ft)	316.30	316.40	316.80
Crit W.S. (ft)		Flow Area (sq ft)	1014.84	33407.21	910.20
E.G. Slope (ft/ft)	0.000073	Area (sq ft)	1014.84	33407.21	910.20
Q Total (cfs)	182000.00	Flow (cfs)	1023.41	179978.50	998.03
Top Width (ft)	791.42	Top Width (ft)	73.49	619.66	98.27
Vel Total (ft/s)	5.15	Avg. Vel. (ft/s)	1.01	5.39	1.10
Max Chl Dpth (ft)	57.73	Hydr. Depth (ft)	13.81	53.91	9.26
Conv. Total (cfs)	21274080.0	Conv. (cfs)	119627.1	21037790.0	116660.1
Length Wtd. (ft)	316.40	Wetted Per. (ft)	77.55	638.74	101.62
Min Ch El (ft)	25.20	Shear (lb/sq ft)	0.06	0.24	0.04
Alpha	1.08	Stream Power (lb/ft s)	0.06	1.29	0.04
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	22.54	1356.00	26.61
C & E Loss (ft)	0.00	Cum SA (acres)	2.04	25.32	2.76

CROSS SECTION OUTPUT Profile #50 yr

E.G. Elev (ft)	91.55	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.67	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	90.88	Reach Len. (ft)	316.30	316.40	316.80
Crit W.S. (ft)		Flow Area (sq ft)	1674.87	38329.87	2042.91
E.G. Slope (ft/ft)	0.000093	Area (sq ft)	1674.87	38329.87	2042.91
Q Total (cfs)	260000.00	Flow (cfs)	2266.08	254673.70	3060.27
Top Width (ft)	878.86	Top Width (ft)	92.67	619.66	166.53
Vel Total (ft/s)	6.18	Avg. Vel. (ft/s)	1.35	6.64	1.50
Max Chl Dpth (ft)	65.68	Hydr. Depth (ft)	18.07	61.86	12.27
Conv. Total (cfs)	27007520.0	Conv. (cfs)	235388.7	26454240.0	317886.2
Length Wtd. (ft)	316.40	Wetted Per. (ft)	98.31	638.74	170.51
Min Ch El (ft)	25.20	Shear (lb/sq ft)	0.10	0.35	0.07
Alpha	1.13	Stream Power (lb/ft s)	0.13	2.31	0.10
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	41.73	1556.56	53.86
C & E Loss (ft)	0.00	Cum SA (acres)	2.82	25.32	3.98

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	95.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.80	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	94.30	Reach Len. (ft)	316.30	316.40	316.80
Crit W.S. (ft)		Flow Area (sq ft)	2006.72	40453.96	2642.55
E.G. Slope (ft/ft)	0.000103	Area (sq ft)	2006.72	40453.96	2642.55
Q Total (cfs)	302000.00	Flow (cfs)	3052.14	294286.70	4661.15
Top Width (ft)	903.65	Top Width (ft)	100.95	619.66	183.04
Vel Total (ft/s)	6.70	Avg. Vel. (ft/s)	1.52	7.27	1.76
Max Chl Dpth (ft)	69.10	Hydr. Depth (ft)	19.88	65.28	14.44

Conv. Total (cfs)	29701010.0	Conv. (cfs)	300170.5	28942420.0	458413.2
Length Wtd. (ft)	316.41	Wetted Per. (ft)	107.28	638.74	187.37
Min Ch El (ft)	25.20	Shear (lb/sq ft)	0.12	0.41	0.09
Alpha	1.15	Stream Power (lb/ft s)	0.18	2.97	0.16
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	51.94	1642.98	68.28
C & E Loss (ft)	0.00	Cum SA (acres)	3.17	25.32	4.48

CROSS SECTION

RIVER: Willamette R
REACH: Butteville RS: 42.93

INPUT
Description: Upstream Face of Dock
Station Elevation Data num= 73

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	104.14	4.34	103.73	22.37	102	23.41	102	29.9	101.36
30.63	101.32	45.05	100	53.06	99.14	62.22	98	63.11	98
63.66	97.63	66.99	96	71.06	94	75.13	92	79.2	90
83.27	88	87.34	86	87.82	85.77	90.85	84	94.29	82
97.6	80	101.05	78	104.51	76	107.98	74	111.44	72
114.9	70	114.94	69.98	121.01	66	124.06	64	127.33	62.35
127.81	62	128.85	61.47	131.25	60	170	26.52	294.3	25.3
414.3	25.1	525.1	25.1	680	26.15	703.68	43.38	729.2	46.47
735.26	47.34	745.49	51.32	750.05	53.89	760.64	57.56	763.5	59.8
763.63	60	776.59	70.01	777.55	68.41	785.38	69.7	786.02	70.57
796.82	71.4	806.08	74.49	810.33	75.46	819.71	76.78	828.27	78.93
834.82	79.7	840.199	81.11	847.62	82.71	859.14	84.92	864.18	85.61
880.6	89.7	885.18	90.96	898.11	94	911.16	96	923.22	98
937.25	100	945.28	102	948.35	102.11	970.48	102.44	971.36	102.39
978.01	102	998.15	102	999.16	102				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	131.25	.033	763.63	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
131.25	763.63	1404	1426	1448	.1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
703.5	704.5	100

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	83.35	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	82.91	Reach Len. (ft)	1404.00	1426.00	1448.00
Crit W.S. (ft)		Flow Area (sq ft)	439.47	33957.44	768.41
E.G. Slope (ft/ft)	0.000084	Area (sq ft)	439.47	33957.44	768.41
Q Total (cfs)	182000.00	Flow (cfs)	390.96	180744.40	864.63
Top Width (ft)	754.96	Top Width (ft)	38.53	631.38	85.05
Vel Total (ft/s)	5.18	Avg. Vel. (ft/s)	0.89	5.32	1.13
Max Chl Dpth (ft)	57.81	Hydr. Depth (ft)	11.41	53.78	9.04
Conv. Total (cfs)	19883900.0	Conv. (cfs)	42713.7	19746720.0	94463.2
Length Wtd. (ft)	1426.03	Wetted Per. (ft)	44.85	731.67	91.33
Min Ch El (ft)	25.10	Shear (lb/sq ft)	0.05	0.24	0.04
Alpha	1.05	Stream Power (lb/ft s)	0.05	1.29	0.05
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	17.26	1111.35	20.51
C & E Loss (ft)	0.00	Cum SA (acres)	1.63	20.77	2.09

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50 yr

E.G. Elev (ft)	91.51	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.66	Wt. n-Val.	0.070	0.033	0.050

W.S. Elev (ft)	90.85	Reach Len. (ft)	1404.00	1426.00	1448.00
Crit W.S. (ft)		Flow Area (sq ft)	803.51	38968.83	1599.01
E.G. Slope (ft/ft)	0.000110	Area (sq ft)	803.51	38968.83	1599.01
Q Total (cfs)	260000.00	Flow (cfs)	984.59	256341.60	2673.78
Top Width (ft)	806.31	Top Width (ft)	53.78	631.38	121.15
Vel Total (ft/s)	6.28	Avg. Vel. (ft/s)	1.23	6.58	1.67
Max Chl Dpth (ft)	65.75	Hydr. Depth (ft)	14.94	61.72	13.20
Conv. Total (cfs)	24835460.0	Conv. (cfs)	94049.4	24486010.0	255402.5
Length Wtd. (ft)	1426.07	Wetted Per. (ft)	62.06	747.55	128.33
Min Ch El (ft)	25.10	Shear (lb/sq ft)	0.09	0.36	0.09
Alpha	1.08	Stream Power (lb/ft s)	0.11	2.35	0.14
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	32.73	1275.83	40.62
C & E Loss (ft)	0.00	Cum SA (acres)	2.29	20.77	2.94

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	95.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.80	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	94.27	Reach Len. (ft)	1404.00	1426.00	1448.00
Crit W.S. (ft)		Flow Area (sq ft)	999.50	41129.89	2038.45
E.G. Slope (ft/ft)	0.000124	Area (sq ft)	999.50	41129.89	2038.45
Q Total (cfs)	302000.00	Flow (cfs)	1393.59	296654.00	3952.45
Top Width (ft)	828.39	Top Width (ft)	60.75	631.38	136.26
Vel Total (ft/s)	6.84	Avg. Vel. (ft/s)	1.39	7.21	1.94
Max Chl Dpth (ft)	69.17	Hydr. Depth (ft)	16.45	65.14	14.96
Conv. Total (cfs)	27108320.0	Conv. (cfs)	125091.9	26628440.0	354782.2
Length Wtd. (ft)	1426.09	Wetted Per. (ft)	69.82	754.39	143.83
Min Ch El (ft)	25.10	Shear (lb/sq ft)	0.11	0.42	0.11
Alpha	1.09	Stream Power (lb/ft s)	0.15	3.05	0.21
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	41.03	1346.69	51.25
C & E Loss (ft)	0.00	Cum SA (acres)	2.58	20.77	3.32

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Willamette R
REACH: Butteville RS: 42.66

INPUT
Description: C section
Station Elevation Data num= 56

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	98.73	8.85	96	15.33	94	21.82	92	34.8	88
38.86	86.75	41.29	86	47.78	84	54.26	82	60.75	80
60.82	80	68.07	78.3	68.78	78	69.39	77.84	69.51	77.81
69.82	77.7	71.07	77.32	75.18	76	75.8	75.79	81.09	74
86.94	72	92.2	70	101.89	66	102.82	65.62	106.55	64
111.01	62.2	111.05	62	111.25	61.88	113.92	60.22	114.31	60
187	29.5	294.3	25.5	414.3	25.1	525.1	25.1	629.2	26
705	29.06	751.96	60	759.12	64	766.29	68	773.45	72
780.61	76	787.78	80	794.94	84	802.1	88	810.09	92
813.49	93.66	814.93	94	823.48	96	832.03	98	849.12	102
854.84	103.34	859.57	103.4	875.15	103.03	877.1	103.05	881.32	102.91
894.09	102.64								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	114.31	.033	751.96	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
114.31	751.96	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	83.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	82.80	Reach Len. (ft)			
Crit W.S. (ft)	41.60	Flow Area (sq ft)	631.26	33939.06	465.47
E.G. Slope (ft/ft)	0.000072	Area (sq ft)	631.26	33939.06	465.47
Q Total (cfs)	182000.00	Flow (cfs)	508.62	180947.10	544.29
Top Width (ft)	741.12	Top Width (ft)	62.64	637.65	40.83
Vel Total (ft/s)	5.19	Avg. Vel. (ft/s)	0.81	5.33	1.17
Max Chl Dpth (ft)	57.70	Hydr. Depth (ft)	10.08	53.23	11.40
Conv. Total (cfs)	21402630.0	Conv. (cfs)	59812.1	21278810.0	64006.9
Length Wtd. (ft)		Wetted Per. (ft)	66.94	653.21	46.77
Min Ch El (ft)	25.10	Shear (lb/sq ft)	0.04	0.23	0.04
Alpha	1.05	Stream Power (lb/ft s)	0.03	1.25	0.05
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #50 yr

E.G. Elev (ft)	91.37	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.67	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	90.70	Reach Len. (ft)			
Crit W.S. (ft)	45.71	Flow Area (sq ft)	1227.34	38976.49	844.66
E.G. Slope (ft/ft)	0.000092	Area (sq ft)	1227.34	38976.49	844.66
Q Total (cfs)	260000.00	Flow (cfs)	1389.15	257257.50	1353.35
Top Width (ft)	781.45	Top Width (ft)	88.27	637.65	55.53
Vel Total (ft/s)	6.33	Avg. Vel. (ft/s)	1.13	6.60	1.60
Max Chl Dpth (ft)	65.60	Hydr. Depth (ft)	13.90	61.13	15.21
Conv. Total (cfs)	27084710.0	Conv. (cfs)	144710.2	26799020.0	140981.4
Length Wtd. (ft)		Wetted Per. (ft)	93.76	653.21	63.46
Min Ch El (ft)	25.10	Shear (lb/sq ft)	0.08	0.34	0.08
Alpha	1.07	Stream Power (lb/ft s)	0.09	2.27	0.12
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	94.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.81	Wt. n-Val.	0.070	0.033	0.050
W.S. Elev (ft)	94.10	Reach Len. (ft)			
Crit W.S. (ft)	47.66	Flow Area (sq ft)	1546.22	41144.50	1045.34
E.G. Slope (ft/ft)	0.000103	Area (sq ft)	1546.22	41144.50	1045.34
Q Total (cfs)	302000.00	Flow (cfs)	2000.54	298121.30	1878.14
Top Width (ft)	800.35	Top Width (ft)	99.30	637.65	63.40
Vel Total (ft/s)	6.91	Avg. Vel. (ft/s)	1.29	7.25	1.80
Max Chl Dpth (ft)	69.00	Hydr. Depth (ft)	15.57	64.53	16.49
Conv. Total (cfs)	29710820.0	Conv. (cfs)	196813.8	29329240.0	184771.5
Length Wtd. (ft)		Wetted Per. (ft)	105.30	653.21	72.07
Min Ch El (ft)	25.10	Shear (lb/sq ft)	0.09	0.41	0.09
Alpha	1.09	Stream Power (lb/ft s)	0.12	2.94	0.17
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Willamette R

Reach	River Sta.	n1	n2	n3
Butteville	43.30	.07	.033	.05
Butteville	42.99	.07	.033	.05
Butteville	42.93	.07	.033	.05
Butteville	42.66	.07	.033	.05

SUMMARY OF REACH LENGTHS

River: Willamette R

Reach	River Sta.	Left	Channel	Right
Butteville	43.30	1583.2	1636.8	1756.1
Butteville	42.99	316.3	316.4	316.8
Butteville	42.93	1404	1426	1448
Butteville	42.66			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Willamette R

Reach	River Sta.	Contr.	Expan.
Butteville	43.30	.1	.3
Butteville	42.99	.1	.3
Butteville	42.93	.1	.3
Butteville	42.66	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	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
Butteville	43.30	10 yr	182000.00	7.50	83.01		83.55	0.000106	5.89	31649.12	750.54	0.15
Butteville	43.30	50 yr	260000.00	7.50	90.97		91.76	0.000126	7.15	37771.12	790.81	0.17
Butteville	43.30	100 yr	302000.00	7.50	94.41		95.34	0.000138	7.79	40635.84	895.06	0.18
Butteville	42.99	10 yr	182000.00	25.20	82.93		83.38	0.000073	5.39	35332.25	791.42	0.13
Butteville	42.99	50 yr	260000.00	25.20	90.88		91.55	0.000093	6.64	42047.64	878.86	0.15
Butteville	42.99	100 yr	302000.00	25.20	94.30		95.11	0.000103	7.27	45103.23	903.65	0.16
Butteville	42.93	10 yr	182000.00	25.10	82.91		83.35	0.000084	5.32	35165.31	754.96	0.13
Butteville	42.93	50 yr	260000.00	25.10	90.85		91.51	0.000110	6.58	41371.35	806.31	0.15
Butteville	42.93	100 yr	302000.00	25.10	94.27		95.07	0.000124	7.21	44167.85	828.39	0.16
Butteville	42.66	10 yr	182000.00	25.10	82.80	41.60	83.24	0.000072	5.33	35035.79	741.12	0.13
Butteville	42.66	50 yr	260000.00	25.10	90.70	45.71	91.37	0.000092	6.60	41048.49	781.45	0.15
Butteville	42.66	100 yr	302000.00	25.10	94.10	47.66	94.91	0.000103	7.25	43736.06	800.35	0.16

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Conveyance Compensation Cut

Assumptions:

- Only the Stations Along the Cross-section of the River that the planned dock impacts is all that we are looking at when Calculating the Conveyance loss.
- The worst case Cross Section on the dock is the one with the pier furthest out along the dock after the angle point. The Concrete is not in this cross section.
- the Manning's n coefficient is a roughness number that is used in water flow Calculations and is different for each surface the water flows over. The manning's n coefficient for the Channel we defined as station 8+25.2' toward the center. The Manning's n for the right bank starts at station 8+25.2' and continues away from the Center line of the Willamette River.
- The Right of way lines are not parrallel to the Cross-Section of the River at the dock and the Right of way lines are not perpendicular to the Centerline of the River.

REGISTERED PROFESSIONAL ENGINEER
18,924
Corbey Boatwright
OREGON
July 26, 1985
CORBEY BOATWRIGHT
EXPIRES: 12/31/2021

Job No.	By	Subject	Date	Sheet No.
	SDW	Butteville Landing Conveyance & compesation Cut	11/17/21	1/7

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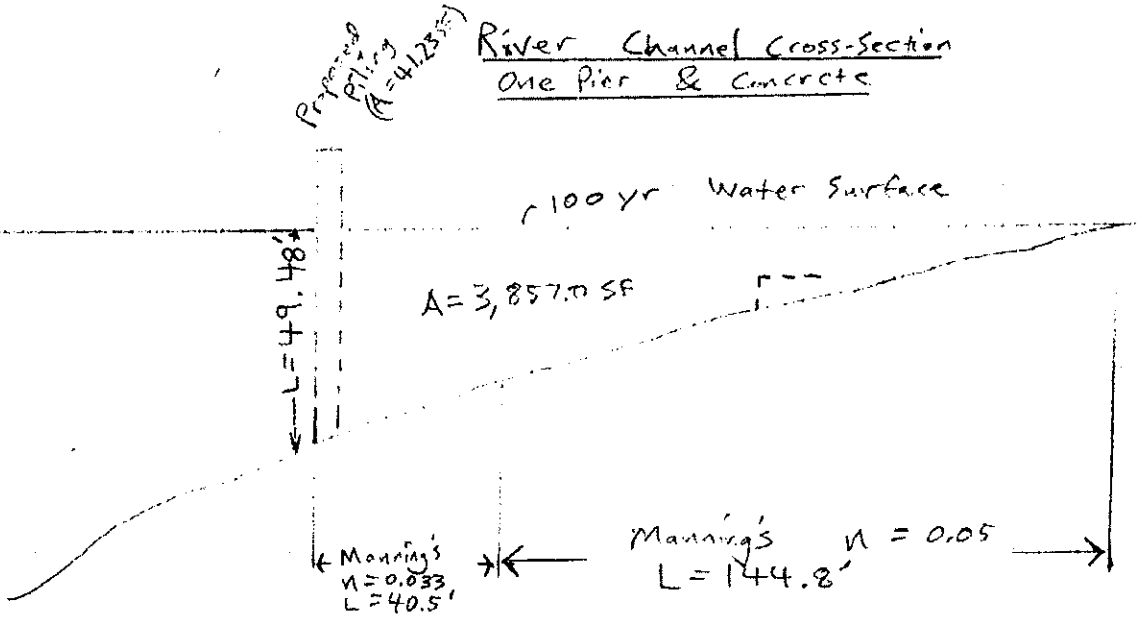

Pre Construction

$$K_{pre} = \frac{1.49}{n} \cdot A \cdot R^{2/3}$$

A = 5689.2 SF

WP = 226.8 ft

R = 25.08

$R^{2/3}$ = 8.57

$$n = \frac{(0.033)\cdot(82.0) + (0.05)\cdot(144.8')}{226.8}$$

n = 0.0439

$$K_{pre} = \frac{1.49}{0.0439} \cdot (5689.2) \cdot 8.57$$

K_{pre} = 1,656,421 cfs

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12,924
Corbey Boatwright
OREGON
July 26, 1985
CORBEY BOATWRIGHT

EXPIRES: 12/31/2021

Job No.	By	Subject	Date	Sheet No.
	SDW	Butteville Landing Conveyance & Compensation Cut	12/1/21	2/7

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UpStream

Post Construction

$K_{post} = \frac{1.49}{n} A R^{2/3}$

$A = 5689.2 - 42.3$

$A = 5646.9$ SF

$n = \frac{(0.0439)(226.8) + (0.012)(99.0)}{325.8}$

$n = 0.0342$

$WP = 226.8 + 99$

$WP = 325.8$ ft

$R = 17.33$

$R^{2/3} = 6.70$

$K_{post} = \frac{1.49}{0.0342} \cdot (5646.9) \cdot (6.70)$

$K_{post} = 1,648,333$ cfs

$K_{pre} = 1656421$ cfs

Conveyance Needed = 8,088 cfs

$K_{post} < K_{pre}$

∴ Compensation Needed to keep 100-yr flood flow from decreasing.

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12,984
Corbey Boatwright
OREGON
July 26, 1985
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EXPIRES: 12/31/2021

Job No.	By	Subject	Date	Sheet No.
	SDW	Butteville Landing Conveyance & Compensation Cut	12/1/21	3/7

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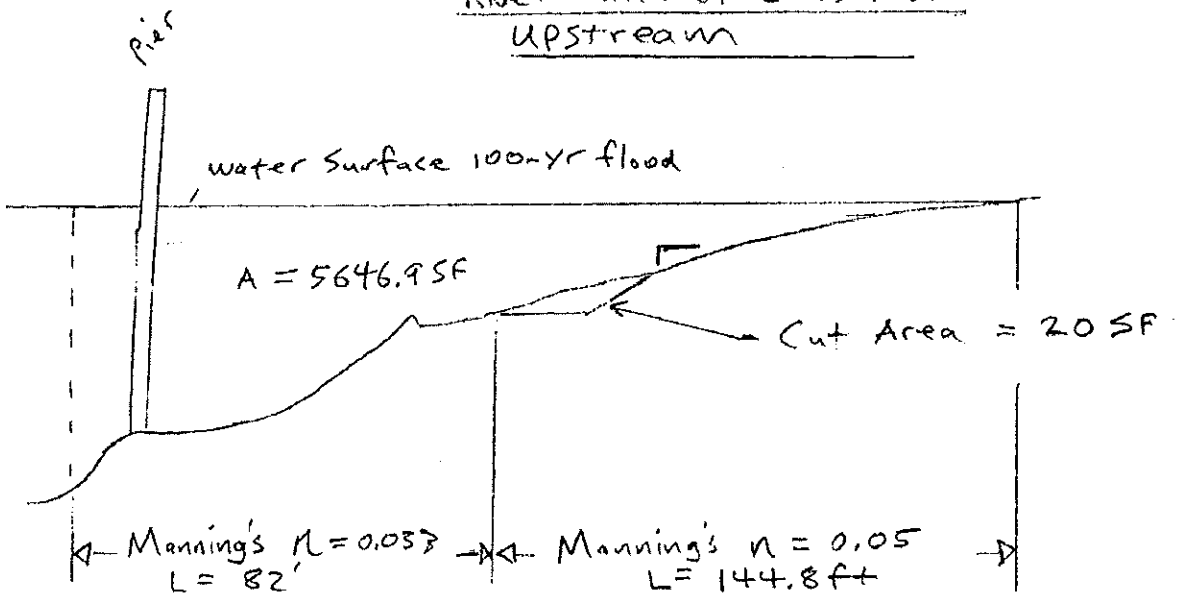
River Channel Cross-Section
Upstream



Designed Conveyance Compensation

$K_{prop} = \frac{1.49}{n} \cdot A \cdot R^{2/3}$

$A = 5646.9\ SF + \boxed{20\ SF}$

$A = 5,666.9\ SF$

$WP = 82 + 144.8 + 99 + 0.4$

$WP = 326.2$

$R = 17.37$

$R^{2/3} = 6.71$

$n = \frac{(0.0439)\cdot(227.2)}{326.2} + \frac{(0.05)\cdot(0.04)}{\text{overbank}} + \frac{(0.012)(99)}{\text{Pier}}$ (ground)

$n = 0.0342$

$K_{prop} = \frac{1.49}{0.0342} \cdot 5666.9 \cdot 6.71$

$\boxed{K_{prop} = 1,656,640\ cfs}$

$K_{prop} \geq K_{pre}$ ok!

$1,656,640 \geq 1,656,421\ cfs$

REGISTERED PROFESSIONAL ENGINEER
12.984
Corbey Boatwright
OREGON
July 26, 1985
CORBEY BOATWRIGHT

EXPIRES: 12/31/2021

Job No.	By	Subject	Date	Sheet No.
	SDW	Butteville Landing Conveyance & Compensation Cut	12/1/21	4/7

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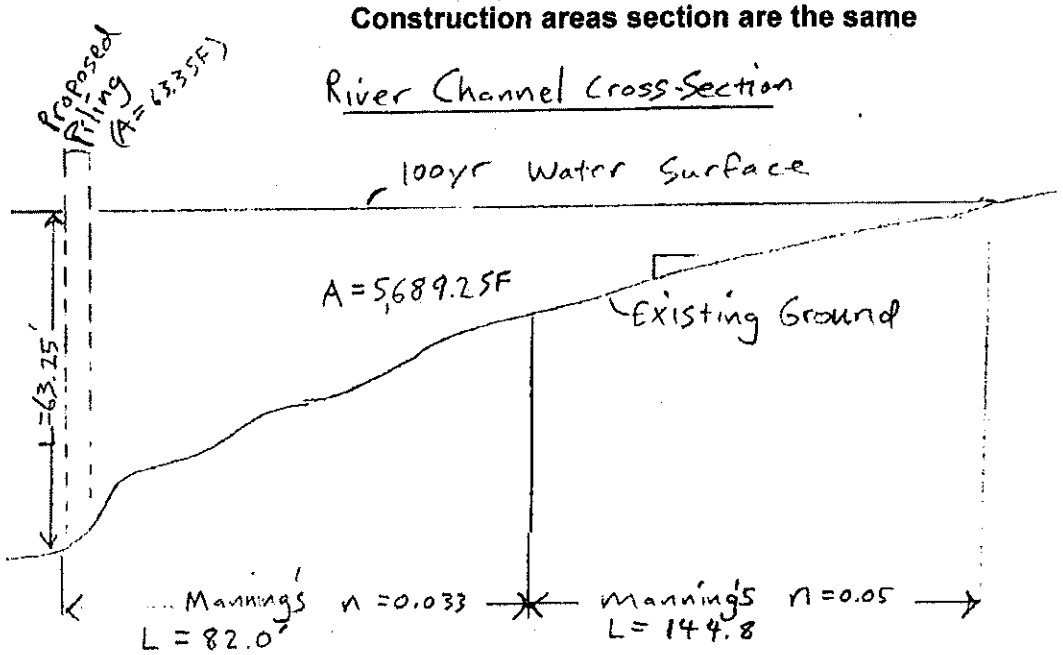
Assumed upstream & downstream Pre Construction areas section are the same



Pre Construction

$K_{pre} = \frac{1.49}{n} A R^{2/3}$

$n = \frac{(82')\cdot 0.033 + (144.8)\cdot 0.05}{226.8'}$

A, Area: Area of floodway up to and including piling. Area derived from cross-Section in Civil 3D By use of hatch area.

$A = 63.3 + 5625.9$

$A = 5,689.25F$

$n = 0.0439$

$R = A/WP$

$R = 25.08$

$R^{2/3} = 8.57$

Wetted Perimeter, WP: Wetted perimeter is the length in the cross-section that the water flows over causing resistance. Derived in Civil 3D By PLine

$WP = 226.8$ ft

$K_{pre} = \frac{1.49}{0.0439} \cdot (5689.2) \cdot 8.57$

$K_{pre} = 1,656,421$ cfs

REGISTERED PROFESSIONAL ENGINEER
18,984
Corbey Boatwright
OREGON
July 26, 1985
CORBEY BOATWRIGHT

EXPIRES 12/31/2021

Job No.	By	Subject	Date	Sheet No.
	SDW	Butteville Landing Conveyance & Compensation Cut	11/17/21	5/7

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(503) 363-9225

DownStream

Post Construction

$K_{post} = \frac{1.49}{n} A R^{2/3}$

existing ground — steel piers

$n_{avg} = \frac{225.8'(0.044) + 125.0'(0.012)}{350.8'}$

$n_{avg} = 0.0326$

Area = $A = 5625.9$ SF

$WP = 350.8$ ft $= 225.8 + 125.0$

$R = 16.04$

$R^{2/3} = 6.36$

$K_{post} = \frac{1.49}{0.0326}(5625.9) \cdot 6.36$

$K_{post} = 1{,}635{,}376.6$ cfs

$K_{pre} = 1{,}656{,}421$ cfs

Conveyance Needed $= 21{,}044$ cfs

$K_{post} < K_{pre}$

∴ So, compensation is needed to keep 100-yr flood flow from decreasing.

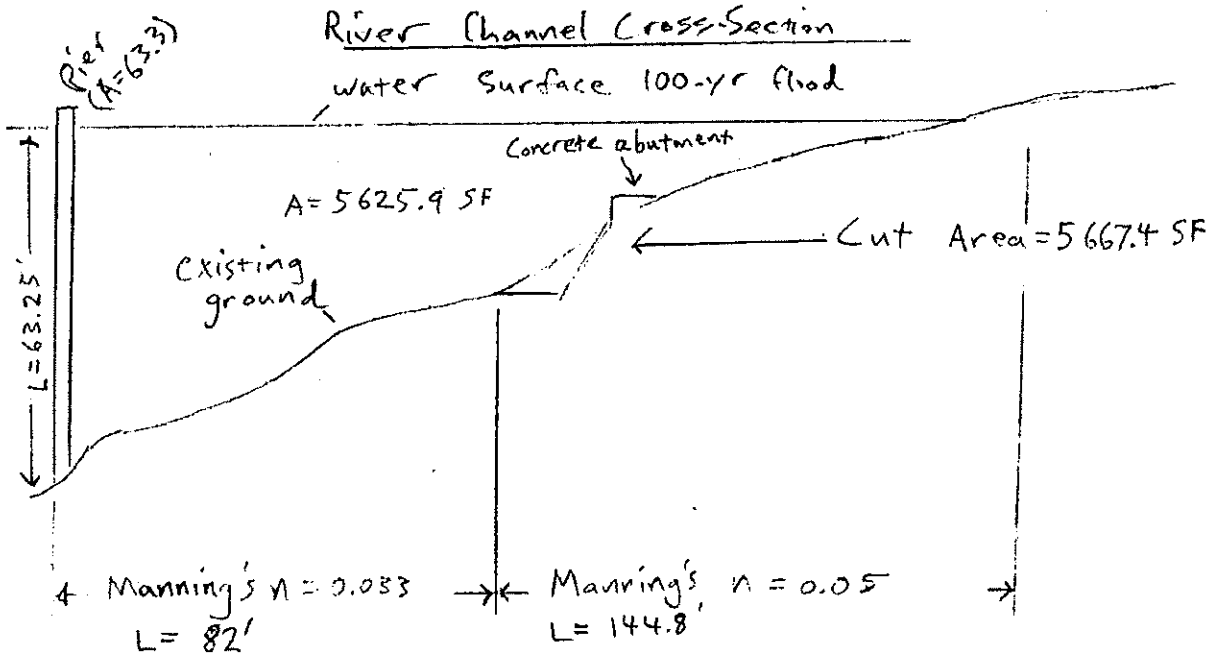
REGISTERED PROFESSIONAL ENGINEER
18,984
Corbey Boatwright
OREGON
July 28, 1985
CORBEY BOATWRIGHT

EXPIRES 12/31/2021

Job No.	By	Subject	Date	Sheet No.
	SDW	Butteville Landing Conveyance & Compensation Cut	11/17/21	6/7

Boatwright Engineering Inc.
2613 12th ST SE, SALEM, OREGON 97302
civil engineers • land surveyors
(503) 363-9225

River Channel Cross-Section



Designed Conveyance Compensation

$K_{prop} = \frac{1.49}{n} \cdot A \cdot R^{2/3}$

$A = 5625.9 + \boxed{41.5\,SF} = 5667.4\ SF$

$WP = 82' - 1' + 144.8' + 125 + 0.4 = 351.2$

$R = 16.14$

$R^{2/3} = 6.386$

Channel overbank — Steel Pilings

$n_{avg} = \frac{(0.033)\,81' + (0.05)\,144.8' + (0.05)(0.4) + (0.012)\cdot 125}{351.2'}$

$n_{avg} = 0.03255$

$K_{prop} = \frac{1.49}{0.03255} \cdot 5667.4 \cdot 6.386$

$\boxed{K_{prop} = 1{,}656{,}716.0\,CFS}$

$K_{prop} \geq K_{pre}$ OK!

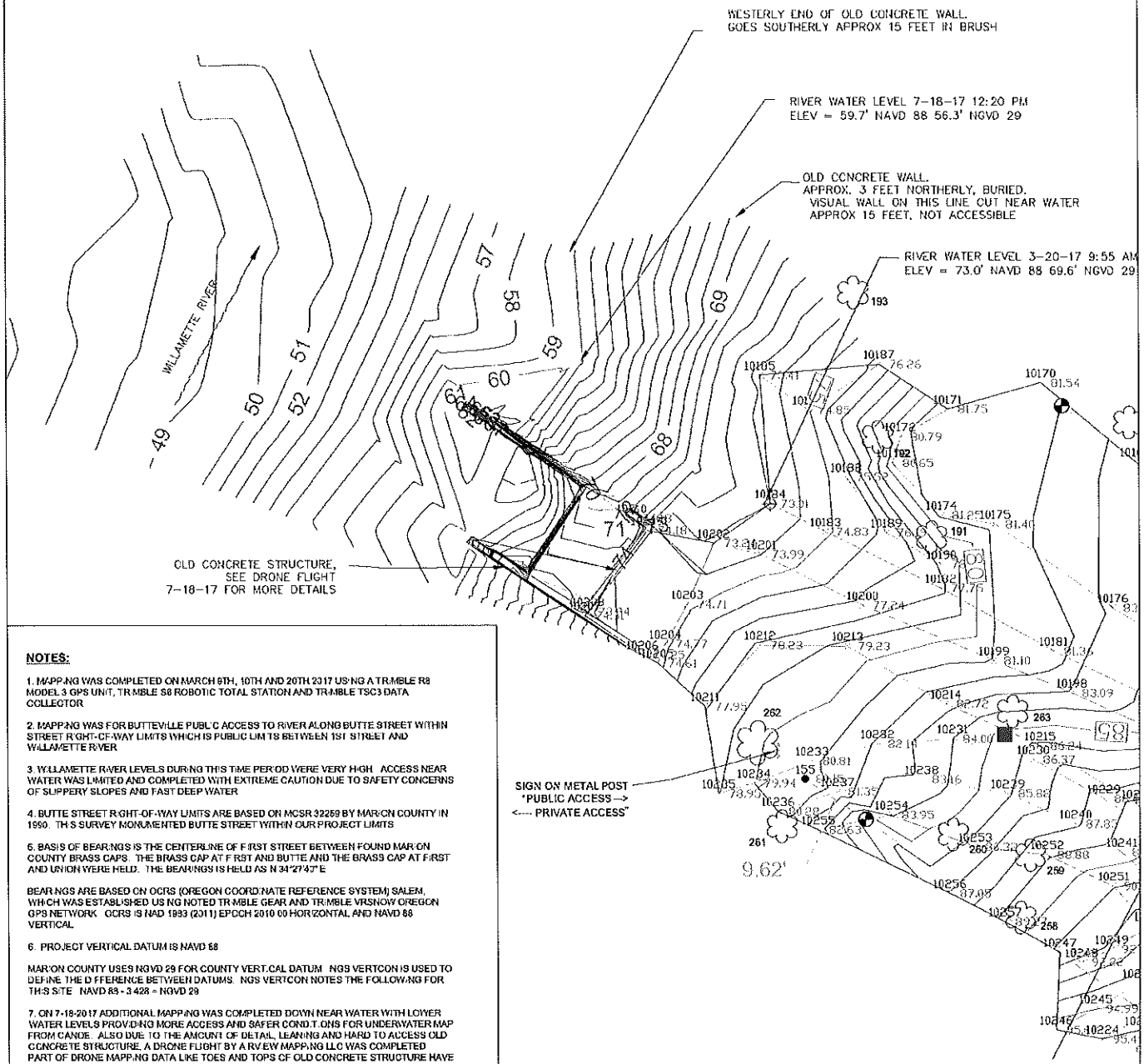
$1{,}656{,}716. \geq 1{,}656{,}421.\ cfs$

REGISTERED PROFESSIONAL ENGINEER
18,984
Corbey Boatwright
OREGON
July 26, 1985
CORBEY BOATWRIGHT

EXPIRES 12/31/2021

Job No.	By	Subject	Date	Sheet No.
	SDW	Butteville Landing Conveyance & Compensation Cut	11/17/21	7/7

Survey Provided By:
AG Geospatail NW, LLC
Molalla, OR
2017



NOTES:

1. MAPPING WAS COMPLETED ON MARCH 6TH, 10TH AND 20TH 2017 USING A TRIMBLE R8 MODEL 3 GPS UNIT, TRIMBLE S8 ROBOTIC TOTAL STATION AND TRIMBLE TSC3 DATA COLLECTOR

2. MAPPING WAS FOR BUTTEVILLE PUBLIC ACCESS TO RIVER ALONG BUTTE STREET WITHIN STREET RIGHT-OF-WAY LIMITS WHICH IS PUBLIC LIMITS BETWEEN 1ST STREET AND WILLAMETTE RIVER

3. WILLAMETTE RIVER LEVELS DURING THIS TIME PERIOD WERE VERY HIGH. ACCESS NEAR WATER WAS LIMITED AND COMPLETED WITH EXTREME CAUTION DUE TO SAFETY CONCERNS OF SLIPPERY SLOPES AND FAST DEEP WATER

4. BUTTE STREET RIGHT-OF-WAY LIMITS ARE BASED ON MCSR 32259 BY MARION COUNTY IN 1990. THIS SURVEY MONUMENTED BUTTE STREET WITHIN OUR PROJECT LIMITS

5. BASIS OF BEARINGS IS THE CENTERLINE OF FIRST STREET BETWEEN FOUND MARION COUNTY BRASS CAPS. THE BRASS CAP AT FIRST AND BUTTE AND THE BRASS CAP AT FIRST AND UNION WERE HELD. THE BEARINGS IS HELD AS N 34°27'47" E

BEARINGS ARE BASED ON OCRS (OREGON COORDINATE REFERENCE SYSTEM) SALEM, WHICH WAS ESTABLISHED US NG NOTED TRIMBLE GEAR AND TRIMBLE VRSNOW OREGON GPS NETWORK. OCRS IS NAD 1983 (2011) EPOCH 2010.00 HORIZONTAL AND NAVD 88 VERTICAL.

6. PROJECT VERTICAL DATUM IS NAVD 88

MARION COUNTY USES NGVD 29 FOR COUNTY VERTICAL DATUM. NGS VERTCON IS USED TO DEFINE THE DIFFERENCE BETWEEN DATUMS. NGS VERTCON NOTES THE FOLLOWING FOR THIS SITE. NAVD 88 - 3.428 = NGVD 29

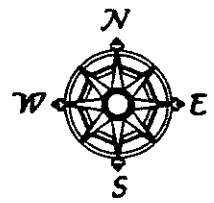
7. ON 7-18-2017 ADDITIONAL MAPPING WAS COMPLETED DOWN NEAR WATER WITH LOWER WATER LEVELS PROVIDING MORE ACCESS AND SAFER CONDITIONS FOR UNDERWATER MAP FROM CANOE. ALSO DUE TO THE AMOUNT OF DETAIL LEANING AND HARD TO ACCESS OLD CONCRETE STRUCTURE. A DRONE FLIGHT BY AIRVIEW MAPPING LLC WAS COMPLETED PART OF DRONE MAPPING DATA LIKE TOES AND TOPS OF OLD CONCRETE STRUCTURE HAVE BEEN ADDED TO MAPPING SHOWN. ADDITIONAL DATA IS AVAILABLE FROM AIRVIEW MAPPING LLC.

8. UNDERWATER MAPPING WAS COMPLETED FROM A TWO PERSON CANOE USING RTK GPS FOR LOCATION AND A HAND HELD DEPTH FINDER FOR WATER DEPTH. THE DATA WAS COMBINED IN THE OFFICE FOR BOTTOM OF RIVER ELEVATIONS.

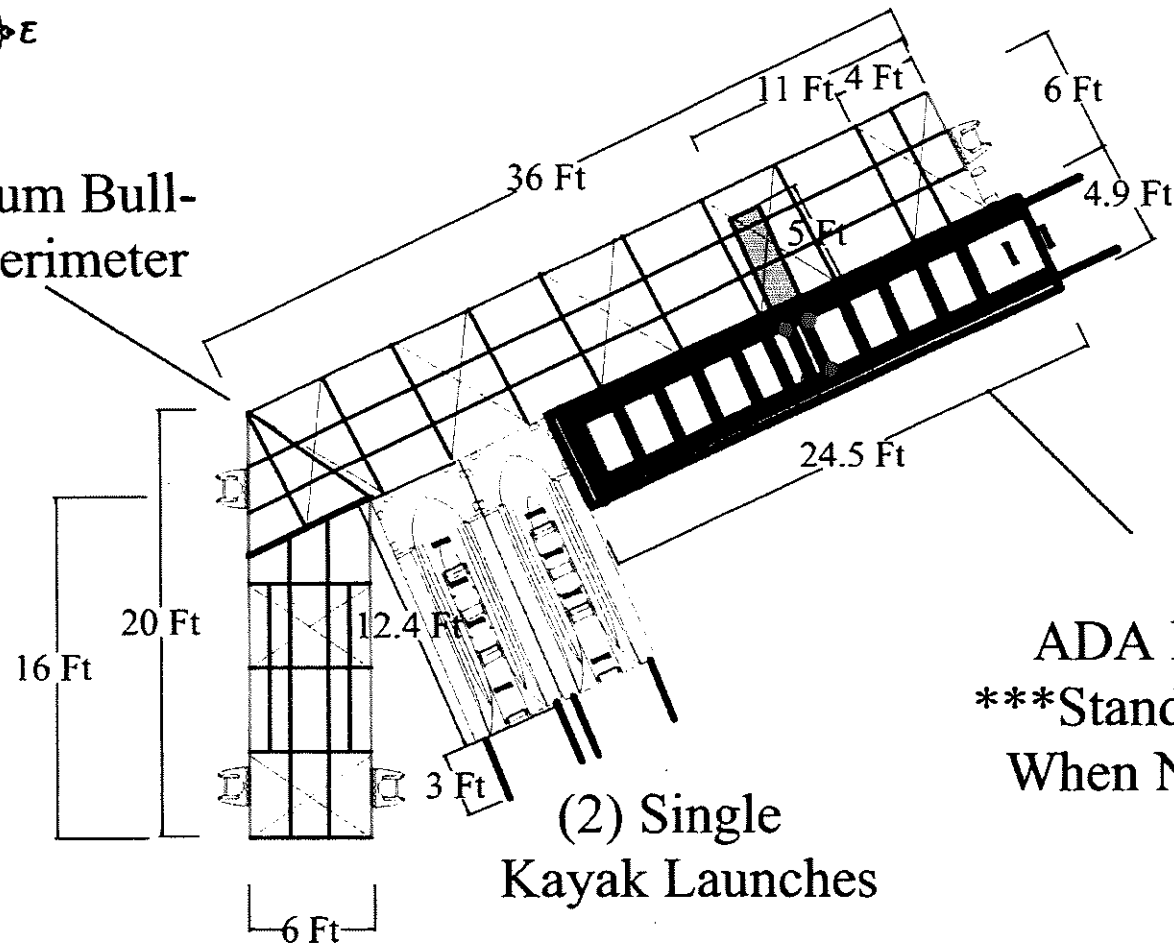
9. DRONE MAPPING WAS COMPLETED BY AIRVIEW MAPPING LLC USING A DJI PHANTOM 3 PRO DRONE AND AGISOFT MAPPING SOFTWARE. DXF FILES WERE PROVIDED TO SURVEYING FOR THE TOES AND TOPS OF OLD CONCRETE STRUCTURE FOR LOCATION AND ELEVATIONS.

Flowing solutions
Flowing Solutions
3305 SW 87th Avenue
Portland, OR 97225
Phone (503) 297-6311

SHEET TITLE: EXISTING SURVEY		DATE: 12/4/17 Rev 5/8/19
PROJECT: BUTTEVILLE LANDING RIVER ACCESS BUTTE ST NE BUTTEVILLE, OREGON		SHEET NO. 4
RIVER/MILE: WILLAMATTE RIVER, MILE 42.9	DATUM: NAVD88	



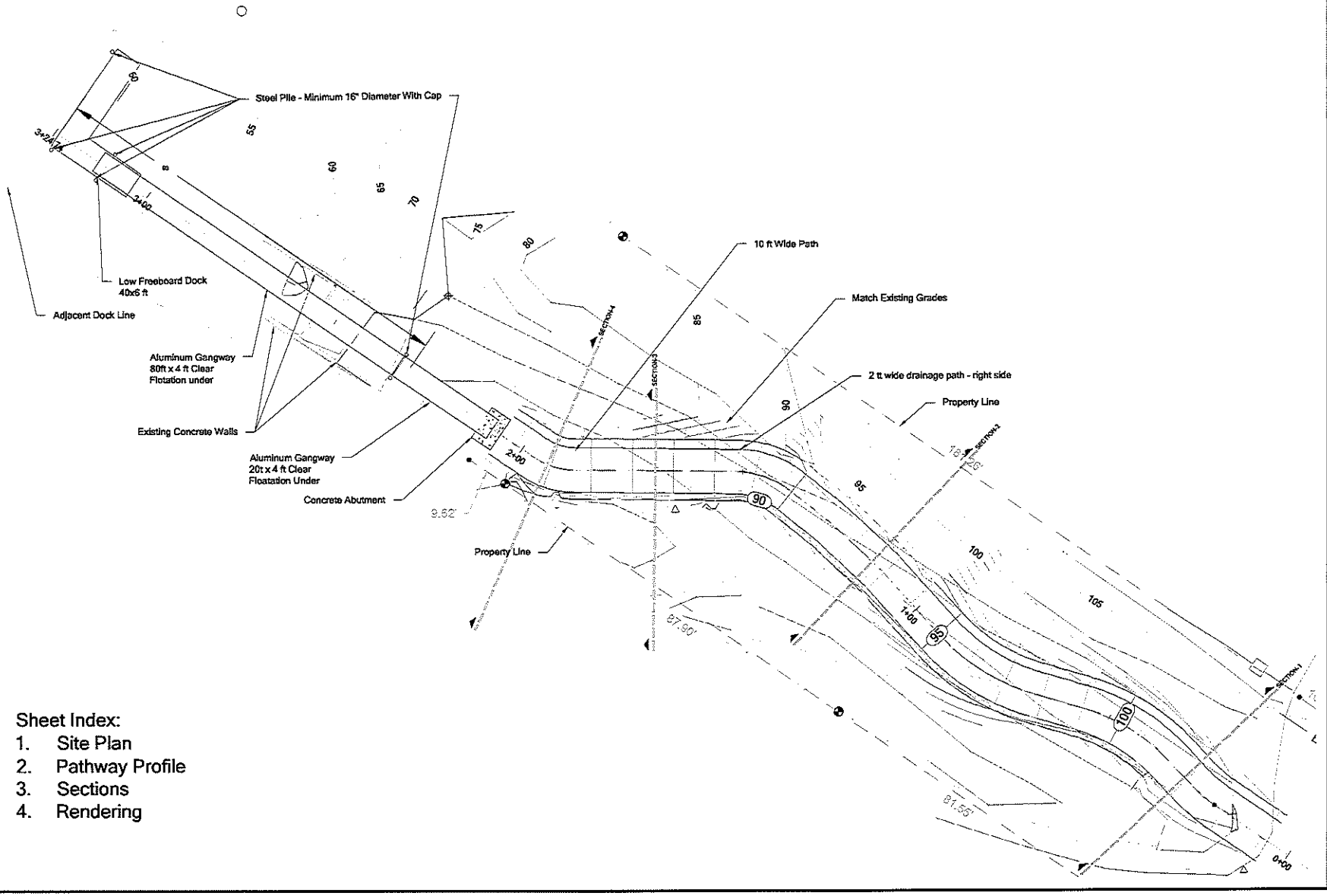
= Aluminum Bull-Rail On Perimeter



(2) Single Kayak Launches

ADA Ez Launch &
Standard Dual Launch When Not In Use

9085 Arney Lane NE	Butteville Landing River Access	Phone: 503-982-5521
Woodburn, OR 97071	Oregon Marine Construction	info@oregonmarine.net



Sheet Index:

1. Site Plan
2. Pathway Profile
3. Sections
4. Rendering

SITE PLAN

Flowing solutions

Butteville Landing Access

Friends of Historic Butteville
c/o Ben Williams
Aurora Oregon 97002

DATE: 10/13/17

PROJECT: BUTTEVILLE

SHEET 2 OF 4

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