Sampling and Analysis Plan for the Characterization of Sediments in the Camas Slough, Washington

In-water and Overwater Structures Removal Project

Camas Mill, Camas, Washington

March 10, 2023

Original Submittal: January 21, 2021

Revised (Version 1) Submittal: March 10, 2023

Prepared for

Georgia-Pacific

Georgia-Pacific Consumer Operations LLC
Camas, Washington

Prepared by

TETRA TECH

19803 North Creek Parkway
Bothell, WA 98011

Table of Contents

1.0 INTRODUCTION 1

1.1 Project Team 1

1.2 Safety 2

2.0 PROJECT OVERVIEW 3

2.1 Site History and Conceptual Site Model 3

2.2 Riverbank Final Surface Conditions 4

2.3 Columbia River Hydrograph 4

2.4 Invasive Species 4

3.0 STUDY OBJECTIVES 5

3.1 Purpose and Objectives 5

3.2 Sampling Areas 5

3.3 Dredged Materials Management Units 6

4.0 CAMAS SLOUGH SAMPLING 6

4.1 Dredging Plans 6

4.2 Camas Slough Sampling Design 6

5.0 TARGET ANALYTES 8

5.1 Conventional Analytes 8

5.2 Sediment Compositing 9

5.3 Chemicals of Concern 9

5.4 Additional Analytes 11

5.5 Laboratory Limits of Detection 12

6.0 FIELD SAMPLING PROCEDURES 12

6.1 Schedule 12

6.2 Sample Equipment 12

6.3 Horizontal Control: Datum and GPS Positioning 12

6.4 Vertical Control: Datum, Water Depth Determination, and Tidal Levels 12

6.5 Sample Acceptance Criteria 13

6.6 Sampling Logs and other Documentation 14
6.7 Sample Identification 15
6.8 Chain of Custody Procedures and Transport 15

7.0 SAMPLE PROCESSING 16

7.1 Decontamination Procedure 17
7.2 Sample Compositing 17
7.3 Subsamples for Total Sulfides 18
7.4 Archived Sediments 18

8.0 LABORATORY ANALYSIS 18

8.1 Quality Assurance and Quality Control 18
8.2 Laboratory Sample Handling 19
8.3 Laboratory Reporting 21
8.4 Bioassay Laboratory Protocols 21

9.0 DATA REPORTING REQUIREMENTS 23

10.0 ANTIDEGRADATION EVALUATION 24

11.0 REFERENCES 24

List of Tables

Table 1. Record of Coordination 2
Table 2. Tasks and Responsible Party 2
Table 3. Summary Information for Dredged Materials Management Units (DMMU) 6
Table 4. Camas Slough Sample and Analysis Quantities 7
Table 5. Camas Slough DMMUs—Unit Elevations and Thickness 7
Table 6. Conventional Analytes 8
Table 7. Sediment Compositing Scheme 9
Table 8. Chemicals of Concern and Freshwater Sediment Management Standards 9
Table 9. Perfluorooctanoic Acid Compounds 11
Table 10. Information Required to Be Collected for Core Sampling Logs 15
Table 11. Analyte, Estimated Sample Volume Needed, and Holding Conditions 20
Table 12. Recommended Measurement Performance Criteria 21
Table 13. Bioassay Species, Tests and Endpoints 22
Table 14. Bioassay Test Performance Standards and Screening Levels 22

List of Figures

Figure 1 Site Plan Showing Locations of Structures to Be Removed
Figure 2 Preliminary Grading Plan, Dock Warehouse Piers Plan View
Figure 3 Dock Warehouse Piers Dredge Prism, Cross Sections
Figure 4 Preliminary Grading Plan, PECO Dock

List of Appendices

Appendix A Health and Safety Plan (To be submitted with Final Plan to DMMO)
Appendix B Aquatic Invasive Species Decontamination Procedures
Appendix C Sampling Area Coordinates
Appendix D Field Forms

Acronyms and Abbreviations

°C	degree Celsius
COC	contaminant of concern
CRD	Columbia River Datum
GPS	global positioning system
DMMO	Dredged Material Management Office
DMMP	Washington Dredged Materials Management Program
DMMU	Dredged Materials Management Unit
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
GP	Georgia-Pacific Consumer Operations LLC
GPS	global positioning system
NAD 83	North American Datum of 1983
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OHWM	ordinary high water mark
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PQL	practical quantitation limit
PSET	Portland Sediment Evaluation Team
PS-SRM	Puget Sound standard reference material
QA	quality assurance
QC	quality control
SCO	Sediment Cleanup Objective
SSAP	Sediment Sampling and Analysis Plan (this report)
TEQ	toxicity equivalence quotient
TOC	total organic carbon
TVS	total volatile solids
USACE	U.S. Army Corps of Engineers
UTM	Universal Transverse Mercator

Signature Page

Draft Sampling and Analysis Plan for the Characterization of Sediments in the Camas Slough and Columbia River

In-water and Overwater Structures Removal Project
Camas Mill, Camas, Washington

The following subcontractors have read and agree to follow the proposed procedures documented in this Sampling and Analysis Plan. If there are any significant deviations from the procedures outlined, the Tetra Tech Project Manager and the DMMO Project Manager will be informed.

Name, Title	Date
Name, Title	Date
Name, Title	Date

1.0 INTRODUCTION

Georgia-Pacific Consumer Operations LLC (GP) plans to abate and demolish structures that are located in-water and/or overwater on the Columbia River and Camas Slough in the City of Camas and in unincorporated Clark County, Washington. Dredging will be required to enable barge access to remove piles in one location. Dredging will also occur where the Camas Slough riverbank is to be reshaped following the removal of overwater structures.

Note that because this project would remove older infrastructure, dredging will only be implemented to the extent needed to safely remove the features. Unlike most dredging projects, a specific deepening is not a requirement for most of the dredging. The exception is one location where dredging is planned to provide deepening for demolition barge access.

Figure 1 provides an overview of the locations of proposed activities (all figures are attached following this narrative). Dredged materials, if found suitable based on Washington Dredged Material Management Program (DMMP) criteria for in-water disposal, would be used as fill in areas of underwater structures that have been removed and/or for upland area fills. Excess dredged material, or dredged material found to be unsuitable for in-water disposal would be transferred to the Dredged Materials Management Areas on Lady Island (LI DMA) if acceptable as solid waste, or other approved upland facility.

This Sediment Sampling and Analysis Plan (SSAP) was prepared in accordance with the Dredged Materials Evaluation and Disposal Procedures User Manual (USACE December 2021), which provides guidance for evaluation of potential contaminant-related environmental impacts of dredging and aquatic disposal of dredged sediments and meets requirements of the DMMP.

A Tier 1 Report was developed and provided to the DMMP for review. The Tier 1 report summarizes available background information relative to the proposed quality of the sediment to be dredged. Coordination with the DMMP to date is summarized in **Table 1**, including coordination on review and revisions of the Tier 1 Report.

Once approved, any significant deviation from this approved SSAP will be coordinated with the DMMP.

1.1 Project Team

Mr. Matt Tiller, P.E., is the Director for Global Remediation & Environmental Services representing GP. He has overall project management responsibility and in this role is the primary point of contact for this effort for GP. Ms. Caleigh Belkoff, Environmental Manager at Camas Mill, is the local point of contact at the mill. GP is the sole organization responsible for maintaining, developing, removing, and demolishing the facilities at Camas Mill.

This SSAP was prepared for GP's use by Keir Craigie of Tetra Tech. Gary Braun (Tetra Tech) provided Senior Technical Review.

Table 2 provides information on roles and responsibilities for the activities under this SSAP. The full demolition and dredging project team is under development at the time of this writing. Following approval of this SSAP by the DMMP agencies, GP will formally establish a team for execution of the

plan. At this time, it is likely that Tetra Tech will be involved for administration of the sampling effort, and roles are tentatively identified in **Table 2**. Other contractors may be hired by GP, and GP would provide them a copy of this plan. A sampling and data quality assurance representative will be determined prior to generation of the data report. This entity will help perform quality assurance for the field sampling program and keep records of variances from the SSAP, if any.

Table 1. Record of Coordination

Action	Date	Note
Document Submitted to DMMP	August 10, 2020	Tier 1 only, no Sediment Sampling and Analysis Plan (SSAP) submitted
Comments Received from DMMP	September 2, 2020	Coordination meeting held between GP and DMMP
Document Revised	November 16, 2020	Substantive changes from August submission in response to DMMP comments were in Blue Text. An SSAP will be prepared as a separate document
Submitted to DMMP	December 2020	SSAP to be submitted as a separate document and references the Tier 1 Report for introduction and background information
Comments Received from DMMP on 11/16/2020 on Revised Tier 1	December 4, 2020	Comments received from DMMP on the Tier 1 Report and conceptual sampling plan
Submitted to DMMP	January 21, 2021	Submittal of Draft SSAP . Revised Tier 1 Report submitted as a separate document.
Comments Received from DMMP on 02/11/2021	February 11, 2021	Comments received from DMMP
This Document	March 10, 2023	Substantive changes for SSAP from January 2021 submission in response to DMMP comments and for changes in project scope.

Table 2. Tasks and Responsible Party

Tasks	GP	Tetra Tech
Project Management	Matt Tiller	Steve Negri
Environmental Management	Caleigh Belkoff	
SSAP Development		Keir Craigie; Gary Braun, reviewer
Health and Safety		Luke Maddox
Sediment Sampling/Field Quality Assurance		Corey Graves
Core Processing/Compositing/Subsampling		Luke Maddux
Chemical Analysis		To Be Determined
Conventional and Chemicals of Concern Analysis Quality Assurance		Lauren McHugh
Dioxin/Furan Analysis Quality Assurance		Lauren McHugh
Data Validation		Lauren McHugh
Data Analysis Summary and Reporting		Keir Craigie

1.2 Safety

Collection of sediment samples involves operations from a sampling vessel. Project-level and site-specific health and safety plans and job hazard assessments will be implemented throughout sampling. In addition, precautions are needed for work around chemicals that may pose safety concerns or toxicity. A safety plan is provided as **Appendix A (to be provided with final)**.

2.0 PROJECT OVERVIEW

The In-water/Overwater Structures Removal project includes removal of one building-like industrial structure, five docks/piers, and approximately 3,000 piles/dolphins. Structures to be removed are located both in-water and overwater. Access for construction equipment to conduct the structure removal project will require dredging to facilitate riverbank reshaping following removals.

Dredge volumes comprise approximately 10,500 cubic yards in the Camas Slough. No precise contingency has been used to calculate dredge volumes. Instead, the design of the dredge prisms has conservatively extended the layout of the dredge prisms beyond the limits of actual dredging anticipated to be required to allow access for construction equipment.

The project footprint is shown on **Figure 1** and includes:

- Areas along the Camas Slough, both along the north riverbank within the Camas Mill main site and south riverbank on Lady Island;
- Several other locations within the Camas Slough; and
- Dolphins extending approximately 3 miles downriver from the Camas Mill in the Camas Slough and the Columbia River.

Structures to be removed are shown in gold color on **Figure 1,** and design details and historical sediment sampling locations for work areas are shown on **Figures 2 through 4**. Work would occur following receipt of all permits and approvals during appropriate river conditions and regulatory open work windows. Several open work window periods are assumed to be needed.

Additional details regarding the removal project and demolition methods are presented in the *Revised Tier 1 Report* (Tetra Tech 2023a) and in the *In-water Overwater Structures Removal Project Description* (Tetra Tech 2023b).

2.1 Site History and Conceptual Site Model

Details of the site history were provided in the Tier 1 Report, and only essential information is briefly summarized here. According to the DMMP, the current risk ranking for sediment dredging projects in the Camas Slough is “Moderate.” Based on the Camas Slough management rank, the maximum sediment volume for each DMMU is 40,000 cubic yards.

As discussed in depth in the Tier 1 Report, there have been several recent sediment sampling events in the project area. A sediment sampling and analysis event was conducted by GP at operating Outfalls 001 in the Columbia River and 002 in the Camas Slough in 2017-2018 to comply with National Pollutant Discharge Elimination System (NPDES) monitoring requirements (ESA 2018). Detailed results of those previous investigations are summarized in the Tier 1 Report (Tetra Tech 2023a), which included copies of those reports in an appendix.

The Tier 1 Report provides further discussion of the development of the conceptual sampling model for the project area.

2.2 Riverbank Final Surface Conditions

In the project area, most dredged surfaces will be backfilled with clean fill and provide no potential future exposure pathways. However, dredging and excavations along the Camas Slough north riverbank will expose areas of newly dredged surface. Riverbank reshaping following demolition will result in a new location of the OHWM. The OHWM elevation will move horizontally toward the upland such that new land area will be within the wetted area of the river because the reshaped riverbank would be topographically flatter than the existing steep riverbank, with newly regraded slopes ranging from 4-to-1 to 5-to-1.

At this time, the riverbank area is occupied by various large dock structures. To meet antidegradation requirements, and at the suggestion of the DMMP, GP proposes to sample final grades below OHWM following demolition to determine the condition of surface materials. Owing to some uncertainty in final grades and layout at this early design phase, a future *Sampling and Analysis Plan* for riverbank areas will be developed in coordination with DMMP, once the riverbank work is approaching final design approval.

Briefly, and as recommended, the approach for riverbank sampling for analysis and antidegradation evaluation would likely entail grab-type sampling at an appropriate number of locations to adequately survey the area. Assuming sampled final grade materials are found suitable, then the upper portion of the newly shaped riverbank area would be planted with native plant species. Sampling would occur prior to landscaping. If final grade materials were found to not be suitable to meet antidegradation requirements, then GP would work with agencies to determine appropriate actions, possibly including the extent of over-excavation that may be needed and appropriate replacement materials to establish suitable final grades. As stated, further details on sampling and analysis of the riverbank area would be provided in a future SSAP.

2.3 Columbia River Hydrograph

As described in the *Tier 1 Report*, the Columbia River hydrograph is strongly seasonal, with a spring high river stage reflecting large volumes of snowmelt runoff and a fall season with a low water river stage. In the project area, the change of water depth is about 15 feet between these seasons, and the timing and extent of change are variable by year. A general note: aerial photos used in the figures presented here show the river at a relatively low stage of about +2.0 feet relative to the Columbia River Datum (CRD), while ordinary high water is at 16.5 feet CRD.

2.4 Invasive Species

The Camas Slough is not documented as an area known or suspected of harboring aquatic invasive species (AIS) including the New Zealand mud snail (*Potamopyrgus antipodarum*). Equipment brought to the Camas Slough for this sampling event will be decontaminated in accordance with AIS decontamination standard operating procedure (Appendix B) to ensure AIS will not be transported to the slough. AIS decontamination procedures in this standard operating procedure follow the Washington State Department of Fish and Wildlife decontamination guidance (https://wdfw.wa.gov/species-habitats/invasive/prevention).

3.0 STUDY OBJECTIVES

This section summarizes the purpose and objectives of this sampling plan and provides an overview of the sampling design for the overall project. A more detailed description of the dredging activities and sampling design is presented in Section 4 for the Camas Slough.

3.1 Purpose and Objectives

Characterization of sediments is proposed to achieve the following objectives:

- Provide information needed for the DMMP to determine the suitability of dredged sediments for in-water and/or upland disposal.
- Characterize the post-dredged surface sediment quality at the Dock Warehouse Piers dredge prism to evaluate project compliance with antidegradation requirements where a new sediment surface will result.

As mentioned, a *Tier 1 Report* has been completed and provided:

- Detailed project description,
- Site history and existing conditions,
- Summaries of recent sampling,
- Management area rank, and
- Conceptual dredging design

This SSAP provides details on the following:

- Refined dredging design,
- Proposed DMMUs, sampling design, and sampling methods,
- Chemical analytes and analytical parameters,
- Approach to evaluate sediment characteristics, and
- Identification of components of the project Data Report to be generated following sampling and analysis.

3.2 Sampling Areas

For this project we propose a “Sampling Area” approach rather than the usual, more specific, sample points. In this approach, one core sample will be collected at a suitable location to be identified in the field from within the boundaries of each Sample Area designated for each DMMU. This “Sampling Area” approach allows for increased flexibility because a sample taken at any location within the approved Sampling Area will be acceptable to DMMP without further coordination. DMMP gave general approval for this approach, as well as for the general locations of the Sampling Areas, in comments provided in December 2020 on the Revised Tier 1 Report. Based on those comments, further refinements of Sampling Area locations have been made (see attached figures).

This approach was taken to increase the likelihood of sample success and to avoid the uncertainty and possible delays associated with failed sampling at a narrowly defined location.

3.3 Dredged Materials Management Units

The sampling effort will occur in the Camas Slough, a side channel of the Columbia River. The Slough is also the outlet of the Washougal River (**Figure 1**). **Table 3** provides the proposed DMMUs and summarizes the dredging volumes and sampling plan for each DMMU.

The Camas Slough has been designated a "Moderate Risk" area, and sediments are heterogeneous in this area. The regulatory maximum sediment volume represented by a DMMU in the Camas Slough is 40,000 cubic yards. Two DMMUs have been identified for the Camas Slough dredging to account for heterogeneity across the different work areas and sediment profiles. Volumes at each proposed DMMU are well below the maximum sediment volume guideline.

Table 3. Summary Information for Dredged Materials Management Units (DMMU)

	Camas Slough DMMUs		
	CS1-A: Dock Warehouse Piers, Surface Unit	CS1-B: Dock Warehouse Piers, Subsurface Unit	CS1-Z: Dock Warehouse Piers, Z-layer
Proposed Dredged Materials Volume (Cu. Yds.)	6,900	3,600	N/A
Maximum Sediment Volume Per DMMU (Cu. Yds.)	40,000	40,000	N/A
Sample Type	Core	Core	Core
Cores per DMMU	2	2	2
Analysis	1	1	2
Archive (Yes/No)	Yes	Yes	Yes

Abbreviations
Cu. Yds. = cubic yards
DMMU = Dredged Materials Management Unit

4.0 CAMAS SLOUGH SAMPLING

As stated in the Tier 1 Report, river conditions in the Camas Slough include:

- Abundant rock and cobble areas to be avoided as they cannot be readily sampled (log forms will include details of site conditions encountered);
- High river flow rates owing to the location at the mouth of the Washougal River;
- Shallow bedrock in some locations; and
- Abundant infrastructure that must be avoided.

4.1 Dredging Plans

Figure 3 provides plan and profile views of the dredge prisms for access in the Camas Slough. The estimated quantities to be dredged in the Camas Slough are provided in **Table 3**. The sampling design for each DMMU in the Camas Slough is provided in **Table 4**.

4.2 Camas Slough Sampling Design

As stated previously, difficult sampling conditions are present and thus we have identified "Sampling Areas" instead of more specific sampling points often utilized. This Sampling Area approach allows for

increased flexibility over an identified "point" approach because a sample taken at any location within the Sampling Area will be acceptable to DMMP without further coordination.

Table 4. Camas Slough Sample and Analysis Quantities

Camas Slough Locations	DMMU	Sample Quantities per DMMU			Analysis Quantity
		Surface	Subsurface	Z-layer	
Dock Warehouse Piers, Surface Unit	CS1-A	2			1
Dock Warehouse Piers, Subsurface Unit	CS1-B		2		1
Dock Warehouse Piers, Z-layer	CS1-Z			2	2
Total					**4**

Abbreviations
DMMU = Dredged Material Management Unit

The Camas Slough Sampling Areas are shown on **Figure 3**. Sampling Areas were identified using information from the 2020 bathymetric survey, infrastructure design drawings, available diver survey information, and a review of dredge prism location, shape, and anticipated thickness.

As described in the Tier 1 Report, the Camas Slough sediments are assumed to be heterogeneous, thus surface and subsurface DMMUs have been identified at each dredge prism. **Table 3** lists the proposed DMMUs. The effects are seen in the sampling depths and thickness of each Sampling Area, which are summarized in **Table 5**. As stated, the target within each of the Sampling Areas is the thickest, full profile, but avoiding areas likely to be rocky.

Table 5. Camas Slough DMMUs—Unit Elevations and Thickness

DMMU	Sampling Area[1]	Approximate Top Elevation (mudline) (feet CRD)[2,3]	Approximate Bottom Elevation (feet CRD)[3]	Total Thickness (feet)[3]	Sample Numbers[4]	Composite for Analysis
CS1-A (Surface)	CS1-A-1	-3.5	-7.5	4	CS1-A-1	CS1-A
	CS1-A-2	-2.5	-5	4	CS1-A-2	
CS1-B (Subsurface)	CS1-B-1	-7.5	-10	2.5	CS1-B-1	CS1-B
	CS1-B-2	-5	-10	5	CS1-B-2	
CS1-Z (Below Dredge Surface)	CS1-Z-1	-10	-12	2	CS1-Z-1	CS1-Z-1
	CS1-Z-2	-10	-12	2	CS1-Z-2	CS1-Z-2
			Maximum Core Length (feet)	11		

1. Sample area identifiers are based on DMMU identifier followed by sample area (e.g., CS1-A-1 is sample area 1 in DMMU CS1-A.
2. Top of "A" zone is mudline elevation.
3. Elevations and thicknesses given near centroid for each sampling area. Actual elevations and the thicknesses of the lower ("Zone B") sampling intervals vary along dredging areas.
4. Sample numbers are assigned to each 4 foot core length sampled to required depth.

For each Sampling Area, one core will be collected to the depth of dredging plus the depth required for the Z-layer sampling. Each core will be subdivided to reflect the surface and subsurface DMMUs, and Z-layer. The top 4-foot sediment layer (the surface DMMU) will be analyzed separately from the sediment located below 4 feet (subsurface DMMU).

As there are two Sampling Areas in the dredging area, the two samples from within the DMMU will be composited. While we plan on compositing materials from two cores for the DMMU, we also plan on archiving sediment samples without compositing for individual analysis, if warranted.

Z-Layer sampling will be performed to provide sediment quality characteristics to evaluate antidegradation requirements for the Dock Warehouse Piers area, as this area will retain a new surface following dredging. Z-Layer samples will be taken from the 2-ft of material immediately underlying the required dredge prism, and will represent the new surface to be exposed following project dredging. Z-Layer samples will be from two cores taken below the minus 10-ft CRD planned new sediment surface at the Dock Warehouse piers (i.e. from -10 to -12-ft CRD) and will not be composited.

5.0 TARGET ANALYTES

For Camas Slough samples, analytes include conventional parameters, along with a suite of chemicals of concern identified by the State Sediment Management Standards. No elutriate assays or biological assays are planned at this time. Archived sediment from each sampling DMMU would be used if it is determined that bioassessments are needed, assuming holding times can be met.

5.1 Conventional Analytes

Conventional analytes consist of total solids, total organic carbon, total sulfides, ammonia, particle size distribution, and total volatile solids (**Table 6**). Grain-size distribution for each composite sample will be determined following ASTM Method D-422 (modified). The modified U.S. Environmental Protection Agency (EPA) sieve series (U.S. sieve Nos. 4, 10, 18, 35, 60, 120, and 230 [cut off for clay]) will be used for the larger size fractions. Pipette analysis will be used for particle sizes finer than the 230 mesh. The cutoff for gravel from sand will be No. 10 sieve (2 millimeters). The silt/clay fractions will be classified by the Krumbein phi scale (+5, +6, +7, +8, >8). Total solids, ammonia, total volatile solids, and sulfides will be analyzed in the Camas Slough samples.

Table 6. Conventional Analytes

Analyte	Method	Reporting Units
Total solids	PSEP (1986)/ SM 2540G	% by dry weight
Total organic carbon	SM 5310B/ EPA 9060 (modified for sediments)	% by dry weight
Total sulfides	PSEP (1986)/Plumb (1981)/SM4500-S2	mg/kg
Ammonia	Plumb (1981)/SM4500-NH3	mg/kg
Sediment particle size distribution/Grain size	PSEP (1986)/ASTM D-422 (modified)	relative percent or class
Total volatile solids	PSEP (1986)/SM 2540G	% by dry Weight

Abbreviations
ASTM = ASTM International
EPA = U.S. Environmental Protection Agency
mg/kg = milligrams per kilogram
PSEP = Puget Sound Estuary Program
SM = Standard Methods for the Examination of Water and Wastewater
SW-846 = U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods

5.2 Sediment Compositing

The proposed sediment compositing scheme is shown in **Table 7**.

Table 7. Sediment Compositing Scheme

DMMU Number	DMMP Sample Designation	Sample Core Sections	Analyses to be Conducted			
			Conventional Analytes	DMMP Chemicals of Concern	Dioxins/ Furans	Additional Analyses
CS1-A	CS1-A	CS1-A-1, CS1-A-2	X	X	X	X
CS1-B	CS1-B	CS1-B-1, CS1-B-2	X	X	X	X
CS1-Z	CS1-Z-1	CS1-Z-1	X	X	X	X
	CS1-Z-2	CS1-Z-2	X	X	X	X

5.3 Chemicals of Concern

Testing procedures will be conducted in accordance with the DMMP User's Manual (DMMP 2021), and samples from the Camas Slough will be analyzed for the state's Freshwater Sediment Management Standards, Sediment Cleanup Objectives (SCO), which are equivalent to the DMMP guidance SLs, chemicals of concern and dioxins/furans (**Table 8**).

Table 8. Chemicals of Concern and Freshwater Sediment Management Standards

Chemical of Concern	CAS Number	Reporting Units—Dry Weight	Freshwater Sediment Management Standards (SMS SCO)		Laboratory PQL
			SL1	SL2	
Metals (EPA Method 3050B/6010/6020 except Mercury by EPA Method 7471)					
Arsenic	7440-38-2	mg/kg	14	120	1.0
Cadmium	7440-43-9	mg/kg	2.1	5.4	0.2
Chromium	7440-47-3	mg/kg	72	88	1.0
Copper	7440-50-8	mg/kg	400	1,200	2.0
Lead	7439-92-1	mg/kg	360	>1,300	0.2
Mercury	7439-97-6	mg/kg	0.66	0.8	0.08
Nickel	7440-02-0	mg/kg	38	110	2.0
Selenium	7782-49-2	mg/kg	11	>20	1.0
Silver	7440-22-4	mg/kg	0.57	1.7	0.2
Zinc	7440-66-6	mg/kg	3,200	>4,200	4.0
Organometallic Compounds (Krone et al. 1989)					
Monobutyltin ion (bulk)	78763-54-9	µg/kg	540	>4,800	3.0
Dibutyltin ion (bulk)	10-53-502	µg/kg	910	130,000	3.0
Tetrabutyltin ion (bulk)	1461-25-2	µg/kg	97	>97	3.0
Tributyltin ion (bulk)	36643-28-4	µg/kg	47	320	3.0
Polycyclic Aromatic Hydrocarbons (PAH) (EPA Method 3550/8270)					
Naphthalene	91-20-3	µg/kg	---	---	5.3

Chemical of Concern	CAS Number	Reporting Units—Dry Weight	Freshwater Sediment Management Standards (SMS SCO)		Laboratory PQL
			SL1	SL2	
Acenaphthylene	208-96-8	µg/kg	---	---	2.7
Acenaphthene	83-32-9	µg/kg	---	---	2.7
Fluorene	86-73-7	µg/kg	---	---	2.7
Phenanthrene	67580	µg/kg	---	---	2.7
Anthracene	120-12-7	µg/kg	---	---	2.7
1-Methylnaphthalene	90-12-0	µg/kg	---	---	5.3
2-Methylnaphthalene	91-57-6	µg/kg	---	---	5.3
Fluoranthene	206-44-0	µg/kg	---	---	2.7
Pyrene	129-00-0	µg/kg	---	---	2.7
Benz(a)anthracene	56-55-3	µg/kg	---	---	2.7
Chrysene	218-01-9	µg/kg	---	---	2.7
Benzofluoranthenes (b)	207-08-9	µg/kg	---	---	4.0
Benzofluoranthenes (j)	205-82-3	µg/kg	---	---	4.0
Benzofluoranthenes (k)	205-99-2	µg/kg	---	---	4.0
Benzo(a)pyrene	50-32-8	µg/kg	---	---	4.0
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/kg	---	---	2.7
Dibenz(a,h)anthracene	53-70-3	µg/kg	---	---	2.7
Benzo(g,h,i)perylene	191-24-2	µg/kg	---	---	2.7
Total PAHs (sum of all listed above)	---	µg/kg	17,000	30,000	
Chlorinated Hydrocarbons (EPA Method 3550/8270)					
beta-Hexachlorocyclohexane	319-85-7	µg/kg	7.2	11	1.0
Phthalates					
Di-n-butyl phthalate	84-74-2	µg/kg	380	1,000	26.7
Bis(2-ethylhexyl) phthalate	117-81-7	µg/kg	500	22,000	26.7
Di-n-octyl phthalate	117-84-0	µg/kg	39	>1,100	26.7
Phenols (EPA Method 3550/8270)					
Phenol	108-95-2	µg/kg	120	210	5.3
4-Methylphenol	106-44-5	µg/kg	260	2,000	6.7
Pentachlorophenol	87-86-5	µg/kg	1,200	>1,200	26.7
Miscellaneous Extractables (EPA Method 3550/8270)					
Benzoic acid	65-85-0	µg/kg	2,900	3,800	333
Dibenzofuran	132-64-9	µg/kg	200	680	2.7
Carbazole	86-74-8	µg/kg	900	1,100	4.0
Pesticides & PCBs (EPA Method 3550/8081 and 3550/8082)					
2,4'-DDD and 4.4'-DDD 2,4'-DDE and 4,4'-DDE 2,4'-DDT and 4,4'-DDT	Various	µg/kg	310 21 100	860 33 8,100	1.0
Dieldrin	60-57-1	µg/kg	4.9	9.3	1.0
Endrin ketone	53494-70-5	µg/kg	8.5	>8.5	1.0

Chemical of Concern	CAS Number	Reporting Units—Dry Weight	Freshwater Sediment Management Standards (SMS SCO)		Laboratory PQL
			SL1	SL2	
Total PCBs (Aroclors)	Various	µg/kg	110	2,500	10
Bulk Petroleum Hydrocarbons (NWTPH-Dx)					
TPH – Diesel	Various	mg/kg	340	510	20
TPH – Residual	Various	mg/kg	3,600	4,400	40
Dioxins/Furans (EPA Method 1613B)					
17 Congeners	Various	ng/kg	Total TEQ	0.65 – 2.89[1]	0.4

Notes:
1 For non-Port projects on the Washington side of the Columbia River, dioxin concentrations in dredged material have been compared to background values for sediment taken downstream of Puget Island, which range from 0.65 to 2.89 ng/kg TEQ as of 2009.

Abbreviations:
µg/kg = micrograms per kilogram
PQL = practical quantitation limit
CAS = Chemical Abstracts Service
SL1 = screening level 1
mg/kg = milligrams per kilogram
SL2 = screening level 2
ng/kg = nanograms per kilogram
SCO = Sediment Cleanup Objectives
PAH = polycyclic aromatic hydrocarbons
TEQ = toxicity equivalency quotient
PCB = polychlorinated biphenyl

5.4 Additional Analytes

Samples will be analyzed for perfluorooctanoic acid compounds for if dredged material is considered to be used as backfill at the site. A liquid chromatography / tandem mass spectrometry (LC-MS/MS) method will be used to analyze for the perfluorooctanoic acid compounds listed in **Table 9**.

Table 9. Perfluorooctanoic Acid Compounds

PFOA Compounds	CAS Number	Reporting Units—Dry Weight	Laboratory PQL
Perfluorobutanoic Acid (PFBA)	375224	mg/kg	0.0005
Perfluorobutane Sulfonic Acid (PFBS)	375735	mg/kg	0.0005
Perfluorodecanoic Acid (PFDA)	335762	mg/kg	0.0005
Perfluorododecanoic Acid (PFDoDA)	307551	mg/kg	0.0005
Perfluoroheptanoic Acid (PFHpA)	375859	mg/kg	0.0005
Perfluorohexanoic Acid (PFHxA)	3707244	mg/kg	0.0005
Perfluorohexane Sulfonic Acid (PFHxS)	355464	mg/kg	0.0005
Perfluorononanoic Acid (PFNA)	375951	mg/kg	0.0005
Perfluorooctanoic Acid (PFOA)	335671	mg/kg	0.0005
Perfluorooctane Sulfonic Acid (PFOS)	1763231	mg/kg	0.0005
Perfluoroundecanoic Acid (PFUnDA)	2058948	mg/kg	0.0005
Hexafluoropropylene Oxide – Dimer Acid (HFPO-DA	13252136	mg/kg	0.0005

Abbreviations:
µg/kg = micrograms per kilogram
PQL = practical quantitation limit
CAS = Chemical Abstracts Service
mg/kg = milligrams per kilogram

5.5 Laboratory Limits of Detection

The laboratory practical quantitation limits (PQLs) will be below the lower of the DMMP screening levels, and are shown in **Table 8**. If the practical quantitation limits cannot be met, the analytical laboratory will be responsible for doing everything possible to lower the sample detection limits down to or below the lower of the Screening Levels.

6.0 FIELD SAMPLING PROCEDURES

6.1 Schedule

Sampling would occur during appropriate river conditions and as provided by Agencies and documented in permits and approvals for the project. Sampling is anticipated to occur soon after receipt of all permits and approvals, including approval of this sampling plan.

6.2 Sample Equipment

In the Camas Slough, sediment cores will be collected using a vibratory core sampler. Core samplers can generally collect up to a 20-foot-long core. Sediment cores will be collected with a vibracoring system deployed from an A-frame or quadrapod mounted on the sampling vessel. Cores will be collected using the submersible vibracore system with Lexan polycarbonate core barrels. If, after three attempts, the target depths are not achieved with a Lexan polycarbonate core barrel, an alternative aluminum or stainless steel core barrel will be employed to determine if better penetration could be achieved.

6.3 Horizontal Control: Datum and GPS Positioning

Horizontal coordinates are referenced to the Washington State Plan Coordinate System, South Zone (North American Datum 1983 [NAD 83]). The sampling vessel will be positioned using a Global Navigation Satellite System (GNSS) will be capable of positioning the sampling device within 10 feet horizontally of target sampling locations, maintaining position during sampling, and recording sample positions with a minimum of 3-foot accuracy. The Trimble R10 GNSS receiver, installed directly over the sampling equipment, will be integrated into the navigation software (HYPACK v. 2020) along with the sample locations to provide real-time positioning for accurate equipment deployment. (DMMP 2021).

Sampling Areas are roughly rectangular, and geographic coordinates for each of the four corner points of the area have been determined (using UTMs); these are tabulated in Appendix C.

6.4 Vertical Control: Datum, Water Depth Determination, and Tidal Levels

Vertical sampling data will be reported for the project area using the Columbia River Datum (CRD). A recently completed bathymetric survey for the project area will assist in evaluation of vertical measurements for sampling and to assist with interval calculations.

Water depths will be determined using an on-board instrumentation will include a 200-kilohertz HydroSystems CeeEcho single-beam echosounder, paired with a high accuracy Trimble R10 GNSS system. As explained in detail in the Tier 1 Report, while the project area is tidal, the tidal prism at this location 120 river miles upriver from the Columbia River's mouth at the Pacific Ocean is about 1 foot and only noticeable at low river levels. As river volume increase seasonally, tidal fluctuation is attenuated.

The National Oceanic and Atmospheric Administration's (NOAA) Vancouver, Washington, tidal gauge (Station 9440083) is located approximately 16 miles downriver on the Columbia River and provides historical, as well as current and predicted, tidal information.

River stage levels are measured by the U.S. Geological Survey (Station 14144700) at the Vancouver, Washington, station located 16 miles downriver on the Columbia River. River forecast stage data are issued routinely year-round by NOAA's Advance Hydrologic Prediction Service for Vancouver, Washington.

Mudline elevations will be estimated from water depths, water elevation at the tidal gauges and GPS positions. River water depth will be determined at each sampling location and recorded. River water depths will be measured using a contemporary high-accuracy acoustic depth sounder located on the sampling vessel. Mudline elevations will be determined and sampling interval depths listed in **Table 5** adjusted to meet the target elevations.

6.5 Sample Acceptance Criteria

After the sample is retrieved, the sample is carefully inspected against acceptance criteria before being accepted. If a sample does not meet these criteria, it will be rejected, and a subsequent sample made. Sample locations and failed acceptability criteria will be recorded for every failed sample. All sampling attempts will be recorded, including locations and conditions of refusals for core sampling. Waste sediment from rejected samples or extra sediment not processed as a sample or for archive will be retained on the vessel for disposal at an approved upland location. No sampled sediment will be returned to the water.

For core samples, the following acceptability criteria must be satisfied:

- Percent recovery must be at least 75 percent of the target characterization depth. Percent recovery will be calculated by the ratio of the length (feet) of sediment filled core to the depth of core penetration (feet).
- For sampling, the longest core collected will be used.
- For sampling, core depths will not be compaction corrected.
- The sample within the core appears to be largely undisturbed.
- The sample was not exposed to any contamination during handling.
- Core penetration depth will reach the lower limit of the sample design.

For each Camas Slough DMMU, the anticipated unit elevations in feet are summarized in **Table 5**. Within each sampled core, the sample unit will be determined by depth below the mudline for each

core based on the unit's elevations and thicknesses. Cores will be driven to depths that fully characterize the proposed dredge prism and the Z-layer, or to refusal. Bedrock is known to occur near or at the surface in some locations in the Camas Slough, and within 25 feet of the surface throughout the Camas Slough, so refusals are possible. If the core meets refusal before penetration is sufficient, the coring location may be moved. Per this sample design, the intent is to sample within the designated Sampling Areas, and if needed several cores may be taken within the sample area to fully characterize the dredge prism. Up to three cores will be collected if acceptance criteria listed above are not met. If core penetration and recovery are still insufficient to meet sampling requirements within the Sample Area, real-time consultation with the DMMP will be initiated.

The penetration of the core will be measured at the end of the core drive and recovery will be measure on-deck after the core has been retrieved. Recovered cores will not be compaction corrected for sampling intervals.

6.6 Sampling Logs and other Documentation

Sampling field logs will be completed for each sampling event. Field core logs will be completed for each core collected and will be kept with the core during transport and processing.

At a minimum, the following information will be recorded in the field/sampling logs.

- Elevation of each station sampled as measured from CRD at the time of sampling;
- Station location determined in latitude and longitude using GNSS;
- Date and time of collection of each sample;
- Names of field person(s) collecting and logging in the sample;
- Weather conditions;
- The sample station number as derived from this sampling plan, along with sequential number of the individual cores collected at the location;
- Penetration depth of each coring attempt;
- Percent recovery for each coring attempt;
- Note of core acceptance or discard; and
- Apparent resistance of the material to sampling based on the depth of penetration of the sampler.
- Notes on core refusal for hard material, including presence of rip-rap or rock.

Appendix D contains the field forms that will be used to document project field work.

Table 10 provides the information to be entered and retained in the sampling logs.

Table 10. Information Required to Be Collected for Core Sampling Logs

Information	Details
Date and time	Month, day, year, and time the sample is collected.
Recorder information	Names of vessel and vessel operators, field supervisors, and persons collecting and logging information.
Weather and river conditions	River conditions will include wave and current observations. Weather includes wind, temperature, and cloud cover as well as precipitation.
Project Name and Number	Project name along with a numeric or alphanumeric code identifying the project.
Core Sample Name	An alphanumeric code of up to 5 characters, using project-specific site codes identifying the location where the sample is collected.
Sampling Equipment	Equipment used for sampling (i.e., core sampler). For core samples, information includes total length of the core tube, for example.
Sample Observations	Penetration depth, refusal conditions, if needed. Information on sampling conditions and condition of the sample to determine if criteria for acceptance are met.
Sediment Description	Type of sediment (density, color, consistency, texture); plant, animals, or debris present; and presence of odors, oils, or sheen. Any other distinguishing feature.
Sample Determination	Information regarding status of sample—accepted or discarded.
Comments	Any deviations from the approved sampling plan along with general observations related to the sampling event.

Information will be recorded on a field form. As stated, all attempts at sampling will be recorded, documenting field conditions, even for refused or failed samples.

Field data undergo quality assurance procedures. All data and log forms are reviewed daily by the person recording the data so that any errors or omissions can be corrected. A second review is performed to verify the initial review.

6.7 Sample Identification

A unique sample number is assigned to each sample and recorded. Sample numbers are generated and pre-assigned but may be adjusted if needed during sampling. The sample numbering system does not identify a geographic location to ensure that samples sent to analytical laboratories are “blind” to the laboratory to prevent bias.

6.8 Chain of Custody Procedures and Transport

Chain of custody procedures will be followed. This procedure:

- Commences in the field, immediately upon sample acceptance;
- Is maintained throughout all sampling and sample processing activities; and
- Is continued by the analytical laboratory.

Chain of custody forms are completed to document information that verifies protocols have been followed and to keep essential information on the sample with the sample throughout its processing.

The procedure documents:

- Responsible parties,

- Sample identification number,
- Sample handling history, including transfers (date and times and including removal from and return to storage at the laboratory);
- Holding conditions, including temperature, location, and duration; and
- Final disposition of the sample.

Chain of custody forms are placed inside plastic bags to protect them from water damage and are stored with the samples. The samples listed on a chain of custody form are packed together with their form.

The chain of custody form is signed and dated at the time samples change custody. The form is never signed prior to, or in advance of, the actual transfer of the samples from one custodian to the next. Following sampling, samples remain in sight of the sampling crew or are stored in a secure, temperature-controlled location. After collection and processing, samples will be driven to the laboratory. If someone other than the sample collector transports samples to the laboratory, the collector signs and dates the chain of custody form and writes the name of the person or firm transporting the samples under “transported by” before sealing the container with a custody seal.

7.0 SAMPLE PROCESSING

Sample processing refers to the process to move sediments from sampling equipment into correctly identified containers in a manner that provides for appropriate analysis conditions, and follows a step-wise, formalized procedure to ensure that materials are managed correctly. Initial sample processing occurs on the field vessel. Depending on field conditions, additional processing may occur at the laboratory.

Tetra Tech will coordinate directly with a Washington State laboratory, certified for the analysis of solid samples by the required methods, in determining the amount of sediment and numbers and types of containers required to successfully analyze the suite of analytes. Tetra Tech will coordinate closely so that the laboratory receives samples of a quantity and condition to meet all analytical procedures. Approximately 2 to 3 liters total of sample will be required to provide adequate volume for testing of sediment conventional parameters and chemicals of concern; additional material will be collected as well as for archiving. Compositing will occur prior to subsampling. Z-Layer samples will not be composited. Samples will be held on ice from time of collection to composting and subsampling or sampling for the z-layer samples. Collected samples will be stored in coolers on ice until delivered to the laboratory. If held for an extended period of time (i.e., overnight), ice will be replenished as needed.

For core samples, the core tube will be split to expose the sediments. Observations will be made and documented. Following acceptance of the core, the sediment unit’s boundaries are measured, identified, and marked. Sediment in the core will be collected, containerized, and labeled, with a portion to be composted for analysis.

7.1 Decontamination Procedure

Standard decontamination procedure will be implemented so that no contamination occurs from one sample to the next or from outside sources. All equipment and instruments used to move sediment are stainless steel and are cleaned before each day's use and again between sampling or compositing events.

Equipment that may be used for sample management include the following:

- Stainless-steel bowls, tray, spoons, spatulas;
- Aluminum foil;
- Distilled water and soap; and
- Disposable gloves.

The decontamination procedure is as follows:

1. Prewash rinse with tap water.
2. First wash with solution of tap water and Alconox soap (brush).
3. Second rinse with tap water.
4. Second wash with solution of tap water and Alconox soap (brush).
5. First rinse with distilled water.
6. Second rinse with distilled water.
7. Coverage (no contact) of all decontaminated items with aluminum foil.
8. Storage in clean, closed container for next use.

The decontamination procedure does not use any acid or solvent rinses (the final rinse uses distilled water).

7.2 Sample Compositing

The collected sample intervals for each DMMU listed in **Table 5** will be composited in the field after the collection of all cores for each DMMU. Subsamples for all analyses will be collected from the composite sample representative of sediment from each DMMU.

Equal volumes of sample material from each core will be collected and composited into one DMMU sample for analysis. For each 4-foot core interval, a representative sediment volume along the length of the interval will be collected and thoroughly mixed. One liter of the homogenized sediment will be collected into a bowl for the DMMU composite. From the remaining homogenized material, samples will be collected to submit to the laboratory to archive for potential future chemical analysis, if needed. As material is collected from each core interval for the DMMU composite, the material will be mixed in the bowl used for the DMMU composite. After collection of the last core interval for a DMMU, the collected sediment will be thoroughly mixed and subsamples will be collected into the appropriate sample containers for delivery and analysis at the laboratory.

All sediment handling (extruding, mixing, and homogenizing) will be performed using stainless-steel or disposable spoons and bowls. All reusable sampling, mixing, and homogenizing equipment will be decontaminated prior to collection at each sampling station. Disposable latex/nitrile gloves will be used and will be rinsed with distilled water before and after handling each individual sample, as appropriate, to prevent sample contamination. Gloves will be disposed of between composites to prevent cross contamination. Containerizing for archive of sampled materials will also be implemented, which would make sediment available for additional analysis, if needed, as long as holding times and conditions were able to be met during archiving.

7.3 Subsamples for Total Sulfides

Samples for total sulfides will be collected in a 4-ounce jar with zinc acetate solution and filled to minimize head space . The sample container will be shaken to mix the zinc acetate solution and sediment. The total sulfides sampling jars will be clearly labeled to indicate that zinc acetate had been added as a preservative.

7.4 Archived Sediments

Approximately 1 liter of additional sediment from each DMMU and samples from the Z-layer is collected for archiving. These samples for chemical analysis are frozen and maintained at -18 degrees Celsius (°C). Sediment from archived samples may be used for re-analysis of selected analytes. Sediment for potential bioassays will be collected from the composite material and stored separately from the chemical samples collected and maintained at 4°C with no head space or under nitrogen.

8.0 LABORATORY ANALYSIS

For Camas Slough samples, analytes include conventional parameters along with a suite of chemicals of concern identified for fresh waters and dioxins/furans. Tiered results may indicate that bioassays or other tests should be subsequently made. Archived sediment from each DMMU would be used if it is determined that bioassessments are needed, assuming holding times can be met (**Table 11**).

8.1 Quality Assurance and Quality Control

The laboratory quality assurance procedures will be followed. All data packages will be verified at a Stage 2B validation level, and a Stage 4 data validation may be conducted if the results do not meet the acceptance criteria or if the summary validation shows problems with the quality control (QC) requirements.

A Stage 2B data review includes the following steps and evaluate the data using the measurement performance criteria noted in **Table 12**:

- Review sample holding times.
- Verify that the sample numbers and analyses match those requested on the chain-of-custody form.
- Verify that the required reporting limits have been achieved.

- Verify that that field duplicates, matrix spikes, laboratory duplicates, and lab-control samples were run at the proper frequency and met QC criteria.
- Verify that the surrogate compound analyses have been performed and have met QC criteria.
- Verify that the lab blanks are free of contaminants.
- Verify that initial and continuing calibrations have met criteria.

Testing procedures for dioxin/furan analysis will comply with the recommended methods utilizing isotope dilution high resolution gas chromatography/mass spectrometry procedures, with the Puget Sound standard reference material (PS-SRM) run alongside (USACE 2021). A Stage 2B data review will be completed on the PS-SRM sample data.

Calculation of the toxicity equivalence quotient (TEQ) will occur using toxicity equivalence factors for each of the 17 congeners/isomers. Per the DMMP User's Manual (2021), dioxin concentrations will be compared to background values for the Lower Columbia River, which range from 0.65 to 2.89 nanograms per kilogram TEQ.

8.2 Laboratory Sample Handling

The analytical laboratory provides EPA-approved containers for all samples and preservative where needed. The type of analysis to be performed is listed on the container label along with preservatives added.

Table 11. Analyte, Estimated Sample Volume Needed, and Holding Conditions

Sample Type	Prep/Extraction Method	Analytical Methods	Holding Time	Sample Size[1/]	Temperature[2/]	Container	Archive[3/]
Particle Size	NA	PSEP (1986)/ASTM D-422 (modified)	6 months	100-200 g (75-150 ml)	4°C	16 oz. glass jar	
Total Solids	NA	PSEP (1986)/ SM2540G	14 days	125 g (100 ml)	4°C	8 oz. glass jar*	X
Total Volatile Solids	NA	PSEP (1986)/ SM2540G	14 days	125 g (100 ml)	4°C	8 oz. glass jar*	X
Total Organic Carbon	NA	SM 5310B/EPA 9060 (modified for sediments)	14 days	125 g (100 ml)	4°C	8 oz. glass jar*	X
Ammonia	NA	Plumb (1981)	7 days	25 g (20 ml)	4°C	4 oz. glass jar	X
Metals (except Mercury)	3050B	6020	6 months	50 g (40 ml)	4°C	4 oz. glass jar	X
Semi-volatiles, Pesticides and PCBs	3541	8081/8082/8270	14 days until extraction 40 days after extraction	150 g (120 ml)	4°C	8 oz. glass jar	X
Total Sulfides	NA	PSEP (1986)/ Plumb (1981)	7 days	50 g (40 ml)	4°C[4/]	4 oz. glass jar	
Mercury	NA	7471	28 days (1 year if frozen)	50 g (40 ml)	4°C	4 oz. glass jar	X
Butyltin	NA	Krone et al 1989	6 months	50 g (40 ml)	4°C	4 oz. glass jar	X
TPH (DRO, RRO)		NWTPH-Dx	14 days until extraction 40 days after extraction	50 g (40 ml)	4°C	4 oz. glass jar	X
Dioxin/furan (PCDD/PCDF)	NA	EPA 1613	1 year	50 g (40 ml)	-18°C	4 oz. glass jar	X
PFAS	NA	LC-MS/MS	14 days	125 g (100 ml)	4°C	8 oz. glass jar*	X
Archive for potential bioassays	NA	NA	8 weeks	5 L	4°C (zero headspace or purged with nitrogen)	1 L glass or HDPE jars or Polyethylene Bags	

Notes:
1/ Recommended minimum field sample sizes for one laboratory analysis. Actual volumes to be collected have been increased to provide a margin of error and allow for retests.
2/ During transport to the lab, samples will be stored on ice. All temperatures are +1-2°C. The mercury and archived samples will be frozen immediately upon receipt at the lab.
3/ For every DMMU, I L will be frozen to run any or all of the analyses indicated.
4/ The sulfides sample will be preserved with 5 ml of 2 Normal zinc acetate for every 30 g of sediment.
* Analyses can be from the same container.

Abbreviations and Acronyms:
°C = degree Celsius
DRO = diesel-range organics
g = gram
LC-MS/MS = liquid chromatography / tandem mass spectrometry
ml = milliliter
NA = not applicable
PCB = polychlorinated biphenyl
PSEP = Puget Sound Estuary Program
RRO = residual range organics

Table 12. Recommended Measurement Performance Criteria

Analysis Type	Precision	Accuracy	Surrogate Limits	Completeness
Semivolatiles	±35% RPD	50%-150% R	Lab Limits	95%
Pesticides	±35% RPD	50%-150% R	Lab Limits	95%
PCBs	±35% RPD	50%-150% R	Lab Limits	95%
Metals	±20% RPD	75%-125% R	NA	95%
Ammonia	±20% RSD	75%-125% R	NA	95%
Total Sulfides	±20% RSD	75%-125% R	NA	95%
Total Organic Carbon	±20% RSD	75%-125% R	NA	95%
Total Solids	±20% RSD	NA	NA	95%
Total Volatile Solids	±20% RSD	NA	NA	95%
Grain Size	±20% RSD	NA	NA	95%
Tributyltin	±35% RPD	50%-150% R	Lab Limits	95%
Dioxins/Furans	±30% RPD	Method limits[1]	Method Limits[1/]	95%

Notes:
1/ Method 1613B (EPA, 1994a).
Abbreviations and Acronyms:
NA = not applicable
PS-SRM = Puget Sound Sediment Reference Material
RPD = relative percent difference
RSD = relative standard deviation
R = recovery
SRM = standard Reference material

8.3 Laboratory Reporting

A written report will be prepared by the analytical laboratory and will document all the activities associated with analysis of samples.

At a minimum, the following will be included in the Laboratory Report:

- Results of the laboratory analyses
- Laboratory quality control results
- All protocols used during analyses and documented exceptions
- Analytical procedures, including explanation of any deviation from them
- Run batch identification for each analytical method
- Digestion, extraction, and analysis dates for each QA/QC parameter corresponding to each batch definition (i.e., all QA/QC data will be batch specific)
- A case narrative describing analytical issues/problems.

8.4 Bioassay Laboratory Protocols

Bioassays will be conducted if one or more chemicals exceed the SL criteria (**Table 8**). Bioassay tests will be run for two test species, *Hyalella azteca* and *Chironomus dilutus*. Tests will be run for at least one chronic and one acute effects. At least three endpoints will be evaluated, including lethal and sublethal endpoints (**Table 13**).

Table 13. Bioassay Species, Tests and Endpoints

Species, Biological Test, and Endpoint	Acute Effects Biological Test	Chronic Effects Biological Test	Lethal Effects Biological Test	Sub-lethal Effects Biological Test
Amphipod: *Hyalella azteca*				
10-Day mortality	X		X	
28-Day mortality		X	X	
28-Day growth		X		X
Midge: *Chironomus dilutus*				
10-Day mortality	X			
10-Day growth	X			

Acute Effects Tests

- Hyalella azteca 10-day mortality: ASTM E1706-05 (2010)/EPA Method 100.1 (EPA, 2000) DMMP User Manual 9-98 July 2021 9.7 9.7.1 9.7.2 9.7.3
- Chironomus dilutus 10-day mortality: ASTM E1706-05 (2010)/EPA Method 100.2 (EPA, 2000)
- Chironomus dilutus 10-day growth: ASTM E1706-05 (2010)/EPA Method 100.2 (EPA, 2000)
- Chronic Effects Tests
- Hyalella azteca 28-day mortality: EPA Method 100.4 (EPA, 2000)
- Hyalella azteca 28-day growth: EPA Method 100.4 (EPA, 2000)

Negative bioassay control samples will be run with the test samples and meet the performance standards noted in **Table 13**. Each test sediment will be run with eight replicates along with the laboratory control samples. Water quality over the overlying water will be monitored at the initiation and termination of the tests for conductivity, hardness and alkalinity.

Bioassay tests will be based on comparisons to the laboratory control samples and compared to the performance guidelines noted in **Table 14**. Sediment that fails to meet the SL1/SCO criteria will be considered as unsuitable for unconfined open-water disposal.

Table 14. Bioassay Test Performance Standards and Screening Levels

Biological Test/Endpoint	Performance Standard		Screening level	
	Control	Reference	SL1	SL2
Amphipod: Hyalella azteca				
10-Day mortality	MC ≤ 20%	MR ≤ 25%	MT - MC > 15% and MT vs MC SD (p ≤ 0.05)	MT - MC > 25% and MT vs MC SD (p ≤ 0.05)
28-Day mortality	MC ≤ 20%	MR ≤ 30%	MT - MC > 10% and MT vs MC SD (p ≤ 0.05)	MT - MC > 25% and MT vs MC SD (p ≤ 0.05)
28-Day growth	MIGC ≥ 0.15mg/ind	MIGR ≥ 0.15 mg/ind	(MIGC - MIGT)/MIGC > 0.25 and MIGT vs MIGC SD (p ≤ 0.05)	(MIGC - MIGT)/MIGC > 0.40 and MIGT vs MIGC SD (p ≤ 0.05)
Midge: Chironomus dilutus				
10-Day mortality	MC ≤ 30%	MR ≤ 30%	MT - MC > 20% and MT vs MC SD (p ≤ 0.05)	MT - MC > 30% and MT vs MC SD (p ≤ 0.05)

Biological Test/Endpoint	Performance Standard		Screening level	
	Control	Reference	SL1	SL2
10-Day growth	MIGC ≥ 0.48 mg/ind	MIGR/MIGC ≥ 0.8	(MIGC - MIGT)/MIGC > 0.20 and MIGT vs MIGC SD (p ≤ 0.05)	(MIGC - MIGT)/MIGC > 0.30 and MIGT vs MIGC SD (p ≤ 0.05)

Notes:
M = Mortality; C = Control; R = Reference; T = Test; F = Final; MIG = Mean Individual Growth at time final; ind = individual; mg = milligrams; SD = statistically significant difference.

9.0 DATA REPORTING REQUIREMENTS

Following completion of sampling and analysis, a Sediment Quality Data Report for the project will be produced.

A QA discussion will identify any field and laboratory activities that deviated from the approved sampling plan and the referenced protocols, including overall assessment of the validity of the data generated.

Per the DMMP User's Manual (2021), at a minimum the following will be included in the data report:

- Explanation of any deviations from this approved SAP;
- Sampling equipment and protocols used to collect sediment samples;
- Procedures used to locate sampling positions;
- Table with coordinates of actual sampling locations, measured water depth at each location, real-time tidal stage at the time of sampling each station, and mudline elevations (tide-corrected to CRD);
- Figure showing target and actual sampling locations with DMMU outlines;
- Penetration and recovery data;
- Compositing scheme with actual core lengths and depths (referenced to both CRD and the mudline);
- Analytical QA/QC section, including case narrative describing any analytical problems;
- Table of analyzed concentrations for all DMMP contaminants of concern (COC), lab and validation qualifiers, method reporting limits, and method detection limits, with DMMP guideline exceedances highlighted;
- Table of analyzed concentrations for all SMS COCs, laboratory and validation qualifiers, method reporting limits, and method detection limits, with SMS guideline exceedances highlighted;
- PS-SRM required deliverables: data validation report, electronic data deliverable, and SRM sample data summary report;
- Chemistry QA review and validation results;
- Sampling/field log as an appendix;
- Core logs as an appendix, including any relevant photos;
- Chemistry data report (including a case narrative) as an appendix;

- Validation report as an appendix;
- EIM-ready data, with data validation qualifiers, to be submitted to DMMO for QA review (electronic submittal only);
- Comprehensive laboratory data package data for Ecology (electronic submittal only); and
- Chain-of-custody forms as an appendix.

10.0 ANTIDEGRADATION EVALUATION

As stated, planned dredging is associated with the demolition of in-water and overwater infrastructure.

Post-dredge sediment surfaces would remain exposed at the following locations:

- Access dredging at the Dock Warehouse Piers
- Along the reshaped Camas Slough riverbank.
  - Old sediments would be uncovered in place by removal of structures and piling.
  - Riverbank reshaping will result in a new horizontal location for the OHWM and thus new surface area previously above OHWM becomes exposed to the aquatic environment.

As stated, future analysis of the sediments at the riverbank below the new OHWM has been recommended by DMMP to evaluate antidegradation criteria. GP plans to provide a plan addressing that sampling and analysis late in the design process.

Following the recommendation of the DMMP (2021), antidegradation analysis would be conducted for the newly exposed sediment layer at the Dock Warehouse dredge prism if:

- Testing shows the overlying materials are determined to be unsuitable for unconfined aquatic disposal,
- Other sampling in the Camas Slough showed evidence of subsurface sediments with greater contamination than surface sediments, or
- If in DMMO's judgement other site-specific conditions indicate the newly exposed surface could fail to meet antidegradation policy. (DMMP 2021)

Currently, the DMMP has indicated that analysis of the Z-layer samples in this location should proceed given the prior industrial activities at this location. The Z-layer samples will be analyzed for the same analytes as the overlying sediment samples.

In general, if the results of analysis show that the sediment meets the Sediment Management Standards, Sediment Quality Standards, then the protective conditions for antidegradation of water quality are met.

11.0 REFERENCES

DMMO (U.S. Army Corps of Engineers, Dredged Material Management Office). 2021. Dredged Material Evaluation and Disposal Procedures, User Manual. Dredged Material Management Program: U.S. Environmental Protection Agency Region 10, Washington State Department of Natural

Resources, and Washington Department of Ecology, Seattle, Washington. https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll11/id/5397.

Ecology (Washington State Department of Ecology). 2013. Sediment Management Standards, WAC Chapter 173-204. https://fortress.wa.gov/ecy/publications/publications/1309055.pdf.

ESA. 2018. Sediment Data Report: NPDES Waste Discharge Permit NO. WA0000256. Prepared by Environmental Associates for Georgia-Pacific Consumer Products (Camas) LLC. Camas, Washington. February 2018.

NOAA Advanced Hydrologic Prediction Service, Vancouver, WA. https://water.weather.gov/ahps2/hydrograph.php?wfo=pqr&gage=vapw1&view=1,1,1,1,1,1

Plumb, Jr., R.H. 1981. Procedures for Handling and Chemical Analysis of Sediment and Water Samples: Prepared for the U.S. Environmental Protection Agency/Corps of Engineers Technical Committee on Criteria for Dredged and Fill Material, Environmental Laboratory, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

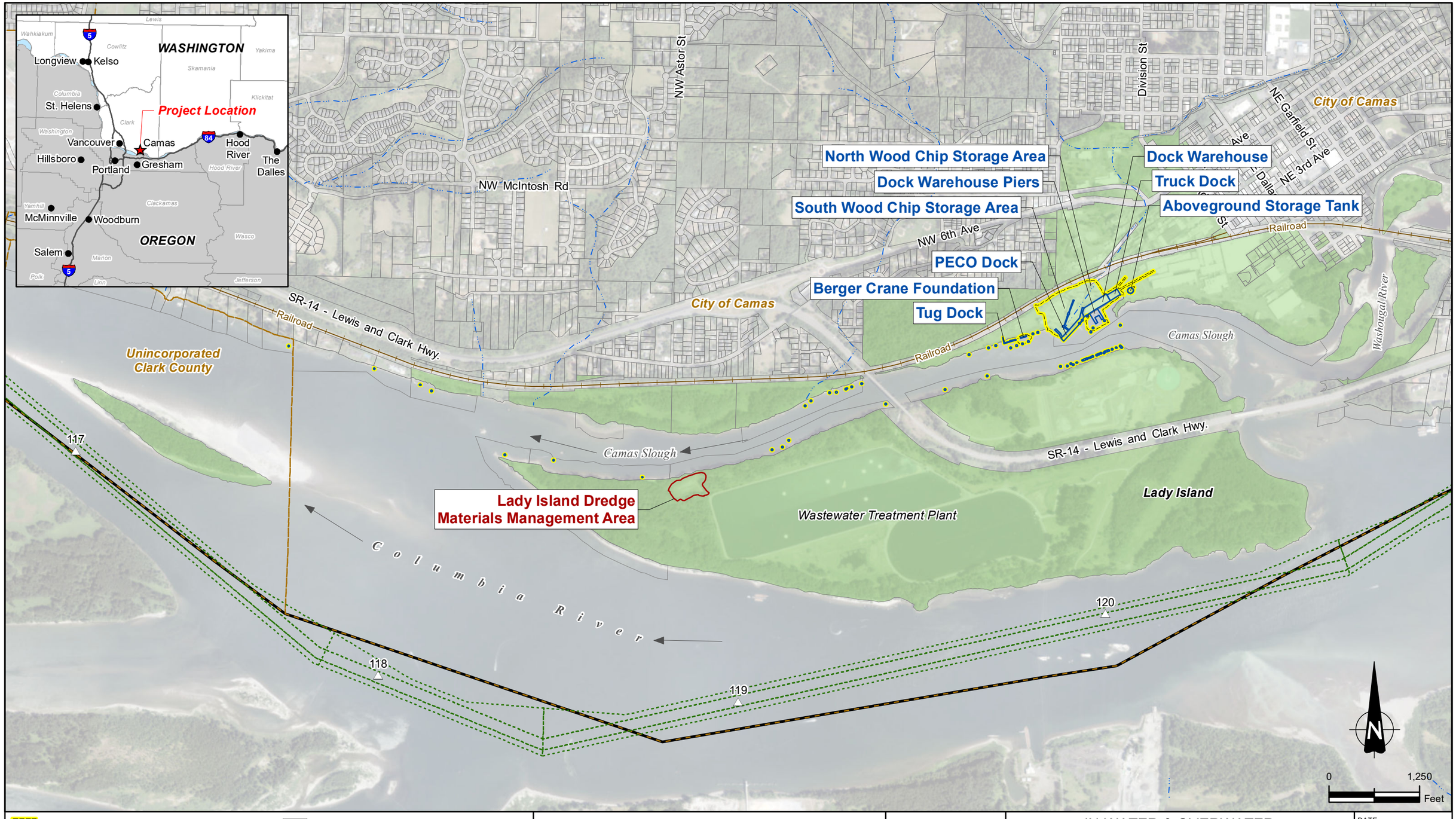
PSET (Portland Sediment Evaluation Team). 2019. EPA (Environmental Protection Agency) Suitability Determination Memorandum (SDM) for USACE Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-ODN-W, Stokke) Vancouver to the Dalles Federal Navigation Channel. Portland District's operations and maintenance dredging for the Vancouver to Dalles Federal Navigation Channel. U.S. Environmental Protection Agency, Region 10, Water Division. April 17.

USACE (U.S. Army Corps of Engineers, Portland District). 2019. Sediment Quality Evaluation Report: Vancouver to the Dalles Federal Navigation Channel, Columbia River Miles 108+15 to 136+30, Oregon, and Washington. Prepared by the Sediment Quality Team (CENWP-ODN-W).

Tetra Tech. 2023a. Revised (version 3) Tier 1 Evaluation for Dredged Materials Management, In-water and Overwater Structures Removal Project, Camas Mill, Camas, Washington. Prepared for Georgia-Pacific Consumer Operations LLC, Camas, Washington. March 10, 2023.

———. 2023b. Project Description, In-water and Overwater Structures Removal Project, Camas Mill, Camas, Washington. Prepared for Georgia-Pacific Consumer Operations LLC, Camas, Washington. February 1, 2023.

FIGURES



- Project Limits
- Columbia River Mile Marker
- Stream/River
- Structure To Be Removed
- Dolphin To Be Removed
- Lady Island Dredge Materials Management Area
- Tax Lot
- Tax Lot Owned by Georgia-Pacific
- City Boundary
- County Boundary
- Federal Navigation Channel

GEORGIA-PACIFIC CONSUMER OPERATIONS LLC

Tetra Tech

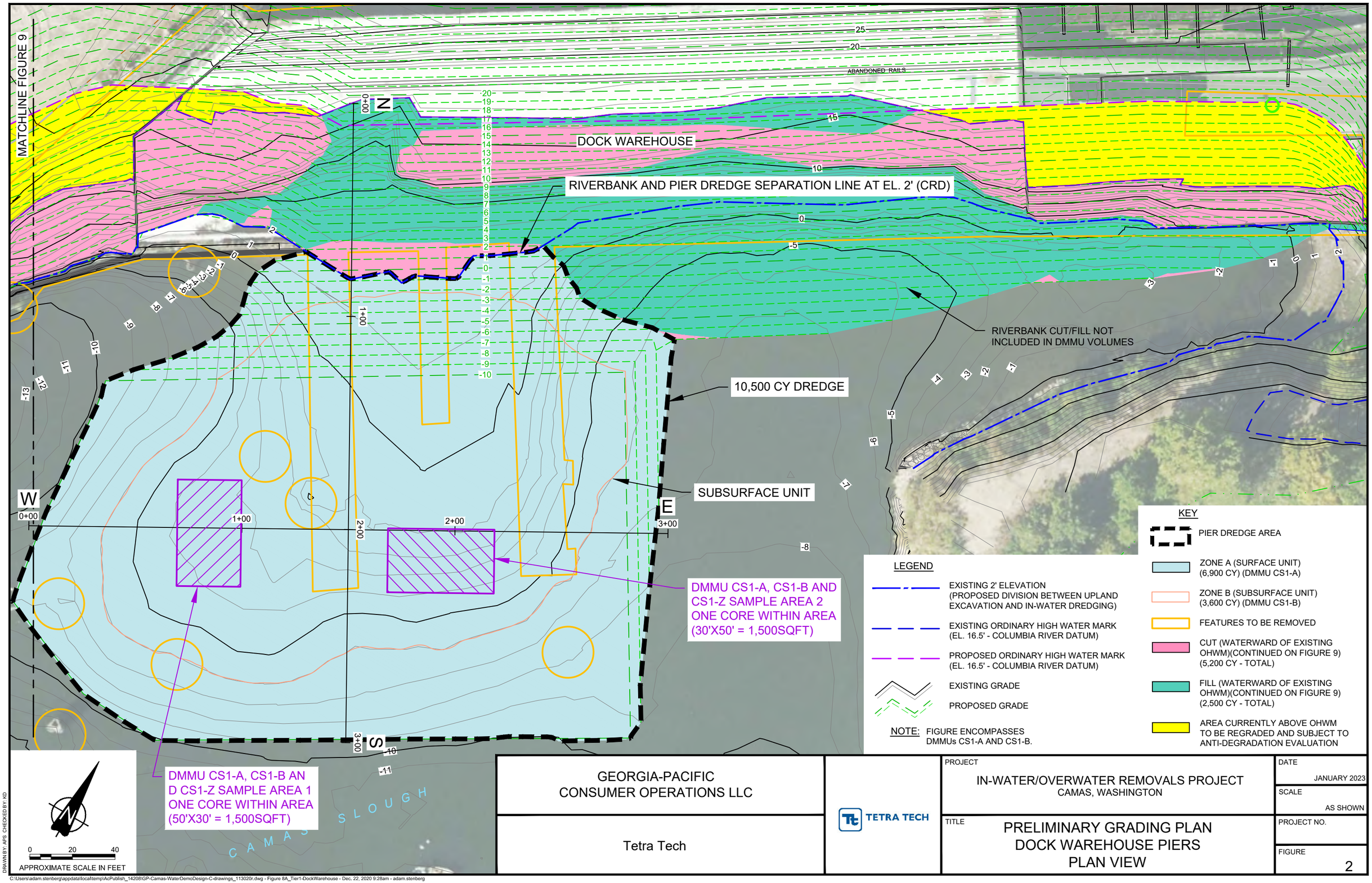
TETRA TECH

IN-WATER & OVERWATER STRUCTURES REMOVAL PROJECT
CAMAS MILL, CAMAS, WASHINGTON

PROJECT LOCATION

DATE: OCTOBER 2022
SCALE: 1 " = 1,250 '
PROJECT NO.
FIGURE: 1

R:\PROJECTS\CAMAS_0117-0064\FIGURES_UPDATE\MAPS\Figure 1 - Project Location.mxd - sierra.marrs - 10/19/2022 - 3:37:33 PM



KEY

PIER DREDGE AREA

LEGEND

EXISTING 2' ELEVATION (PROPOSED DIVISION BETWEEN UPLAND EXCAVATION AND IN-WATER DREDGING)

EXISTING ORDINARY HIGH WATER MARK (EL. 16.5' - COLUMBIA RIVER DATUM)

PROPOSED ORDINARY HIGH WATER MARK (EL. 16.5' - COLUMBIA RIVER DATUM)

EXISTING GRADE

PROPOSED GRADE

NOTE: FIGURE ENCOMPASSES DMMUs CS1-A AND CS1-B.

ZONE A (SURFACE UNIT) (6,900 CY) (DMMU CS1-A)

ZONE B (SUBSURFACE UNIT) (3,600 CY) (DMMU CS1-B)

FEATURES TO BE REMOVED

CUT (WATERWARD OF EXISTING OHWM)(CONTINUED ON FIGURE 9) (5,200 CY - TOTAL)

FILL (WATERWARD OF EXISTING OHWM)(CONTINUED ON FIGURE 9) (2,500 CY - TOTAL)

AREA CURRENTLY ABOVE OHWM TO BE REGRADED AND SUBJECT TO ANTI-DEGRADATION EVALUATION

GEORGIA-PACIFIC CONSUMER OPERATIONS LLC

Tetra Tech

TETRA TECH

PROJECT
IN-WATER/OVERWATER REMOVALS PROJECT
CAMAS, WASHINGTON

TITLE
PRELIMINARY GRADING PLAN
DOCK WAREHOUSE PIERS
PLAN VIEW

DATE
JANUARY 2023

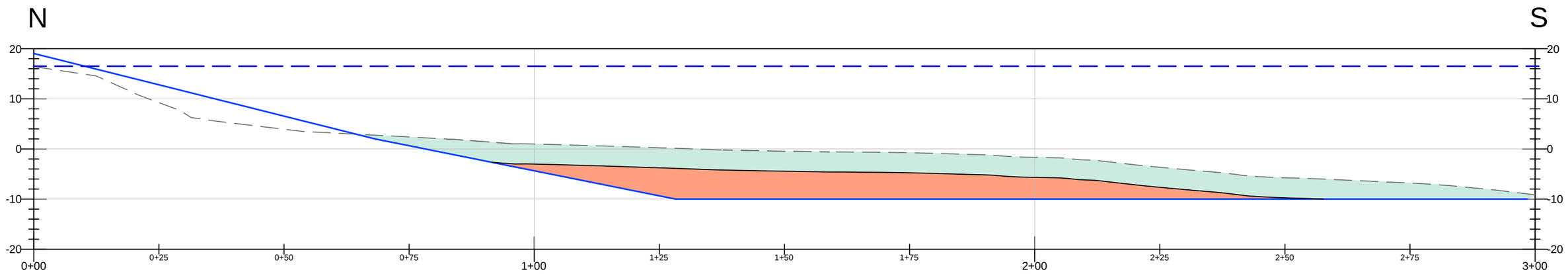
SCALE
AS SHOWN

PROJECT NO.

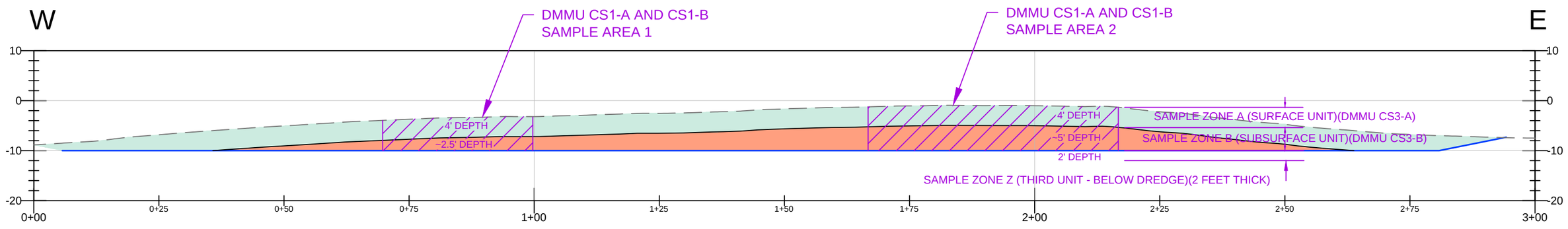
FIGURE
2

DRAWN BY: APS CHECKED BY: KD

C:\Users\adam.stenberg\appdata\local\temp\AcPublish_14208\GP-Camas-WaterDemoDesign-C-drawings_113020r.dwg - Figure 8A_Tier1-DockWarehouse - Dec. 22, 2020 9:28am - adam.stenberg



CROSS SECTION N-S



CROSS SECTION W-E

CROSS SECTION LEGEND

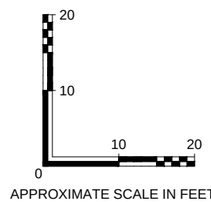
- ORDINARY HIGH WATER MARK (EL. 16.5' - COLUMBIA RIVER DATUM)
- EXISTING GRADE
- DREDGING EXTENT

CAMAS SLOUGH - DMMU CS3 DETAIL

SAMPLED WITH TWO CORES.
SUBSAMPLES TAKEN FROM
ZONES A & B DEPTHS AND
COMPOSITED FOR 3 ANALYSES.

KEY

- ZONE A (SURFACE UNIT) (6,900 CY)
- ZONE B (SUBSURFACE UNIT) (3,600 CY)



APPROXIMATE SCALE IN FEET

CLIENT: GEORGIA-PACIFIC CONSUMER OPERATIONS LLC	TETRA TECH	PROJECT: IN-WATER/OVERWATER REMOVALS PROJECT, CAMAS, WASHINGTON	DATE: JANUARY 2023
Tetra Tech			SCALE: AS SHOWN
		TITLE: DOCK WAREHOUSE PIERS DREDGE PRISM CROSS SECTIONS	PROJECT NO.
			FIGURE: 3

DRAWN BY: PM CHECKED BY: JKH

C:\Users\adam.stenberg\Documents\PS18200620\DredgePrisms\tier1-Figures\GP Camas-Tier1-DredgePrisms_120920.dwg - Figure 8B_DockDredge (3) - Dec. 20, 2020 1:29pm - adam.stenberg

LEGEND

- EXISTING 2' ELEVATION (PROPOSED DIVISION BETWEEN UPLAND EXCAVATION AND IN-WATER DREDGING)
- EXISTING ORDINARY HIGH WATER MARK (EL. 16.5' - COLUMBIA RIVER DATUM)
- PROPOSED ORDINARY HIGH WATER MARK (EL. 16.5' - COLUMBIA RIVER DATUM)
- EXISTING GRADE
- PROPOSED GRADE

KEY

- CUT (WATERWARD OF EXISTING OHWM)(CONTINUED ON FIGURE 8A) (5,200 CY - TOTAL)
- FILL (WATERWARD OF EXISTING OHWM)(CONTINUED ON FIGURE 8A) (2,500 CY - TOTAL)
- AREA CURRENTLY ABOVE OHWM TO BE REGRADED AND SUBJECT TO ANTI-DEGRADATION EVALUATION
- PIER DREDGE AREA (10,500 CY)
- FEATURES TO BE REMOVED

MATCHLINE FIGURE 8A

PECO DOCK

PECO CRANE

RAILS

RAILS

CAMAS SLOUGH

0 40 80

APPROXIMATE SCALE IN FEET

DRAWN BY: APS CHECKED BY: KD

C:\Users\adam.stenberg\appdata\local\temp\AcPublish_14208\GP-Camas-WaterDemoDesign-C-drawings_113020r.dwg - Figure 9_Tier1-PecoGrading - Dec. 22, 2020 9:34am - adam.stenberg

CLIENT GEORGIA-PACIFIC CONSUMER OPERATIONS LLC		PROJECT IN-WATER/OVERWATER REMOVALS PROJECT CAMAS, WASHINGTON	DATE JANUARY 2023
	TETRA TECH		SCALE AS SHOWN
Tetra Tech		TITLE PRELIMINARY GRADING PLAN PECO DOCK	PROJECT NO.
			FIGURE 4

APPENDIX A: HEALTH AND SAFETY PLAN
(TO BE SUBMITTED WITH FINAL PLAN TO DMMO)

APPENDIX B: AQUATIC SPECIES DECONTAMINATION PROCEDURES

Tetra Tech Inc.
19803 North Creek Pkwy
Bothell, WA 98011

Standard Operating Procedure to Mitigate the Movement of Marine Invasive Species Through Boat and Equipment Decontamination

Purpose

This document references and outlines procedures to mitigate potential movement of marine invasive species between bodies of water, within the State of Washington and other states, and the Hood Canal where NAVBASE Bangor, Bremerton, WA, is located.

Roles

While it is the responsibility of all Tetra Tech staff to oversee the proper decontamination of boats and equipment between movements, the hierarchy of management is as follows:

1. **Captain** – One of Tetra Tech's USCG licensed captains will conduct or oversee and sign off on the decontamination effort.
2. **Surveyor** – Survey/Science staff may participate and assist the captain during decontamination effort.
3. **Warehouse Manager** – It is the responsibility of the Warehouse Manager to maintain a clean storage space for boats and equipment and to catalog the need for boats and equipment to be decontaminated.

Procedure

Tetra Tech will deploy vessels and sediment sampling equipment which have been stored on land and not moved directly from one body of water to another. In accordance with the Washington Department of Fish and Wildlife (WDFW) methods for preventing the spread of invasive species (Attachment 1) and as further defined in WDFW Invasive Species Management Protocols Part II Section C (Attachment 2), Tetra Tech will carry out Level 2 Decontamination Protocol. The steps for Level 2 protocol, are as follows:

1. **Clean** - Using a sturdy bristle brush, all boats and equipment will be cleaned using potable water. Following cleaning, the brush will be thoroughly rinsed as well. Additional cleaning tools for include a boot pick or other device for removing visible traces of sediment or other debris collected from previously entered water bodies.
    a. Whenever possible, Tetra Tech will perform Level 2 Decontamination immediately upon exit from the area.
    b. For the NAVBASE Bangor project decontamination will be conducted prior to the boat(s) and equipment being mobilized to Hood Canal, WA.
2. **Drain** – All boats and equipment will be given adequate time to drain and dry not less than 48 hrs prior to redeployment. Boats and other sealed equipment will be left unplugged when possible to ensure thorough evacuation
3. **Rinse** – Boats and equipment will be rinsed with potable water following cleaning and draining.
4. **Dry** – Let boats and equipment fully dry for 48 hrs or more.

Tetra Tech Inc.
19803 North Creek Pkwy
Bothell, WA 98011

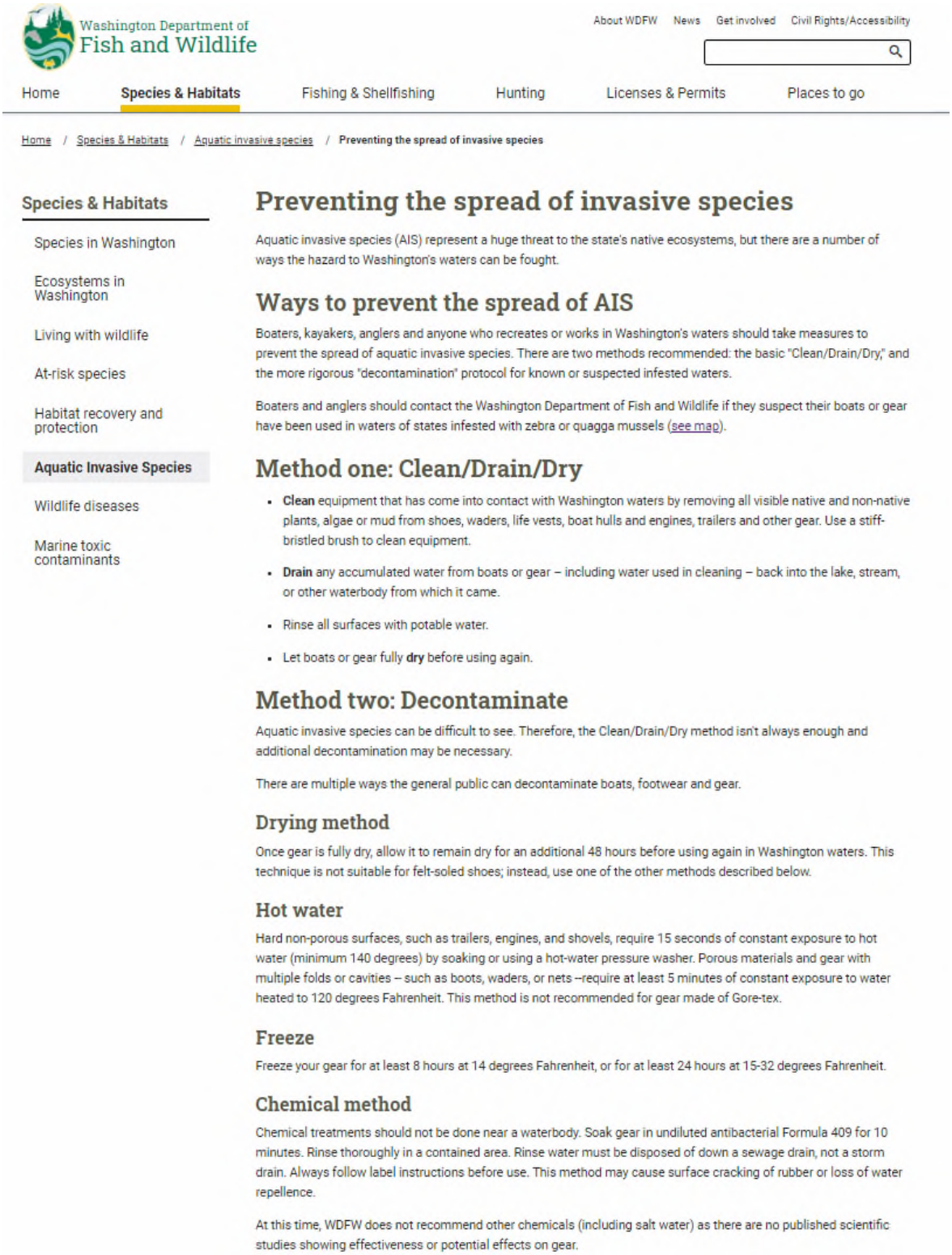
May 2021

Tetra Tech Inc.
19803 North Creek Pkwy
Bothell, WA 98011

Attachment 1
WDFW Preventing the Spread of Invasive Species

May 2021

Tetra Tech Inc.
19803 North Creek Pkwy
Bothell, WA 98011



Washington Department of Fish and Wildlife

About WDFW | News | Get involved | Civil Rights/Accessibility

Home | Species & Habitats | Fishing & Shellfishing | Hunting | Licenses & Permits | Places to go

Home / Species & Habitats / Aquatic invasive species / Preventing the spread of invasive species

Species & Habitats

- Species in Washington
- Ecosystems in Washington
- Living with wildlife
- At-risk species
- Habitat recovery and protection
- **Aquatic Invasive Species**
- Wildlife diseases
- Marine toxic contaminants

Preventing the spread of invasive species

Aquatic invasive species (AIS) represent a huge threat to the state's native ecosystems, but there are a number of ways the hazard to Washington's waters can be fought.

Ways to prevent the spread of AIS

Boaters, kayakers, anglers and anyone who recreates or works in Washington's waters should take measures to prevent the spread of aquatic invasive species. There are two methods recommended: the basic "Clean/Drain/Dry," and the more rigorous "decontamination" protocol for known or suspected infested waters.

Boaters and anglers should contact the Washington Department of Fish and Wildlife if they suspect their boats or gear have been used in waters of states infested with zebra or quagga mussels (see map).

Method one: Clean/Drain/Dry

- **Clean** equipment that has come into contact with Washington waters by removing all visible native and non-native plants, algae or mud from shoes, waders, life vests, boat hulls and engines, trailers and other gear. Use a stiff-bristled brush to clean equipment.
- **Drain** any accumulated water from boats or gear – including water used in cleaning – back into the lake, stream, or other waterbody from which it came.
- Rinse all surfaces with potable water.
- Let boats or gear fully **dry** before using again.

Method two: Decontaminate

Aquatic invasive species can be difficult to see. Therefore, the Clean/Drain/Dry method isn't always enough and additional decontamination may be necessary.

There are multiple ways the general public can decontaminate boats, footwear and gear.

Drying method

Once gear is fully dry, allow it to remain dry for an additional 48 hours before using again in Washington waters. This technique is not suitable for felt-soled shoes; instead, use one of the other methods described below.

Hot water

Hard non-porous surfaces, such as trailers, engines, and shovels, require 15 seconds of constant exposure to hot water (minimum 140 degrees) by soaking or using a hot-water pressure washer. Porous materials and gear with multiple folds or cavities – such as boots, waders, or nets --require at least 5 minutes of constant exposure to water heated to 120 degrees Fahrenheit. This method is not recommended for gear made of Gore-tex.

Freeze

Freeze your gear for at least 8 hours at 14 degrees Fahrenheit, or for at least 24 hours at 15-32 degrees Fahrenheit.

Chemical method

Chemical treatments should not be done near a waterbody. Soak gear in undiluted antibacterial Formula 409 for 10 minutes. Rinse thoroughly in a contained area. Rinse water must be disposed of down a sewage drain, not a storm drain. Always follow label instructions before use. This method may cause surface cracking of rubber or loss of water repellence.

At this time, WDFW does not recommend other chemicals (including salt water) as there are no published scientific studies showing effectiveness or potential effects on gear.

Sourse: [Preventing the spread of invasive species | Washington Department of Fish & Wildlife]

Tetra Tech Inc.
19803 North Creek Pkwy
Bothell, WA 98011

Attachment 2
WDFW Invasive Species Management Protocols*

*Draft Version 3, February 2016, has been confirmed as WDFW current document in May 2021.

May 2021

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

Invasive Species Management Protocols

DRAFT Version 3

February 2016

WDFW Invasive Species Management Committee:
Bill Tweit, Allen Pleus, Dave Heimer, Marc Hayes, Carl Klein, John Kerwin, Jesse Schultz, Larry Phillips, Bill Hebner, Annette Hoffmann, Mike Schmuck, Stacie Kelsey, and Rachel McDaniel

Table of Contents

INTRODUCTION 2
A. Policy Background 2
B. Adaptive Management 2
C. Phase In and Funding Constraints 2

PART I. PROTOCOLS FOR FIELD WORK IN TERRESTRIAL AREAS 3
A. Internal Consultation/Approval 3
B. Protocols for Purchasing Hay 3
C. Protocols for Purchasing Seeds and Rootstock for Revegetation 4

PART II. PROTOCOLS FOR FIELD WORK ON ALL WATERS 5
A. Geographic Management Areas 5
Freshwater Ecosystems 5
Marine and Estuary Ecosystems 5
B. Decontamination Protocols – General Precautions 5
C. Level 1 Decontamination Protocol – Basic 6
In General 6
Level 1 Decontamination Equipment 6
D. Level 2 Decontamination Protocol – High-Risk Situations 7
In General 7
Virkon Aquatic Treatment 7
Hot Water Treatment 8
Freezing Treatment 8
Formula 409 Solution Treatment 9
E. Special Situations 9
Felt Soled Waders/Boots 9
Wading Wet 9
Boats and Other Large Aquatic Conveyances Transported Overland 10
Moored Boats and Other Typically Stationary Large Aquatic Conveyances 10
Nets 11
Vehicles 11
Fish Tankers 11
Heavy Equipment When Used in Aquatic Environments 12
Stream Restoration Guidelines 12
Diving Equipment 12

INTRODUCTION

A. Policy Background

Policy 5310, Managing Invasive Species, commits the Department to "adopt and actively maintain science-based protocols for minimizing the risk that field and property management activities will contribute to the spread of invasive species." The accompanying Procedure established the Invasive Species Management Committee (ISMC), with responsibility for developing and updating these protocols, monitoring their implementation, and ensuring that training needs are met.

B. Adaptive Management

The ISMC relies upon best available science in developing these decontamination protocols. However, the science regarding effectiveness of decontamination protocols (either chemicals or procedures) on the entire suite of undesirable or invasive aquatic organisms remains incomplete. In particular, protocols known to be effective on selected undesirable organisms remain untested or poorly understood on others. Ultimately, science can adaptively fill these gaps. However, where effectiveness of a protocol on a specific undesirable organism is unknown and alternatives for control are lacking, protocol application must be viewed as exploratory and experimental, and control is not guaranteed. The ISMC will keep abreast of scientific developments, as well as monitoring implementation issues, and will adaptively modify these protocols as necessary to ensure they remain science-based, effective and safe.

C. Phase In and Funding Constraints

Policy 5310 stipulated that "Fiscal impacts may be phased in based on available revenue." Full implementation of these protocols, in terms of purchase of materials and establishing proper decontamination stations, may take several years. However, all staff are expected to comply with these protocols to the extent feasible, within existing budget and staff constraints. Basic techniques of Clean, Drain and Dry can be followed at little or no additional cost to the agency and should be implemented immediately. Much of this is already required by existing statutes prohibiting transport of aquatic plants, noxious weeds or prohibited aquatic animal species.

PART I.
PROTOCOLS FOR FIELD WORK IN TERRESTRIAL AREAS

A. Internal Consultation/Approval

1. When any acquisition, habitat enhancement/restoration, or construction projects are proposed, the Regional Director will be notified to disseminate the information to ensure that staff can review for invasive species management issues.
2. Before conducting field work, determine whether those activities will occur in an area with invasives, and ensure that work plan allows for suitable decontamination and that appropriate decontamination equipment is available.
3. On Department lands, follow the requirements of the local Weed Management Plan located in the Wildlife Area Management Plan specific to that site. Consult with the Wildlife Area Manager or Access Site Manager prior to conducting of field work.
4. On other public lands, determine whether any local requirements exist and comply with those rules.
5. Employ basic weed-free precautions prior to entering the field by ensuring equipment, vehicles and clothing are free of invasives. Regularly check clothing and boots for attached weed seeds, remove them immediately to avoid distributing to new areas. Before exiting the field, visually inspect clothing and vehicles for plant hitchhikers and remove. Carry zip lock bags for this purpose, and dispose of them where they will not get reintroduced into the environment. Thoroughly wash vehicles in a contained area before moving to a new site, paying special attention to the flooring, undercarriage, grill and wheel wells.
6. Ensure that any wildlife translocation or relocation efforts comply with pathogen/disease screening criteria[1].
7. Observe special precautions for field work at bat roosts/caves (for example, where white-nose syndrome may be present) and other special circumstances[2].

B. Protocols for Purchasing Hay

Hay purchased for wildlife feeding must meet certain nutritional requirements and be available in bale sizes that are compatible with agency feeding equipment. To reduce the risk of introducing weeds through hay, the following procedure should be followed:

1. Feed certified weed-free hay when available with a target of using 50% weed-free hay for wildlife feeding operations by 2017. In addition, *weed-free* hay should be free of other weeds that are not currently listed as “noxious weeds” but pose a threat to agency lands (e.g. *Ventenata dubia*, cheatgrass, etc.).
2. Hay that is not certified weed-free must include bid and contract language addressing noxious weeds/unwanted plants. Bales, or hay fields that do not

[1] Contact Kristin Mansfield (WDFW Veterinarian) 509-892-1001 Ext 326, Kristin.Mansfield@dfw.wa.gov.

[2] Decontamination protocols for white nose syndrome available at: http://www.fws.gov/WhiteNoseSyndrome/Research.html

meet the standards will be cause for terminating the contract and rejecting the hay.
3. Feeding of wildlife will occur in established feed sites to reduce the potential spread of weeds to wild lands. These feed sites will be surveyed and treated annually for new weeds.

C. Protocols for Purchasing Seeds and Rootstock for Revegetation

The agency purchases seeds and rootstock to implement restoration/enhancement, plant forage crops and as an element of construction projects. Eliminating noxious weeds seeds and propagules in vegetation purchased by the agency will help reduce the potential for infestations on agency and adjacent lands. Revegetation plantings will be consistent with ecological integrity goals and objectives identified for the site. To accomplish this, the following procedure should be followed:

1. Purchase native plant seeds and rootstock adapted to the project area, when appropriate.
2. Ensure that the bid and contract language for seeds and rootstock meet quality standards for noxious weeds/unwanted plants; pathogens; or disease. Request appropriate certification documentation when applicable.
3. Restoration/enhancement and agricultural fields must be revisited and treated for weeds.
4. Refer to the *WDFW Restoration Manual* (currently in draft), *Landscaping for Wildlife in the Pacific Northwest*, and *PNW Weed Management Handbook* for information regarding planting and weed control.

PART II.
PROTOCOLS FOR FIELD WORK ON ALL WATERS

A. Geographic Management Areas

Freshwater Ecosystems – Management areas are based on Watershed Resource Inventory Area (WRIA) boundaries as follows:
Level 1 Decontamination protocols are required whenever moving from one waterbody to another, regardless if in the same WRIA.
Level 2 Decontamination is required whenever:

- Moving across WRIA boundaries, or
- When leaving known infested waters, or
- Before entering protected or highly sensitive sites, or
- When moving between still-water habitats (lakes, marshes or ponds) that have no surface water connection to streams or other aquatic habitats.

Each region is responsible for reviewing the WRIA boundaries, and determining whether additional delineation to the sub-basin level is necessary: either to contain known infestations or to protect vulnerable ecosystems or native populations. Maps delineating WRIA boundaries are available on the WDFW website image gallery[3] or on the SalmonScape website[4]. Sub-basin boundaries will be available on maps on the agency intranet.

Marine and Estuarine Ecosystems - Level 1 Decontamination is required whenever moving from one waterbody to another, regardless if in the same WDFW marine area. See Special Protocols section for moored boats and other typically stationary large aquatic equipment. Level 2 Decontamination is required whenever equipment or vessels are transported between:

- Major oceanographic basins (Outer coast and Strait of Juan de Fuca, Georgia/Haro Strait, Hood Canal, South Puget Sound, and North/Central Puget Sound), or
- When moving from known infested waters (eg., based on local knowledge, as available on the agency AIS website, or other sources), or
- Before entering protected or highly sensitive areas.

B. Decontamination Protocols – General Precautions

In General - All staff are encouraged to apply basic precautionary principles to control invasive species including:

[3] http://wdfw.wa.gov/gallery/index.php/Maps/album28

[4] http://fortress.wa.gov/dfw/gispublic/apps/salmonscape/default.htm

1. Prevent/Minimize - Field staff should be aware of infestations in their management areas and assess whether in-water work is necessary. If in-water work is unavoidable:
    - Arrange sampling plans to progress from the least to the most likely to be contaminated areas within a waterbody.
    - Sample from upstream to downstream in a watershed or from areas of less weed growth to dense weed growth.
    - Minimize wading and avoid running boats into sediment.
    - Consider using bank sampling poles instead of wading.
    - Consider purchase of wading gear and boots with the fewest places for organisms and debris to become attached. Best are one-piece systems with full rubber material and open cleat soles. Riskiest are the multi-piece wading systems with fabrics, detachable boots and felt soles. Mud/rock guards are recommended for all stocking-foot wades to minimize contamination on inside surfaces.
    - Reduce the amount of plants, sediment, or organisms that are removed from the water into boats or sampling gear.
    - Get in the habit of regularly inspecting and cleaning gear while working.
2. Dedicated equipment - When working in infested water bodies, field staff should maintain unique sets of dedicated equipment and clothing such as waders, nets, and other sampling tools to prevent the transfer of AIS to uncontaminated areas. Dedicated equipment does not need to be cleaned or decontaminated after each use if labeled and kept isolated from other equipment to avoid cross-contamination. Dedicated equipment must be decontaminated prior to use in another water body.

C. Level 1 Decontamination Protocol - Basic

In General - The basic steps in decontamination for all types of gear and equipment in all situations are Clean, Drain, and Rinse. Immediately upon leaving a water body, clean off any attached sediment, organisms or debris from surface areas that were in contact with the water, the bottom or the wetted perimeter. You can use local water source to help remove heavy deposits. Drain any water back into the water body from which it came. Rinse all surface areas with potable water. Equipment that comes into contact with a water body must also be decontaminated including stadia rods, measuring tapes, backpack shockers, temperature loggers, etc.

Level 1 Decontamination Equipment - The basic Level 1 Decontamination cleaning equipment is a sturdy bristle brush, a boot pick, and potable rinse water. After exiting the water, remove debris from waders/boots and raingear. Clean thoroughly, especially the often complex gripping soles that tend to gather material. When decontaminating multi-piece gear, it is critical to remove attachments and boots to allow for full cleaning coverage. Once all debris has been removed, rinse off equipment with potable rinse water. Rinse water can be kept in a 3-5 gallon (10.5-17.5 L) water tank in your field vehicle (e.g., water cooler, pressurized tank sprayer; solar shower).

Level 1 Decontamination that is conducted immediately after leaving the water does not require any further containment of rinse liquids or removed debris. If the Level 1 procedures cannot be done in the field, gear must be placed in a plastic bag or tote for transportation to a proper decontamination station.
Note on Scrub Brush: Once you have completed a Level 1 Decontamination on field gear, clean and rinse the brush as well. If conducting a Level 2 Decontamination, make sure you include the brush at the end.

D. Level 2 Decontamination Protocol - High Risk Situations

In General - Level 2 Decontamination treatments are designed to kill/eradicate invasive species. Level 1 Decontamination protocols must be conducted prior to starting Level 2 protocols to ensure the effectiveness of the Level 2 treatments. The use of physical and chemical treatments for Level 2 Decontamination is based on best available science and best professional judgment. Criteria for each treatment are applicable to gear or equipment types as noted. Protocols for each treatment are footnoted to identify the scientific literature the method follows and the species of organisms for which it was tested.
Field gear must be decontaminated every day (excluding gear used solely in one water body or sub-basin, which is a recommended approach for minimizing risk of transmission). When decontaminating multi-piece gear, it is critical to remove attachments and boots to allow for full exposure to all potentially contaminated surfaces. Chemical agents or physical treatments must maintain contact with the entire surface for the duration of the treatment to be effective. Exposure times start when equipment is fully saturated or reaches appropriate temperatures. Safety glasses and waterproof gloves are required for all treatments except freezing.

Virkon® Aquatic Solution Treatment - This is the Level 2 Decontamination **Agency-Preferred Method** for most gear and species:

- Decontamination for bacteria and viruses (micro-organisms) requires soaking gear thoroughly with 1% solution so that it is completely saturated for a minimum of 10 minutes[5].
- Decontamination for larger aquatic organisms such as New Zealand Mudsnails and zebra/quagga mussels requires soaking gear thoroughly with 2% solution so that it is completely saturated for a minimum of 20 minutes[6].
- Rinse thoroughly in a contained area and dispose of rinse water down a sewage drain, not a storm drain.

[5] Criteria based on Johnson et al. 2003 (Chytrid fungus), VESO 1991, Frerichs 1990, Hellstrom and Johansson 1990, Bennett 1997, and Rainnie 2002 on multiple fish bacteria and viruses – NOT tested on whirling disease.

[6] Stockton 2011 for eradicating New Zealand mudsnails and quagga mussels in fish hatcheries.

Note on Mixing and Use of Virkon® Aquatic - Must be mixed in a well-ventilated area, preferably outdoors. A splash apron, gloves and safety goggles must be used. The powder should be mixed with clean water according to the dilution instructions for a 1% or 2% solution. Do not apply the powder directly on the surface you are trying to disinfect. Mix the solution in a clean container of known volume. Measure the correct amount according to the dilution table (1 quart, 1 gallon, 10 gallons or 50 gallons). Refer to the Virkon® Aquatic instructions and MSDS sheets for further information. Information can also be obtained by going to:
http://www.wchemical.com/VIRKON-AQUATIC-P44C11.aspx

Virkon® Aquatic solutions can last up to seven days or more and will need to be checked regularly. Test strips can be purchased to test your solution. Not known to damage gear or equipment materials. Wear protective gear, eye protection and gloves, when using.

Hot Water Treatment[7] – Hot water treatment can be by soaking or applying with a hot water pressure washer. A hot water pressure washer capable of 140°F (60°C) is currently available at every regional office. Note: 140°F (60°C) and higher temperatures cannot be achieved using most hot water heaters that are installed for domestic uses, which should be kept at 120°F to avoid burns.

- Hard non-porous surfaces require constant exposure for a minimum of 140°F (60°C) at a minimum of fifteen (15) seconds.
- Porous materials and gear with multiple folds/cavities require constant exposure at a minimum of 140°F (60°C) for a minimum five minutes or at 120°F (49°C) for a minimum of 30 minutes.
- If whirling disease is a possibility, you must use at a minimum of 167°F (75°C) for a minimum of five minutes.

CAUTION: These temperatures can burn exposed skin. Do not use this method for Gortex or other materials cannot hold up to high temperatures.

Freezing Treatment[8] - Expose gear to 14°F (-10°C) or colder for a minimum of 8 hours or 15°F to 32°F (-9°C to 0°C) for 24 hours. If gear has been used in marine or estuary situations, rinse thoroughly in freshwater before freezing. Do not use for whirling disease or fish virus decontamination.

[7] Maximum temperatures based on Johnson et al. 2003 under laboratory conditions for Chytrid fungus. Supports other decontamination studies for juvenile and adult New Zealand Mudsnails, zebra and quagga mussels, and Didymo species by Medhurst 2003, Morse 2009, and USFS Fire Guidance 2008 respectively. Whirling disease criteria from Wagner et al. 2003.

[8] Minimum temperatures based on Bergendorf 2004 for adult New Zealand Mudsnails and Kilroy et al. 2006 for Didymo. Using conservative criteria as literature studies show high variability in effectiveness. Effectiveness of freezing for whirling disease questioned by Hedrick et al. 2008 as may not completely inactivate cells.

Formula 409® Solution Treatment[9] – Must use anti-bacterial version. Expose gear thoroughly to 100% solution for a minimum of 10 minutes. Rinse thoroughly in a contained area. Rinse water must be disposed of down a sewage drain, not a storm drain.

E. Special Protocols

Felt Sole Waders/Boots - Felt soles are one of the largest risk factors for transmission of invasive species since they are extremely difficult to decontaminate fully. Consequently, WDFW policy is that all alternatives should be explored before deciding to use felt soles. The primary challenge with decontaminating felt soles is the porosity and depth of the material making it very difficult for treatments to effectively decontaminate throughout the porous matrix. For this reason, chemical decontamination treatments are inadequate for this protocol and exposure times for hot water must be sufficient to ensure that target temperatures are attained throughout the porous matrix. Some manufacturing companies are also phasing out felt-sole boots from their lines and offering rubber sole/cleat combinations in their place.

Felt sole waders/boots may only be used under the following conditions:

1. With the approval of the Program AD, based on their determination that no other suitable alternatives exist.
2. The **Agency Preferred Method** is that staff use dedicated felt sole waders/boots within an area of known infested waters not to exceed a single WRIA. A Level 1 Decontamination must still be conducted between uses.
3. If felt sole waders/boots must be used between different known infested waters within the same WRIA or between different WRIAs, a Level 2 Decontamination must be conducted using one of the following treatments[10] (NOT suitable for Whirling Disease or fish viruses):
    - Hot water treatment[11] using standard soaking in constant 120°F (49°C) for a minimum of 30 minutes protocol; or
    - Freezing treatment using standard protocols.

Wading "Wet" - Any gear or clothing that gets wet from a water body are potential vectors for spreading invasive species. Crews that prefer not to wear regular wading

[9] Criteria based on Schisler et al. 2008 on adult New Zealand Mudsnails only. No data on effectiveness for other species.

[10] Based on Kilroy et al 2006. Studies on the survivability of the invasive diatom Didymosphenia geminate under a range of environmental and chemical conditions. NIWA Client Report CHC2006-116. For Biosecurity New Zealand. 110p. Revised May 2007. http://www.biosecurity.govt.nz/pests/didymo/cleaning

[11] Unsure of effects of higher temperatures on glue used to adhere felt to boot, but if ≥ 140°F (60°C) treatment applied, must be for a minimum of 10 minutes (best professional judgment) to allow full penetration.

gear must launder their clothing for decontamination.

Boats and Other Large Aquatic Conveyances Transported Overland - State law requires that boats and other trailered equipment used in an aquatic environment should be free of aquatic animals and plants whenever removed from a water body in order to avoid transport of invasive species to a new water body[12].

When removing or before transporting boats and other large aquatic equipment:

1. Conduct a Level 1 Decontamination. This is required every time you remove the boat from a body of water. No exceptions. Thoroughly inspect both the equipment and trailer for attached or loose organisms such as weeds, algae, barnacles, mussels, snails, etc. A hand mirror and flashlight are important tools to help you see into otherwise hard to reach areas. Scrape or otherwise remove all organisms and put into a secure trash receptacle for upland disposal.
2. Pull drain plug at the boat ramp. Drain all water in bilges and live wells that could hold water from the site and rinse with tap water. Reinsert the drain plug unless you have a good system for remembering before re-launching!
3. If Level 2 Decontamination is indicated, using a self-service commercial car wash with hand operated pressure wands, pressure wash boat and trailer inside (deck or internal areas that get contaminated with aquatic debris) and out. Make sure you wash out raw water storage areas, get behind and under trim tabs, engine mounts and raw water intake ports. Use the hot water and soap setting. OR;
4. Use a department hot water pressure washer to apply constant exposure at a minimum of 140°F (60°C) for a minimum of fifteen (15) seconds on hard/non-porous surfaces; and
5. Flush engine cooling system with fresh tap water at 140^0F (60°C) for a minimum of 5 minutes, or at ambient temperature for 10 minutes – no chemicals, if hot water is not available.
6. Cross-Rinsing Not Allowed. Taking a boat or equipment from a marine environment into a freshwater environment or from a freshwater to a marine environment without decontaminating does not meet decontamination requirements and is not allowed.

Moored boats and other typically stationary large aquatic equipment - Boats and other large aquatic equipment shall not be transported on the water between different WRIAs on larger rivers or lakes, or major oceanographic basins (described above) until a thorough inspection ensures that no aquatic organisms are attached to the hulls, docks, nets, or other submerged equipment being moved. Boats that travel between different ecological regions frequently must have their hulls, running gear, and other niche areas (water intakes, prop shaft, trim tabs, etc.) cleaned using the protocols above on at least a quarterly basis or more often during high growth periods.

[12] RCW 77.15.253 and 77.15.290

As with boots, nets and other gear, dedicating boats to a body of water is a desirable approach. However, even boats that remain in a single body of water should be checked quarterly as described above to minimize hull fouling.

Nets - When possible use water-body specific nets and gear. If this is not possible, nets must be decontaminated before use in a new area. If possible, before leaving the sampling area, hang or stretch the net, and use a pressure washer and hand-picking to remove excess mud, debris and plant matter. If field decontamination is not possible or effective, upon return to the office, or before deploying at another sampling location in a different water body, follow the decontamination guidelines for waders/boots above and either hang the nets to allow clear access to all parts, or soak it in a large tub that allows the solution to fully penetrate the material before starting minimum exposure time.

Vehicles - Determine which vehicles will be used in bodies of water (i.e., hatchery trucks that have to back down into the water to off load fish). Also determine which vehicles will be moving in between established geographic sampling areas. Follow protocols for aquatic conveyances transported overland, including determination whether a Level 1 or 2 Decontamination is indicated.

Fish Tankers - It is vital that fish transfer tanks be disinfected when used between watersheds. Liquid chlorine bleach, which is available in several concentrations, is the preferred disinfectant for this use. Chlorine in solid form is also an effective disinfectant, but is difficult to dissolve completely and has high human health risks, and therefore not recommended. To properly disinfect tankers, use the following protocol.

1. Fill the tanker approximately half full with water at the shipping station. Add enough liquid chlorine bleach to achieve a 20-ppm active ingredient solution (30 ppm if water is noticeably dirty or discolored), Table 1.
2. Recirculate this solution for at least 10 minutes in the tanker and fish pump so that all surfaces are wetted.
3. Following recirculation add the appropriate amount of sodium thiosulfate, (Table 1.) to the tanker and circulate another 10 minutes to neutralize the chlorine and make it safe to discharge.
4. As a precaution, prior to discharge, check the water in the tanker with a test kit to make sure the chlorine is COMPLETELY neutralized.
5. Empty the tank where the discharged water will not contact fish.
6. Rinse thoroughly and refill with clean uncontaminated water for fish hauling.

Table 1. Chemical quantities required for tanker disinfection.

TANKER SIZE IN GALLONS	AMOUNT OF WATER	AMOUNT OF 12% BLEACH FOR 20 PPM	AMOUNT OF 12% BLEACH FOR 30 PPM	POUNDS OF SODIUM THIOSULFATE TO NEUTRALIZE 20 PPM[1] / 30 PPM
6000	3000 gal.	1811 ml	2717 ml	3.8 / 5.7
2500	1250 gal.	764 ml	1160 ml	1.6 / 2.4
1800	900 gal.	566 ml	849 ml	1.1 / 1.7
1000	500 gal.	311 ml	481 ml	0.6 / 0.9

[1] 5.6 grams sodium thiosulfate per 10 gallons of 20-ppm chlorine.

Heavy Equipment when used in water - To be added later.

Stream Restoration Guidelines - To be added later.

Diving Equipment - To be added later.

PART III.
CONDITIONS FOR AQUATIC INVASIVE SPECIS MANAGEMENT ON DEPARTMENT HYDRAULIC PROJECT APPROVAL (HPA), SCIENCE COLLECTION (SCP), AND AIS MONITORING OR CONTROL PERMITS IN ALL WATERS

A. All HPA conditions provided herein meet protection of fish life criteria under RCW 77.55.021(7). The conditions address the threat of detected and undetected aquatic invasive species (AIS) that have the potential to negatively affect fish life by direct or indirect factors including predation, food source competition, habitat displacement, and transmission of diseases and pests.

B. AIS management requirements apply to all gear, equipment, organic and inorganic materials that have come into contact with raw water at another location prior to use in a new location, or come into contact with raw water at the current work location. The following definitions apply:

1. "Raw water" as defined under RCW 77.135.010 means "water from a water body and held on or within property…[but] does not include water from precipitation that is captured in a conveyance, structure, or depression that is not intended to function as a water body, or water from a potable water supply system, unless the water contains visible aquatic organisms."
2. "Water body" as defined under RCW 77.135.010 means "an area that carries or contains a collection of water, regardless of whether the feature carrying or containing the water is natural or nonnatural. Examples include basins, bays, coves, streams, rivers, springs, lakes, wetlands, reservoirs, ponds, tanks, irrigation canals, and ditches."
3. "Gear" means wearable articles such as gloves, boots, raingear, etc.
4. "Equipment" means tools to machinery such as shovels, measuring tapes, backhoes, vehicles, etc.
5. "Organic materials" means mitigation articles such as seeds, dirt, rootstock, natural logs, etc.
6. "Inorganic materials" means construction and structural articles such as silt fencing, culverts, gravel, boulders, treated wood, etc.
7. "Properly dispose" means…

C. To prevent the introduction and spread of AIS into an HPA/SCP work location, or the removal and spread of AIS from a work location:

1. **General provisions** – follow Part I(A) protocols for internal consultation/approval and follow Part II general and applicable special protocols unless further conditioned or waived in permit.

2. **Level 1 decontamination protocols** – applies to all HPA/SCP work locations before arriving at or leaving the site:
   a) Remove all visible dirt and organic debris from gear, equipment (on heavy equipment this includes drive mechanisms, wheels, tires, tracks, buckets and undercarriage), and inorganic materials.
   b) Drain all raw water from site trapped in or on gear, equipment, and inorganic materials.
   c) Rinse all gear, equipment, and inorganic materials with potable water to the greatest extent possible.
   d) Properly dispose of any water used to clean gear, equipment, and inorganic materials.
   e) Refer to Part II(C) for more information.

3. **Level 2 decontamination protocols** – applies to all HPA/SCP work locations identified by the Department under this permit as infested:
   a) Refer to Part II(D) Level 2 Decontamination protocols.
   b) Select and apply preferred treatment method.
   c) Properly dispose of any water and chemicals used to clean gear, equipment, and inorganic materials.

4. **Off-site alternative decontamination plan required (HPA only).**

5. **Organic material protocols (HPA only) -**
   a) Organic materials may be sourced from the HPA work location or from the same uninfested watershed as the work location.
   b) Organic materials sourced from outside (1) should come from dry upland locations or if previously exposed to raw water, have been stored at a dry upland location for a minimum of 3 months unless otherwise conditioned by the Department.
   c) Organic materials should be certified as weed-free where possible.
   d) Follow Part I(C) protocols for purchasing seeds and rootstock for revegetation.
   e) No organic materials collected from a Department-designated AIS infested area may be used at another aquatic work location.

D. To control AIS collected at an HPA/SCP work location -

1. Permit holders are required to humanely euthanize all collected AIS classified as "Prohibited aquatic animal species" under WAC 220-12-090 except as allowed under bullet 5 below for transport purposes.

2. Detection or collection of all Prohibited level 1 species[13] must be reported immediately to WDFW using one of the methods in subpart D below with photos of the species and specimens saved until provided to WDFW or where directed to dispose.
3. Unless otherwise directed by WDFW, all prohibited AIS must be humanely euthanized before being removed from the immediate vicinity of the water body where collected and then disposed of in a public landfill system or chemically preserved.
4. Information on collection (i.e. how, where, number, species, etc), humane euthanizing, and disposal of prohibited AIS must be included in a report submitted to WDFW within 30 days using the online reporting form link under subpart D below.
5. Permit holders may transport live prohibited AIS outside the immediate vicinity of the water body where collected only under the following conditions:
    a. Transport to nearest WDFW regional office or headquarters for purpose of identification; AND
    b. Transported in a secure container to prevent release of either the AIS or any associated water, plant, sediment, animal, or other materials; OR
    c. Transported as authorized by a separate WDFW AIS Permit secured prior to collection.

E. Additional Information -

- Contact WDFW Regional Habitat or other WDFW Biologist listed on HPA or SCP permit
- Online reporting form: www.wdfw.wa.gov/ais/reporting
- Toll-Free reporting phone line: 1-888-933-9247

[13] Includes: Zebra mussels (Dreissena polymorpha), quagga mussels (Dreissena rostriformis bugensis), European green crab (Carcinus maenas), and all members of the genus Eriocheir (including Chinese mitten crab), all members of the walking catfish family (Clariidae), all members of the snakehead family (Channidae), silver carp (Hypophthalmichthys molitrix), largescale silver carp (Hypophthalmichthys harmandi), black carp (Mylopharyngodon piceus), and bighead carp (Hypophthalmichthys nobilis).

APPENDIX C: SAMPLING AREA COORDINATES

Table C1. Sampling Areas – Corner Coordinates

DMMU	Sample Area	NW Corner		NE Corner		SE Corner		SW Corner	
		Northing	Easting	Northing	Easting	Northing	Easting	Northing	Easting
CS-3	1	96,059.3	1,150,783	96,074.0	1,150,809.2	96,030.3	1,150,833.7	96,015.7	1,150,807.5
	2	96,088.7	1,150,880	96,113.2	1,150,923.6	96,087	1,150,938.2	96,062.6	1,150,894.6

Datum: Washington State Plane NAD 83 South US FT.
Note: Actual Sample Location will be recorded.

APPENDIX D: FIELD FORMS

Tetra Tech
CORE LOGGING FORM

Project _____

SAMPLING STATION: _____ Date_____Deployment Time:_____

Core Attempt_____Station Description:_____

DEPTH TO MUDLINE:_____Feet LOCATION: N _____ E _____

Predicted Tide :_____ Water Surface Elevation:_____ Mudline Elevation:_____

TYPE OF CORE ____VIBRACORE_____
MODEL _____ Samplers_____
TUBE LENGTH:_____Feet Tube Type:_____ Liner Type:_____

Core Penetration: _____ (ft below mudline) Recovered Core length:_____ Percent Recovery: _____

Compacted Core sections: _____to_____ _____to_____

Expanded Core sections: _____to_____ _____to_____

NOTES: _____

Length Sample Depth	Description(soil type, color, MC, odor etc)	Other notes, Insitu tests
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Tetra Tech
CORE LOGGING FORM

Project _____

SAMPLING STATION: _____ Date_____

STATION DESCRIPTION:_____

Length Sample Depth	Description(soil type, color, MC, odor etc)	Other notes, Insitu tests
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		