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Stream Crossings

The purpose of this document is to provide guidance and assistance when reviewing and permitting [hydraulic project applications](#) for new and replacement stream crossing structures. The guidance applies to both fish and non-fish streams and provides the biologist with basic information to process an application.

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1. Application Receipt

Applications or pre-applications are submitted to [Aquatic Protection Permitting System](#) (APPS). The application and plans are reviewed in Olympia for statutory completeness under [RCW77.55.021](#). Once the application is Accepted, the Habitat Biologist reviews and processes the application within APPS. There are many training [videos](#) and [self-help](#) documents for this process located on SharePoint.

2. Office Review

Purpose


The office review allows the biologist to become familiar with the project details, location, and determine if the project was designed to meet WAC. The biologist must be knowledgeable on [RCW 77.55](#), [WAC 220-660](#), and [WAC 220-660-190](#) since the RCW and WAC are where the agency's authority comes from. The biologist must also be very familiar with the [Water Crossing Design Guidelines](#) since the manual provides the necessary design guidance to meet all WAC 220-660-190 requirements. Presence of fish life, including the species present, strongly influences proper project design. During the review the biologist may consult reference materials, agency data, and supervisor or coworkers as necessary to determine if the application is complete and the project is appropriately designed or if additional information is needed.

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Tools and Resources

Data for reviewing hydraulic projects comes from a variety of sources and may come from government agencies (local County GIS), Non-Governmental Organizations (Wild Fish Conservancy Maps) as well as private sources of information. Most of this data is available either through WDFW's GIS database or through various internet websites. Other data may be in the form of hardcopy records acquired over time or from coworkers in the agency. All of this information is useful in preparing but nothing ultimately replaces getting out on the ground for projects. Below is a list of commonly used resources:

- WDFW Publications – [Aquatic Habitat Guidelines](#)
- ArcView - WDFW possesses various GIS data sets that include DNR water typing, fish passage barrier inventories, culvert inventories, fish distribution, LIDAR topography, etc. WDFW has created an ArcView project file that allows biologists to view most if not all of our GIS data. If you are not set up to use this system, work with your supervisor to do so.
- [Department of Ecology](#) - maintains a variety of data including:
 - [The Water Quality Assessment and Clean Water Act 303\(d\) list](#)
 - [Coastal Atlas](#) - detailed shoreline imagery.
- [Department of Natural Resources](#) - There are many data layers on the DNR website that you can download and use on GIS. These include fish passage barriers, water typing layers, forest roads, soil types, and many more.
- County Parcel information - Most if not all counties in the state maintain a GIS database of parcel information in their county. This data may also be available through our existing agency GIS data, but is not updated regularly. Some counties do not release their information. It is best to find the ones that do for your area and upload them into your GIS. Others you will need to locate and create an Internet bookmark for yourself to access.
- [Google Maps](#) - for site context, local characteristics, neighboring properties, potential equipment access, estimation of Ordinary High Water Line (OHWL), upland vegetation, vicinity of house to waterbody, relative steepness of the bank, and apparent erosion.
- [U.S. Forest Service Stream Systems Technology Center](#) – Resource for tools and science applications including software, educational materials, and videos.
- [Stream Restoration, A Natural Channel Design Handbook](#)

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Resource Information

The biologist looks for critical details (channel width, gradient, bed material) in the application and plans to determine if the application is complete and the design is appropriate for the stream while referencing the [Water Crossing Design Guidelines \(2013\)](#). Three important things to determine: 1) what design methodology are they using, 2) water type, and 3) location of crossing. If the water type is Type S or F, the design methodology must meet [WAC 220-660-190](#) requirements for fish passage. Fish passage is not required on Type N or Np streams. Whenever possible crossing locations should be chosen in stable straight reaches of stream avoiding meander bends.

Determining water type is done by reviewing existing water type information on GIS or other data sources. It is also important to keep in mind the water typing system was created for regulating forestry activities and is frequently inaccurate in urban and some forested areas. If the applicant indicates the stream is greater than two feet wide and not fish bearing, the biologist should attempt to verify the water type if unfamiliar with the stream. If there is any question, the biologist will need to visit the site to make a determination. The state definition for F water is found in the [Forest Practice Rules](#) and the guidelines for determining water types are found in [Board Manual 13](#).

There are specific situations that don't fit WDFW guidelines, linked above, and require alternative analysis and decision making. Examples may be:

- Non-Fish streams – Structures on non-fish streams do not require fish passage, but may impact fish and fish habitat downstream. In many cases, best management practices such as bypassing stream flow or constructing the project during low flows will mitigate impacts to fish habitat downstream. The crossing must also be designed to withstand a 100-year flood event and pass all material likely to move during the event.
- Tidally affected – Stream crossings that are tidally affected also require special considerations and should be reviewed by a Habitat Program Environmental Engineer.
- Limited fish habitat – Fish habitat above or below a stream crossing may have little functional fish habitat. In some cases, the biologist may determine that fish passage is not required. This situation may occur when the stream crossing is immediately upstream or downstream of a natural fish passage barrier. In other cases, the habitat upstream of the crossing may be so severely impacted that it makes more sense to mitigate the loss of access to the habitat. Your immediate supervisor should be consulted prior to determining that fish passage is not required. This exception does not apply to Washington State Department of Transportation (WSDOT) projects that are part of the culvert lawsuit. The culvert case injunction affects Watershed Resource Inventory Area's 1 – 23. If you get a WSDOT project assigned to you, check with your supervisor as WDFW has specific staff that work on these projects.

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- Sediment management culverts – culverts constructed with a sump to collect excess bedload transported. This is often a chronic condition that must be well documented and monitored for the life of the structure. See document entitled [Sediment Management Culvert](#) dated July 1, 2014 by Bob Barnard.
- Road impounded wetlands – Crossings in wetlands require advanced analysis of the design and impacts to wetlands. Wetlands may be providing habitat for state listed fish and wildlife species and alterations of the wetland may significantly impact fish and wildlife using the wetland.

3. Missing Information

Biologists may require more information before issuing a permit in order to effectively evaluate the project and issue an appropriate permit. New information and feedback to the applicant should happen as soon as possible giving the applicant a reasonable amount of time to reply. Any needed additional information should be requested within 10 days after receiving the complete application. If information needed to issue a permit is not provided, the agency may deny the application or the applicant may choose to put it on hold, the agency cannot, before the end of the 45-day processing period. If these situations occur you should be working closely with your supervisor to avoid conflicts.


4. Site Visit

Purpose

Site reviews typically occur as a pre-application review or the review of an active application in APPS. During a pre-application meeting, the objective of the biologist is to assist the landowner or agent. This typically occurs in the form of helping them determine critical stream measurements, appropriate crossing location, and suggest an appropriate design option and project scope. The biologist should also discuss mitigation and what might be required depending on the impacts of the final project proposal. This is a great time to let the applicant know what will need to be included in their application for it to be considered complete and for you to issue a permit. After a pre-application review, in most cases, another field visit is not necessary. Additional assistance can be found on WDFW's website [here](#).

When processing a formal application, the purpose of the site review is to verify critical stream measurements, appropriateness of the project proposal, determine project impacts, and appropriate mitigation. The biologist may find the design is inappropriate for the stream and must provide suggestions for modifying the plans or suggesting an entirely different design.

If the applicant proposes an alternative design such as other [agency approved guidelines](#), the biologist should arrange to visit the site with an agency environmental engineer. Agency engineer visits can be conducted with any application depending on complexity. In this situation, the biologist works with the

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engineer to determine if the proposed alternative meets the WAC and agency guidance for fish passage.

Safety Highlights

Field reviews of applications for water crossings frequently occur along busy roadways and staff must use caution when working in this environment. Vehicles must be parked in a safe place and not create a safety hazard for staff or the traveling public. Field visits during floods should be avoided unless necessary as part of an emergency response. There are many mandatory training and safety aspects to field work. Make sure you have worked through your supervisor in conducting such trainings and reviewing agency policies before conducting field work.

Field Equipment and Tools


In addition to the basic safety equipment, staff should also bring the tools and equipment listed below. Conditions on site will dictate which equipment is used during the field visit.

- Business card or other agency ID
- High Visibility Safety Vest for Roadside Inspections
- Copy of application and plans
- iPad or other mobile device
- Camera
- GPS
- Tape measure
- Clinometer
- Level (stadia) rod
- Laser level and tripod
- Field notebook
- Knee or Hip boots
- Personal Floatation Device (PFD)
- Rain gear

Verifying Application Information on Site

Once on site, the biologist should offer the applicant or agent time to explain their design proposal and what they wish to accomplish. This initial conversation may yield useful information that may later facilitate discussion if there are problems identified in the design proposal.

The biologist should then walk the stream with the applicant or agent and measure stream width and slope and record this information in their notes. Take

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measurements in presence of the applicant or ask the applicant to assist and explain how stream widths are measured. While walking the stream, the biologist should also note streambed material, sediment size, regrade potential, and riparian conditions. Other site characteristics that might influence project design, habitat impacts and mitigation should also be recorded. Document the site inspection with photos and enter information in APPS site inspection log and/or the project file.

Based on the stream measurements, proposed plans, and design methodology you must determine if the project satisfies the minimum requirements outlined for each methodology in the [Water Crossing Design Guidelines \(2013\)](#) and supported by [WAC 220-660-190](#). If the proposed plan is not appropriate for the site, the biologist would need to work with the applicant to propose an acceptable design that meets the requirements.


The minimum information that should be verified from application material or recorded in field notes (guidelines for determining these metrics are located in the Water Crossing Design Guidelines):

- Stream width
- Stream slope
- Channel pattern type
- Flow Condition
- Substrate material and size
- Habitat – Spawning, rearing, etc. (to assess impacts)
- Riparian cover - 0, 25, 50, 100 percent (to assess impacts)
- Fish observations – species and number
- Date and time
- Individuals present

Identify Project Impacts and Mitigation Opportunities

Impacts to fish life vary based on site specific conditions and how the project is going to be constructed. During the site review, the biologist should keep in mind the potential impacts and document those impacts to fish and fish habitat that may occur from the project. In the case of water crossing replacement projects that will correct a fish passage barrier, the project is usually considered [self-mitigating](#) through best management practices to avoid and minimize impacts to fish life.

Project impacts that are not self-mitigating would require some form of mitigation. These impacts may include construction impacts and loss of riparian and stream habitat. Stream crossing replacement projects that increase the size of the crossing footprint may also require mitigation.

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Establishing Appropriate Work Window

The biologist should refer to [WAC 220-660-110](#) when determining the appropriate work window. This includes taking into consideration fish presence and life history stage, expected impact of construction activities, and best management practices proposed by the applicant. A work window may not be necessary if the work can be conducted at any time with no impacts (direct or indirect) to fish life.

5. Mitigation Determination

Always keep in mind mitigation is based on existing conditions and must be adequate to ensure no net loss of habitat function due to the impacts of the project. The mitigation document was in development at the time of this guidance, please check with your supervisor for the most up to date mitigation document.


6. Rules of Thumb

- The biologist should be very clear with the applicant or agent what the next steps in the process are. If the applicant/agent is expected to provide additional information, the biologist should clarify when that information will be provided.
- Once you have drafted the permit in APPS it is okay to share a draft with the applicant for review, if there is time.
- New employees should go over the application and draft permit with your supervisor or trusted colleague before issuing.
- It's okay to say that you do not know the answer and that you need to consult with your supervisor or environmental engineer.
- Every water crossing location is a bit different and has its own set of challenges.
- When time and workload allow, it is strongly recommended that a post-construction compliance inspection is scheduled with the applicant and/or agent. The purpose of this inspection is to ensure the project was constructed according to the permit conditions required for the protection of fish-life. Large, complex, or high risk projects should be prioritized for inspection. Additionally, any project that implements novel, nonstandard construction techniques or structures should be inspected. This compliance inspection should be done preferably when the contractor is still on site so as to correct any issues and be recorded in APPS or other permitting databases in a timely fashion.

7. Relevant WACS

[WAC 220-660-080](#) - Mitigation requirements for hydraulic projects

[WAC 220-660-100](#) - Freshwater habitats of special concern

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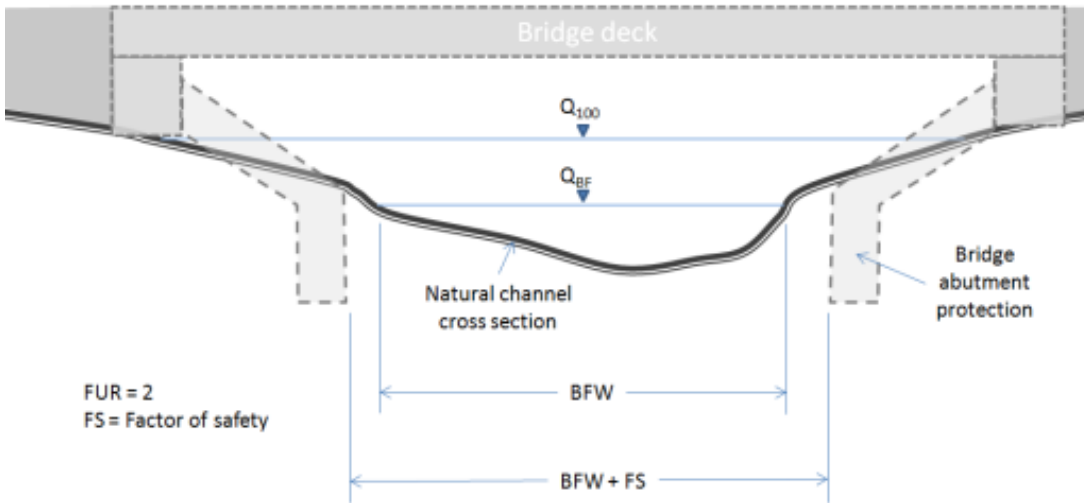
- [WAC 220-660-110](#) - Authorized work times in freshwater areas
[WAC 220-660-120](#) - Common freshwater construction provisions
[WAC 220-660-190](#) - Water Crossing Structures

8. *Example Plans*

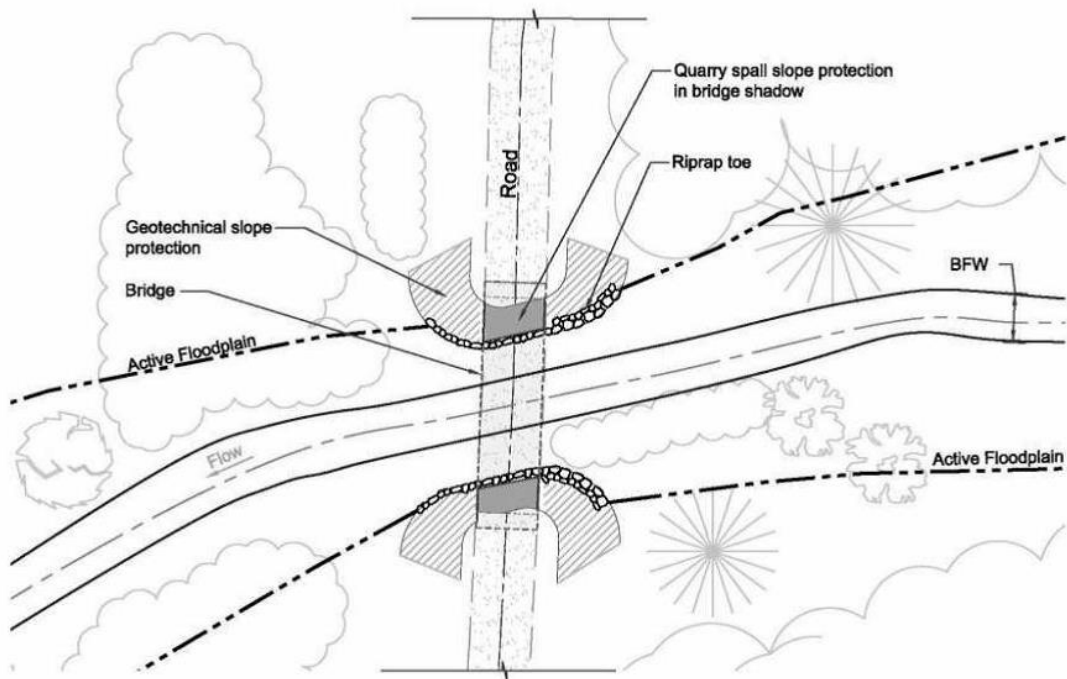
Plans for culvert crossings and bridge crossings have their own set of challenges. Ultimately the written plan in APPS and the information on any drawings needs to support a project that meets our standards for fish passage and avoids impacts to fish life. Important metrics for this may be but aren't limited to: Bank Full Width, Bank Full Elevation, Bench Mark Elevation, 100 Year Flood Elevation, Dewatering Plans, Cofferdam Plans, Cross Section and Plan View Drawings. See Attachment 1 for Example Plans.

Attachment 1

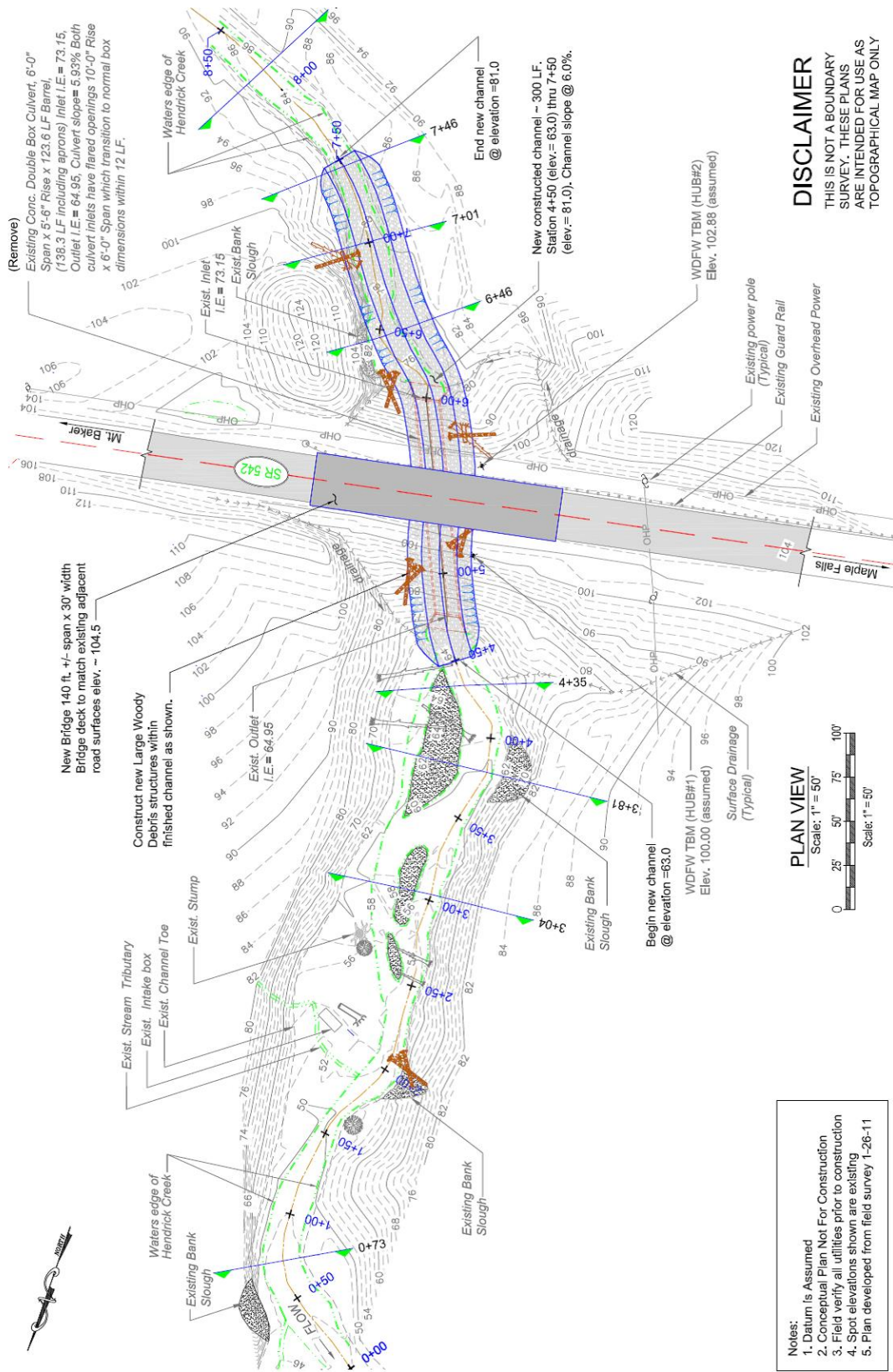
Example Plans



Bridge cross section over a confined channel showing the relationship between the bankfull width and the recommended width between abutment protection. The factor of safety is determined by the designer. The bridge may also be founded on piling or drilled shafts and the scour risk would be eliminated.

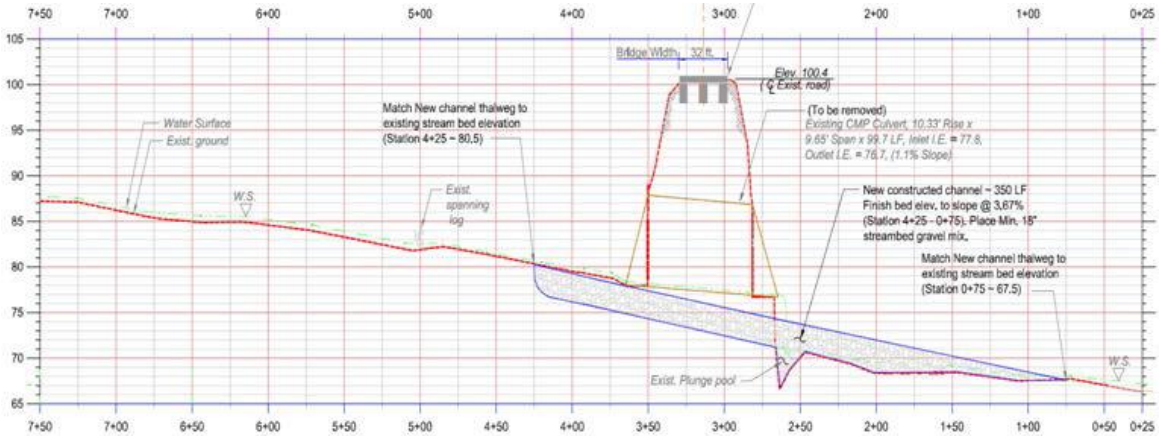


A plan view of a bridge showing reinforcements to the road embankment.

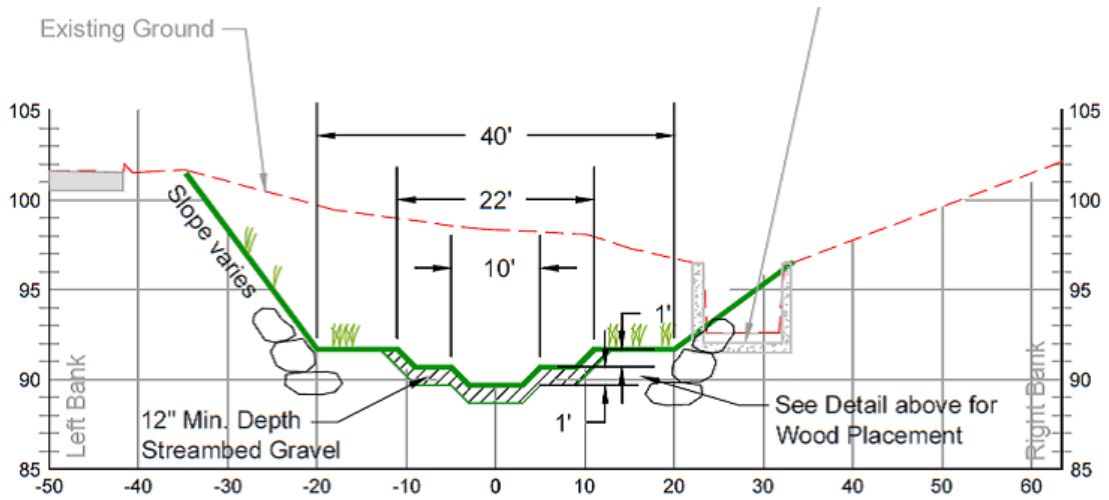


DISCLAIMER
THIS IS NOT A BOUNDARY
SURVEY. THESE PLANS
ARE INTENDED FOR USE AS
TOPOGRAPHICAL MAP ONLY

A more complex example site plan showing principle channel and infrastructure features (WDFW project files).



Channel profile showing existing and proposed crossing, proposed excavation and placed bed materials (WDFW project files).



Channel cross section which includes the main channel and a vegetated floodplain, buried scour protection at the margins and the depth of placed gravel (WDFW project files).