Checklist corresponds with Hydraulics Report Template v2022-10

General Format

[ ]  Table of Contents, Figures, and Tables updated

[ ]  All Figures that require a North Arrow, Flow Arrow, and Scale Bar have them

[ ]  All Figure numbers have been updated in the text

[ ]  All Table numbers have been updated in the text

[ ]  No bookmark errors

[ ]  All highlighted text deleted

[ ]  Footers updated

[ ]  Draft watermark

[ ]  PDF created with bookmarks of headings, so reader can quickly jump between sections

Cover Page

[ ]  SR/MP/Creek Title Correct

[ ]  Cover photograph shows water in the creek channel

[ ]  Names updated

[ ]  Lower right corner title/date/etc. updated

[ ]  Lower left corner submittal type selected from drop down

[ ]  FPT number for all authors (Julie Heilman’s is FTP20-00157)

# Introduction

[ ]  WDFW ID number correct

[ ]  Milepost and State Route correct

[ ]  WSDOT region correct

[ ]  LF habitat gain listed

[ ]  Brief description of what design method was used and why

[ ]  General location described

[ ]  Existing structure type, length, dia./width described

[ ]  Minimum hydraulic opening stated

[ ]  Any design deviations are described

[ ]  Any structure recommendations described or stated that there are none

[ ]  Vicinity Map included

# Watershed and Site Assessment

## Site Description

[ ]  Current reason for barrier status and how does this negatively affect fish habitat

[ ]  Is the crossing a CED/Failing Structure?

[ ]  Maintenance/Repair history (frequency, nature of problem/repairs)

[ ]  Is there any flooding history of the site, surrounding area, what is the extent?

[ ]  Total length of habitat gain

## Watershed and Land Cover

[ ]  Size and location of watershed

[ ]  Major tributaries described

[ ]  Topography described

[ ]  Watershed map included

[ ]  Land cover/land uses table and figure included

## Geology and Soils

[ ]  Geology and soils and their relation to the watershed described

[ ]  Sources for information described

[ ]  If quality of data is sufficient and relevant, discussion how they influence the design

[ ]  Reference to the Geotechnical Scoping memo

## Fish Presence in the Project Area

[ ]  Native fish species table filled out

[ ]  Available data described along with accuracy and completeness

## Wildlife Connectivity

[ ]  Priority described

## Site Assessment

### Data Collection

[ ]  Date of site visit(s) and survey

[ ]  State whether a site visit occurred with WDFW/Tribes

[ ]  Survey extents described

[ ]  Field report summarized and placed in Appendix

[ ]  Summary of data collected (number of bankfull widths, pebble counts, etc.). Refer reader to Section 2.7.2 for bankfull width measurements and Section 2.7.3 for pebble counts.

[ ]  Figure illustrating locations of bankfull widths, pebble counts, and reference reach included

### Existing Conditions

[ ]  Existing structure described (size, type, gradient, condition, alignment, fill depth, relevant history, any drop height at inlet/outlet, size of scour pool, etc.).

[ ]  State whether as-builts were obtained

[ ]  Stream conditions upstream and downstream described

[ ]  Signs of maintenance activity described

[ ]  How the existing conditions are impacting fish life

[ ]  Photographs of the existing conditions provided (inlet, outlet, upstream, downstream, habitat features, etc.)

### Fish Habitat Character and Quality

[ ]  Fish habitat and quality described in the vicinity of the crossing

[ ]  Important habitat related features highlighted (gravels, pools, wood, riparian cover).

[ ]  What species and lifestages are likely using the habitat features adjacent to the crossing

[ ]  Describe type of fish use anticipated in the vicinity of the crossing (spawning, rearing, or migrating)?

[ ]  Channel type and any associated wetlands, estuary function tidal influence, etc.

### Riparian Conditions, Large Wood, Other Habitat Features

[ ]  Vegetation described, including discussion of anticipate possible future tree recruitment

[ ]  Large wood in the system quantified and described (amount, function, etc.)

[ ]  Other channel forming features described

[ ]  Beaver activity or potential for beaver activity discussed

## Geomorphology

### Reference Reach Selection

[ ]  Reference Reach rationale explained and follows WSDOT HM detailed process for how to properly select a reference reach.

[ ]  Reference Reach location described in detail

[ ]  Photographs of reference reach

[ ]  Reference to figure within Section 2.6.1 showing location of reference reach

[ ]  Description of reference reach location good enough that you could find it?

### Channel Geometry

[ ]  Channel planform description

[ ]  Channel cross section description

[ ]  Reference reach slope and what is the slope that should be used as a comparison for design

[ ]  Bankfull width to be utilized for design & minimum structure size, if different, explained why

[ ]  Bankfull width that is agreed upon by WSDOT/WDFW/Tribes

[ ]  Stream width: depth ratio, and channel evolution stage

[ ]  Photographs of where bankfull width was measured that clearly depict channel shape

[ ]  Survey sections of the existing channel in a representative reach (state where data is from)

[ ]  Bankfull width measurement table completed

#### Floodplain Utilization Ratio

[ ]  Explained how the FUR was calculated

[ ]  Clearly illustrate FUR measurement locations

[ ]  FUR was taken at an appropriate location

[ ]  Clearly stated what the FUR is

[ ]  Stated whether system was confined or not confined

### Sediment

[ ]  Location and method of sediment sample described (minimum 3 unless otherwise justified)

[ ]  Sediment size distribution described and illustrated in figure

[ ]  Sediment size table completed

[ ]  Any boulders described and whether or not they are mobile

[ ]  Photographs of sediment and boulders

### Vertical Channel Stability

[ ]  Long profile included with sources and quality of sources. Label crossing, other crossings, significant grade control features (e.g. competent bedrock), assumed base-level control, and reach average slopes. Illustrate equilibrium slopes on figure, to assist in evaluating long-term degradation. Illustrate in more detail in Section 7.2.

[ ]  Degradation discussion brief in this section, refer to Section 7.2 for detailed analysis. Detailed discussion and analysis for long-term degradation should be in Section 7.2.

[ ]  Sediment supply in the watershed discussed

[ ]  Potential for aggradation quantified (range)

[ ]  Location and description of any existing grade controls, and their anticipated stability

### Channel Migration

[ ]  Channel migration zone described

[ ]  Sinuosity described

[ ]  Channel erosion related to migration described

[ ]  Level of risk associated with channel migration

[ ]  Floodplain flow paths described if they exist

# Hydrology and Peak Flow Estimates

[ ]  Describe methodology used to determine peak flows

[ ]  Reason methodology used is most appropriate

[ ]  Clearly shows which flows are to be used (Table filled out, bold method selected)

[ ]  Level of accuracy/uncertainty in calculations (if possible)

[ ]  Discussion of any field verification/validation of modeled conditions

[ ]  Are summer low flow conditions known?

[ ]  High and Low Fish Passage Design Flows (Appendix G of WCDG) **not** included

[ ]  Projected 2080 100-year percent increase and flow identified

# Water Crossing Design

[ ]  All highlights filled in

## Channel Design

### Channel Planform and Shape

[ ]  Channel shape explanation

[ ]  Channel benches and if not an explanation as to why benches are not appropriate

[ ]  Proposed cross section shown superimposed over reference reach cross sections

[ ]  Performance expectation of the channel cross section as compared to the adjacent reaches

[ ]  Was a meander belt amplitude assessment considered?

### Channel Alignment

[ ]  Length of grading, horizontal alignment, and sinuosity described

[ ]  Constraints identified

### Channel Gradient

[ ]  Slope ratio identified and within 25% of reference reach

[ ]  If not within 25%, explanation of why

[ ]  Is long-term degradation or aggradation expected (quantified if so?)

[ ]  If long-term degradation is a risk, is there a reason to constrain it?

## Minimum Hydraulic Opening

### Design Methodology

[ ]  Design methodology clearly defined

[ ]  Reason for design methodology clearly discussed

### Hydraulic Width

[ ]  Width size rational explained adequately

[ ]  Climate Resilience was addressed

[ ]  Velocity tables updated

### Vertical Clearance

[ ]  Minimum required freeboard clear

[ ]  Additional freeboard requirements clear (for debris/aggradation/climate change)

[ ]  Maintenance clearance clearly states whether required or recommended

[ ]  If freeboard is not able to be met, clearly stated why

[ ]  Vertical clearance summary table filled in. Including recommended vs required low chords.

### Hydraulic Length

[ ]  Select one of two pre-written options and fills in hydraulic yellow highlights.

### Future Corridor Plans

[ ]  States whether long-term plans are anticipated.

### Structure Type

[ ]  Clearly stated whether a structural recommendation was made if so, why

## Streambed Design

### Bed Material

[ ]  Methodology chosen to determine size (if not pebble count, why)

[ ]  Describe when D50 and D84 are mobile and method used for assessing stability

[ ]  Table comparing existing and proposed

[ ]  Are we within 20% of D50, if not, why

### Channel Complexity

#### Design Concept

[ ]  Channel planform that is expected to form

[ ]  State total length of proposed stream grading (including channel length within structure)

[ ]  List 75th percentile LWM targets for: # of key pieces, total # of pieces, and wood volume

[ ]  List of proposed LWM (# of key pieces, total # of pieces, and wood volume) for two concepts (buried structure and bridge). Only need one if recommending a specific structure type.

[ ]  Describe how key pieces and volume compare to Fox & Bolton for each of the two concepts (only one if requiring a bridge).

[ ]  What flows are the mobile wood mobile at

[ ]  Recommendations for non-lwm structures for complexity (pools, bars, etc.)

[ ]  2 scenarios shown if no structural recommendation is made and a buried structure could be used. Clearly label proposed log sizes in figures.

[ ]  Anchoring anticipated?

[ ]  Special considerations for LWM/Structure interactions

[ ]  Any low flow considerations/fish stranding risks identified

[ ]  Fish use clearly identified on how they will use the habitat

[ ]  Layouts in figure

[ ]  Pre-approval obtained for anything not in the HM guidance

[ ]  Conceptual Restoration figure for PHD. FHD to include detailed plan and sections. FHD to also include text describing restoration efforts and their objectives (erosion control, bank stability, etc.).

# Hydraulic Analysis

## Model Development

### Topographic and Bathymetric Data

[ ]  Where the topography/bathymetric data was supplied from

[ ]  When was the data collected?

[ ]  What is the datum?

[ ]  Key topographic/structural controls discussed

[ ]  If LiDAR was used, it should be described

### Model Extent and Computational Mesh

[ ]  Upstream and Downstream Domain Limits for existing and proposed (if different)

[ ]  Reason limits were chosen

[ ]  Limits are far enough away not to influence results

[ ]  Total area mesh covers, minimum number of elements (rect + triang)

[ ]  Figures showing existing and proposed mesh limits

### Material/Roughness

[ ]  Describe each Manning’s n value used

[ ]  Figure showing where the Manning’s n values are (two figures if existing/proposed different)

[ ]  Describe how LWM was modeled in both existing and proposed conditions

### Boundary Conditions

[ ]  Boundary Conditions described

[ ]  Geometric data for culverts described

[ ]  Any other boundary conditions described (pressure flow)

[ ]  Discharge values

[ ]  Figure showing all BCs, labeling any culverts, pressure boundaries, etc.

[ ]  Table or screenshot of inputs for Linear BC or HY-8

[ ]  All data included to recreate boundary conditions/rating curves

### Model Run Controls

[ ]  SRH-2D model control (Start Time, Time Step, End Time, Initial Condition, Flow (if defaults not used)

[ ]  State whether the model reached a stable steady state result

### Model Assumptions and Limitations

[ ]  Assumptions listed, states no assumptions if there are none

## Existing Condition

[ ]  Figure showing location of cross sections and alignment stationing used for results reporting

[ ]  Average Hydraulic Results for Existing Conditions

[ ]  Longitudinal Profile with 2-year, 100-year, 500-year

[ ]  Existing conditions velocity map with 100-year flow & Cross section locations

[ ]  Existing conditions channel and floodplain velocities filled out

[ ]  Whether overtopping occurs, if so, when and does it match with maintenance records?

## Natural Conditions (if applicable)

[ ]  Figure showing location of cross sections and alignment stationing used for results reporting

[ ]  Average Hydraulic Results for Natural Conditions

[ ]  Longitudinal Profile with 2-year, 100-year, 500-year, 2080 100-year

[ ]  Natural conditions velocity map with 100-year flow & Cross section locations

[ ]  Natural conditions channel and floodplain velocities filled out

## Proposed Conditions

[ ]  Figure showing location of cross sections and alignment stationing used for results reporting

[ ]  Average Hydraulic Results for Proposed Conditions

[ ]  Longitudinal Profile with 2-year, 100-year, 500-year, 2080 100-year

[ ]  Proposed conditions velocity map with 100-year flow & Cross section locations

[ ]  Proposed conditions channel and floodplain velocities filled out

# Floodplain Evaluation

[ ]  Is the roadway in a mapped floodplain?

## Water Surface Elevations (PHD only)

[ ]  WSE changes described and where 100-yr existing and proposed WSEs converge

[ ]  Risks to properties/infrastructure further explained

[ ]  Profile depicting changes (100yr existing and proposed WSE)

[ ]  Plan view depicting changes. Label existing inlet and outlet, FEMA zones (if applicable), and parcels.

# Scour Analysis

[ ]  Identify what data is available and being used for the scour analysis (geotechnical scoping memorandum or data package, final geotechnical report, etc.)

[ ]  State the assumed structure geometry (minimum hydraulic opening, structure free zone, or final structure) used for the scour calculations.

[ ]  Evaluated all flows up to the scour design flood and scour check flood to determine the deepest depth of scour for each scour component. Documented the flow that causes the maximum depth of scour for each scour component for the scour design flood and scour check flood

## Lateral Migration

[ ] *At the PHD stage, the risk to lateral migration in relation to the structure is assumed to occur (i.e. not a low risk) unless detailed geotechnical data (i.e., competent bedrock, geotechnical evaluation for soil erodibility, stream power vs. soil erodibility, etc.) is available to support the assessment of no lateral migration is anticipated over the life (75+ years) of the proposed structure(s).*

[ ]  Are any scour countermeasures recommended at the various infrastructure components? If so, mention in this section and refer to Section 8 for more detailed description and analysis.

## Long-term Degradation

[ ]  Long-term degradation estimated, state what geotechnical data was used for the analysis and whether additional information is needed to refine estimate as design progresses.

[ ]  Describe methodology used to determine anticipated long-term degradation and how the base-level control was determined.

[ ]  Provide figure showing existing grade, proposed grade, equilibrium slope, base-level control, other significant features and how long-term degradation was measured at various locations.

## Contraction Scour

[ ]  Described type of contraction scour (clear-water or live-bed) and how much is anticipated for the scour design flood and scour check flood.

## Local Scour

[ ]  Described type and amount of local scour (e.g., pier scour, bend scour, abutment scour, etc.) for scour design flood and scour check flood.

[ ]  For each type of applicable local scour, include description of which infrastructure component (e.g., left/right, upstream/downstream abutment foundation, left/right, upstream/downstream walls, etc.) the local scour should be applied to.

## Total Scour

[ ]  Total scour quantified for each infrastructure component (e.g., left/right, upstream/downstream abutment foundation, left/right, upstream/downstream walls, etc.).

[ ]  At the structure free zone and final structure phases, documented the coordination with the Project Office, HQ Geotechnical and HQ Bridge to ensure the provided depths of total scour are being correctly applied to determine the total scour elevations at each infrastructure component.

# Scour Countermeasures

[ ]  Scour countermeasures should not encroach within the minimum hydraulic opening unless there has been additional coordination and acceptance from WDFW and Tribes and is documented in Section 8 .

[ ]  Scour countermeasures are required if key piece LWM are proposed or accumulation of LWM is anticipated inside the crossing structure.

[ ]  PHD to document preliminary extents for proposed scour countermeasures to facilitate discussion. Including plan view extents and typical section.

[ ]  FHD to document details on the countermeasure design (final typical section, sizing, and extents) and calculations.

# Summary

[ ]  Describe and document any hydraulic commitments made throughout PHD/FHD review process

[ ]  Summary Table Updated

Appendices

[ ]  No appendices deleted to maintain appendices lettering of template. Okay to leave an appendix blank if not used.

Appendix A: FEMA Map

[ ]  FEMA Floodplain Map (if in floodplain)

Appendix B: Hydraulic Field Report Form

[ ]  Hydraulic Field Report Form

Appendix C: Streambed Material Sizing Calculations

[ ]  Mobility Calculated

[ ]  Combined Gradation

[ ]  Pebble Counts Compared to Proposed Gradation

Appendix D: Stream Plans Sheets, Profile, Details

D1. Existing Conditions Plan

[ ]  North Arrow Shown

[ ]  Scale Bar Shown

[ ]  Legend contains all line types/symbols shown on plan (no items in legend that are not in plan sheet)

[ ]  Linetype text and callouts are masked where overlapping with other lines

[ ]  Stream labeled and flow direction shown

[ ]  Line Types shown and appropriately scaled for the sheet:

 [ ]  Existing Contours

 [ ]  Stream Alignment (starting downstream with stationing)

 [ ]  Roadway features

 [ ]  Roadway or right of way alignment

 [ ]  Existing culvert

 [ ]  Existing stream lines

 [ ]  Existing wetland lines

[ ]  Proposed Alignment shown (no other proposed stream features)

[ ]  Existing Culvert labeled with type/size

[ ]  Existing Relevant Hydraulic Features labeled (fishways, lwm, etc.)

D2. Proposed Conditions Plan

[ ]  North Arrow Shown

[ ]  Note: “PRELIMINARY – NOT FOR CONSTRUCTION” at bottom of sheet.

[ ]  Scale and position same as Existing Conditions Plan

[ ]  Scale Bar Shown

[ ]  Line Types appropriately scaled for the sheet

[ ]  Stream labeled and flow direction shown

[ ]  Legend contains all line types/symbols shown on plan (no items in legend that are not in plan sheet)

[ ]  Linetype text and callouts are masked where overlapping with other lines

[ ]  Stream labeled and flow direction shown

[ ]  Proposed Alignment shown and labeled (stationing begins at downstream end)

[ ]  All line types oriented right-side-up

[ ]  Cut and fill lines shown

Within Cut & Fill Lines:

[ ]  Line Types shown and appropriately scaled for the sheet:

 [ ]  No existing features or contours shown

 [ ]  Begin/End Stream Grading with stationing and alignment name

 [ ]  Stream Slope Breaks shown and labeled

 [ ]  Minimum Hydraulic Opening Clearly Identified (MHO)

 [ ]  Slopes between MHO and cut hatched with note “To be determined by others”

Outside Cut & Fill Lines:

[ ]  Line Types shown and appropriately scaled for the sheet:

 [ ]  Existing Contours (or proposed + existing if roadway drastically different)

 [ ]  Roadway features

 [ ]  Roadway or right of way alignment

 [ ]  Existing culvert

 [ ]  Existing stream lines

 [ ]  Existing wetland lines

 [ ]  Existing Relevant Hydraulic Features labeled (fishways, lwm, etc.)

[ ]  Note: “EXACT STRUCTURE TYPE, SIZE, LOCATION, AND WALLS TO BE DETERMINED”.

[ ]  Note: “GRADING LIMITS SHOWN ARE FOR ILLUSTRATION PURPOSES ONLY. FINAL LIMITS TO BE DETERMINED BASED ON FINAL STRUCTURE, TYPE, SIZE, AND LOCATION”.

D3. Profile

[ ]  Datum Shown

[ ]  Note: “PRELIMINARY – NOT FOR CONSTRUCTION” at bottom of sheet.

[ ]  Vertical/Horizontal Stations and Elevations shown

[ ]  Alignment named “EN LINE PROFILE” as example if stream alignment “EN LINE”

[ ]  Elevations line up with grid lines

[ ]  Whole Stations line up with grid lines

[ ]  Profile extends beyond proposed stream grading limits ~100 ft upstream and downstream

[ ]  Use vertical and horizontal scale that utilizes the majority of the sheet

[ ]  label significant existing grade control features and whether they are to remain or be removed

[ ]  Existing ground shown through the proposed section

[ ]  Roadway Centerlines Identified

[ ]  Approximate structure location shown

[ ]  Section limits clearly labeled at the top of the sheet that correspond/match detail sheets

[ ]  Channel slope identified

[ ]  Bid Items Correct/Shown over correct stationing (Quantities may not be known)

[ ]  Minimum Thickness of Bed Material shown

[ ]  Begin/End Channel Grading called out with station, elevation and “Match Existing”

[ ]  Note: “SEE SPECIAL PROVISION “AGGREGATES FOR STREAMS, RIVERS, AND WATERBODIES” FOR STREAMBED MATERIAL AND MATERIAL LIFTS

[ ]  Note: “MATERIAL DEPTH IS APPROXIMATE. FINAL DEPTH TO BE DETERMINED FOLLOWING SCOUR ANALYSIS.”

[ ]  Note: “EXACT STRUCTURE TYPE, SIZE, LOCATION, AND WALLS TO BE DETERMINED”.

D4. Detail Sheets

[ ]  Note: “PRELIMINARY – NOT FOR CONSTRUCTION” at bottom of sheet.

[ ]  Note: “SEE SPECIAL PROVISION “AGGREGATES FOR STREAMS, RIVERS, AND WATERBODIES” FOR STREAMBED MATERIAL AND MATERIAL LIFTS

[ ]  Note: “FROM XX XX+XX.00 TO XX XX+XX.00, EVENLY TAPER SECTION X TO MATCH EXISTING CHANNEL.” For both begin/end construction.

[ ]  Note: “MATERIAL DEPTH IS APPROXIMATE. FINAL DEPTH TO BE DETERMINED FOLLOWING SCOUR ANALYSIS.”

[ ]  Note: “SLOPES SHOWN OUTSIDE OF THE MINIMUM CHANNEL SECTION ARE FOR ILLUSTRATIVE PURPOSES ONLY TO DEPICT ESTIMATED AREA OF POTENTIAL IMPACT. FINAL AREAS OF IMPACT TO BE DETERMINED PENDING GEOTECHNICAL AND STRUCTURAL INVESTIGATION, STRUCTURE TYPE, AND STRUCTURE LOCATION.”

Each Section:

[ ]  Sections scalable

[ ]  Sections named (Convention is Section A, B, C, etc.)

[ ]  Station Limits of each Section Identified (should match profile)

[ ]  Creek CL Called out and labeled same as alignment in plan

[ ]  Minimum Hydraulic Opening clearly labeled

[ ]  Existing/Finished ground called out

[ ]  “Match Existing” labeled where finished grade meets existing

[ ]  All break line dimensions shown

[ ]  All slopes labeled

[ ]  Varies includes ranges

[ ]  Construction “wedges” shown (Angle of repose, typically 1:1 that connects bottom of streambed material to top of streambed material)

[ ]  Hatch area between minimum hydraulic opening and match existing in the area that is “To Be Determined” and label as “Estimated area of potential impact”

[ ]  In area of “TO BE DETERMINED” Note “TO BE DETERMINED, X:1 SHOWN, SEE NOTE X”

[ ]  Minimum material thickness identified

[ ]  Minimum Thickness of Bed Material shown

[ ]  Begin/End Channel Grading called out with station, elevation and “Match Existing”

[ ]  Appropriate notes referenced

Appendix E: Manning’s Calculations If needed to support values chosen

Appendix F: Large Woody Material Calculations

[ ]  LWM density and volume calculations based on stream grading length (including within structure)

[ ]  LWM stability calculations (FHD only)

Appendix G: Future Projections for Climate-Adapted Culvert Design

[ ]  Printout of WDFW projections report for watershed

Appendix H: SRH-2D Model Results

[ ]  Plan views of existing, natural, and proposed WSEs, depth, velocity, and shear. Include stationing.

[ ]  Profiles of existing, natural, and proposed showing all modeled flows.

[ ]  Cross sections of existing, natural, and proposed at all locations where section results are summarized within the report.

[ ]  Stationing between plan views, figures, and sections should match. Stationing may vary between existing, natural, and proposed especially if the channel was realigned.

Appendix I: SRH-2D Model Stability and Continuity

[ ]  Plan view of existing, natural, and proposed illustrating locations of monitor lines and points.

[ ]  Monitoring point plots (Y=WSE and X=time) for each model simulation, minimum 3 monitor points

[ ]  Monitoring line plots (Y=flow and X=time) for each model simulation, minimum 3 monitor lines

Appendix J: Reach Assessment

[ ]  This is only used if a Reach Assessment already exists and has been validated by the hydraulic/hydrology staff

Appendix K: Scour Calculations

[ ]  FHWA Hydraulic Toolbox Report printouts of scour calculations. This is required for PHDs and FHDs.

[ ]  .hyd file is included for draft PHD to HQ Hydraulics

Appendix L: Floodplain Analysis *(FHD ONLY)*

[ ]  For FHD only, include floodplain analysis, No-Rise, Zero-Rise, CLOMR, etc. (as applicable)

Appendix M: Scour Countermeasure Calculations *(FHD ONLY)*

[ ]  For FHD only, FHWA Hydraulic Toolbox Report printouts of scour countermeasure calculations.

[ ]  .hyd file is included with draft FHD report to HQ Hydraulics

Final PHD & FHD Deliverables

Below is a summary of deliverables required to be submitted once PHDs/FHDs are finalized, as well as instructions on where the files should be uploaded to WSDOT ProjectWise.

**Final Report**

* **Word and PDF File**
* **Excel Files for Figures in text**
	+ Long Profile and Long Term Degradation
	+ Pebble Counts and sediment mobility calculations
	+ Reference Reach XS comparison figure
	+ Others
* **GIS Data**
* Field Visit data including Bankfull Width, Pebble Count and Reference Reach Locations
* Basin Boundary
* **Appendix Files**
	+ LWM Calculator
	+ Sediment Size and Mobility
	+ Manning’s n roughness
	+ Excel files for Model Results at Cross Sections and Profiles
	+ Scour calculations FHWA Toolbox Report and .hyd files
	+ Scour countermeasure calculations FHWA Toolbox Report and .hyd files
* **Field Visit Photos** (including ones not included in the PHD)

**Hydrology**

* MGSFlood Model if used
* Any other hydrology models

**Hydraulic Model**

* Zipped up SRH Model
	+ All Input and Output files.
	+ Remove extraneous or working files/simulations. Coverages and simulations should be clearly named.
	+ Coverages used for Results reporting including observation lines and 1D Centerline and XS.

**CADD Files**

* Sheets and Basefiles
* Inroads Files (Surface, Alignments and Corridors)
* Project information form.  This was requested by PEO.  See here for example.  **Error! Hyperlink reference not valid.**

**Posting to ProjectWise**

Save all files in **PHD > Final** folder or **FHD > Final** folder

See example below:

