

Hydraulic Project Review for Mitigation: User Guide

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Introduction:

In an effort to increase the transparency and consistency of the Hydraulic Project Approval process, the Habitat Program has initiated use of Hydraulic Project Review forms. These forms will be used to document each* hydraulic project application review including an impact analysis and all mitigation requirements and agreements (* exceptions: emergency HPAs). See [Appendix A](#) for a blank copy of the summary form.

Each project review form is completed using the data entry system in the “WDFW Project Application Review Form.xlsm” file, which is a macro driven, user interface (the user must enable the content (macros) when the file is first opened). This file is protected and no review data is entered or stored within this file. Do not alter the name of the original file as the code requires it to function properly.

Each review form is automatically saved as a new file based on the APP ID entered by the user in the format “APP ID Review Form.xlsm”. Files are saved in the “C:\My Documents\HPA_Project Review\Review Forms” folder. These are the ORIGINAL review form files for any PDRs that are received.

Each Project Review Form documents the baseline condition of the project site, the species at risk of impact from the project activities, and the existing habitat functions. The user will record the project types being proposed along with impacts specifically associated with each project type. Any quantifiable benefits will be recorded. Limitations, actions, and steps that will be required to avoid, minimize, and rectify impacts will be noted. Additional compensatory mitigation that will be required when noted impacts remain must be recorded. Mitigation plans may also be required, and could include the purchase of credits from a mitigation bank or in-lieu-fee program.

Data entry begins by clicking the “Click here to fill out the form” button in the top right of the Excel worksheet. Clicking this button opens the first of a series of data entry forms that will guide you through the collection of data pertinent to the project. See [Appendix B](#) for graphic presentations of each form that may be accessible, depending on selections/choices made. See [Appendix C](#) for a flow chart which represents the data entry process of the review form data entry system.

To provide users with the ability to partially complete their review, the system provides buttons in specific forms to “Save and Exit”. The system recognizes the presence of previously entered data, and will reload that data into the forms when the user clicks to start again. The form may also be left open indefinitely, even if the computer goes to sleep, without losing any data. If any of the forms are terminated (clicking the X in the upper right corner of the form) and the file is closed, all data selections will be lost, even if the file is saved. Simply terminating a form will not cause data loss so long as the file isn’t closed. Multiple forms may need to be terminated to exit in this fashion, and it is not recommended.

To provide the ability to utilize previously entered review forms as a template for a new project review, the system allows a user to open an existing review form, alter the APP ID number, and then make any necessary changes to the selections and entries. The user must verify each form to complete the review for each project.

In the longer term, the goal is full integration of this data collection within the online permit system, significantly reducing the administrative portion of this task and simplifying the process.

Project and Site Review

The user should review the application materials and conduct a site visit as needed to fully understand the project and its potential impacts. Open the data entry file and click the button titled “Click here to fill out the form” located in the upper right corner of the worksheet.

- Review all application materials submitted (Online application, JARPA, Project Plans, Biological Assessments or Evaluation Reports, etc.)
- Conduct a site visit as needed

Environment:

The first window requires that the user select where this project will occur. Options include Freshwater, Marine, or Both. If you choose Both, as you work through documenting your review, the system will display each freshwater form, then the respective marine form.

- **Choose** Freshwater, Marine, or Both

Baseline:

The user is then asked to provide their name, the project name, and the application ID number (AppID). The system will enter the user name associated with the computer being used – change as needed (In Excel, click File/Options and change the User name). The user must select habitat characteristics, enter measurable parameters, and describe any additional baseline conditions of the project site as defined by WAC [220-660-080\(4\(f\)\)](#): “habitat conditions at the time the HPA application is submitted”. The system provides an extensive list of habitat characteristics from which to choose from, as well as common measurements taken. Tables 1 and 2 reflect the common parameters provided for baseline conditions in freshwater and marine environments, respectively.

The system utilizes the AppID and saves the file in the “C:\Data\ HPA_Project Review\Review Forms” folder when the user clicks “Next” on this form. The file name format is as follows: “AppID Review Form.xlsm”.

The user should include as many parameters as necessary to help a third party fully understand the baseline condition of the project site. A site assessment may be needed (or provided) to identify, quantify, and evaluate the abundance and quality of habitat at any particular site.

- **Enter** the Reviewer’s Name, the Project Name, and Application ID#
- **Select** all appropriate habitat characteristics
- **Enter** any measurable parameters
- Evaluate and **describe** any additional habitat conditions (baseline - WAC 220-660) not already selected. Be sure to include any information that may help a third party understand the condition of the project site prior to construction.

Species:

Each species that may be impacted by the project must then be selected. Consider this question when you think about which species to select: ***Which species may be impacted if the project is conducted as proposed without an HPA but during the appropriate time frame*** (the project is completed during the expected timing window)? You do not need to select every species that may be present, only those which may be impacted by the project. The species list is not specific to juvenile or adult, or different

run types (Spring Chinook vs. Fall Chinook). In the Freshwater list, the yellow family name will toggle between selecting/deselecting each of the family members.

- **Select** all potentially impacted fish species at the Project Site/Affected Area

Habitat Functions:

There are eleven common habitat functions. Please select each function that is present at the project site.

- **Select** the existing Habitat Functions for the impact area (construction site, in-water, and other affected areas)

Table 1. Freshwater habitat characteristics to consider for the baseline condition assessment.

| Riparian Condition | Substrate | Banks | Channel Info | Stream Type |
|----------------------------|---------------------|-----------|-----------------|------------------|
| Intact, mature trees | Cobble | Incised | Confined | Fish habitat |
| Fragmented, mature trees | Gravel | Undercut | Unconfined | Non-fish habitat |
| Intact, mature shrubs | Sand | High bank | Unconfined Lake | Seasonal |
| Fragmented, mature shrubs | Mud/Silt | Low bank | Dune ripple | Perennial |
| Intact, other | Vegetated bed | Ravine | Pool-riffle | |
| Fragmented, other | Bedrock | | Plane bed | |
| Wetland | Documented spawning | | Step-pool | |
| Developed | Suitable spawning | | Cascade | |
| Invasive Species dominated | | | Waterfalls | |

| Habitat Features | Existing Structures | Common Measurements | |
|------------------------|------------------------|-----------------------------|----------------------------|
| Large wood | Culvert | Bridge/culvert span | Flow rate |
| Small woody debris | Bridge | Bridge/culvert freeboard | Velocity |
| Beaver dam | Overwater structure | Water surface drop | Turbidity |
| Overhanging vegetation | Armor | Priority Index | # of piling within OHW |
| Adjacent wetlands | Outfall | Armor length | # of pieces of LWD present |
| Off-channel habitat | Grade control | Armor distance to benchmark | |
| Gravel bars | Fish passage structure | Bankfull width | |
| Braided channels | Engineered log jam | Bankfull depth | |
| Aquatic vegetation | | Channel length | |
| Native Boulders | | Channel slope | |
| | | | |

Table 2. Saltwater habitat characteristics to consider for the baseline condition assessment

| Riparian Condition | Substrate | Shoreline | Energy | Habitat Features |
|----------------------------|----------------------------------|------------------|---------------|-------------------------------|
| Intact, mature trees | Sand | Feeder bluff | Low energy | Large wood |
| Fragmented mature trees | Fine gravel with sand base | High Bank | High energy | Intertidal wetland vegetation |
| Intact, mature shrubs | Coarse gravel with sand base | Low Bank | | Kelp/macroalgae |
| Fragmented, mature shrubs | Mud | Hard armored | | Eelgrass |
| Intact, other | Cobble with gravel and sand base | Soft armored | | Undercut banks |
| Fragmented, other | Bedrock/Clay | Accretion point | | Native boulders |
| Wetland/salt marsh | Documented forage fish spawning | Transport zone | | Tide pools |
| Dunes | Suitable forage fish spawning | | | Dendritic channels |
| Developed | | | | Delta |
| | | | | Reef |
| | | | | Tide flats |
| Existing Structures | Common Measurements | | | |
| Overwater structure | Water depth | | | |
| Boat ramp | Water temperature | | | |
| Armor | Water velocity | | | |
| Outfall | Flow rate | | | |
| Mooring buoy | Turbidity | | | |
| Pilings | Armor length | | | |
| Jetties | Armor distance to benchmark | | | |
| Breakwaters | # of piling present | | | |

Impact Analysis

An impact is defined as an unnatural disturbance to habitat-controlling factors. Controlling factors are physical processes or environmental conditions which determine various aspects of habitat structure. Habitat structures are the physical attributes of a habitat and are linked to habitat processes. Habitat processes are defined as the dynamic biogeochemical, biologic, and physical processes which occur within a given aquatic habitat, and are linked to ecological functions such as refuge and prey production.

Alterations to the environment can lead to impacts on the ecological function of habitat. These alterations are called mechanisms of impact and they need to be identified from a geomorphological, engineering, hydrologic, and biological perspective.

Project Type:

Please select each appropriate project type represented by the project you are reviewing. This form was designed to match the project type list in APPS for ease of selection. You will note that there are three project types at the bottom of the form that are not included in the APPS list of options. These may be entered as “Other” in APPS, but please select a named project type when applicable. If the list still does not provide an adequate project type, please select “Other” and ensure the project type is described elsewhere. A maximum of six project types may be entered. If additional project types are reflected by the project, please choose the 6 project types that will cause the majority of impact.

- **Select** all project types represented by the proposed project – up to a maximum of six

Associated Impacts:

The project type(s) selected will trigger the system to highlight impacts normally associated with the project type (see [Appendix D](#) for freshwater and marine Project Type and Impact Matrices). This does not preclude the project from having other impacts, but is meant to guide your selection of the most common options. Please select all appropriate impacts, including impacted processes, structural changes, and functional responses expected for each project type. The project type being referenced is noted at the top of the form. The form will be displayed for each project type so be sure to apply only the impacts associated with that project type.

- **Select** the potential impacts associated with each project type

Quantify Impacts:

You will also be asked to quantify the impact for each project type relative to the area, length, volume, or other basic measurement. This information should be available in the application. For example, a bank protection project could include 120 linear feet, 230 cubic yards of riprap, and the loss of 10 mature trees. This quantification is meant to provide a general sense of the impact. You may need to combine project components, such as cut and fill quantities, for example, and provide the total volume of material being moved. You may include more precise measurements in the additional comments at the end of the form, and the complete application may be referenced as well. If you enter a value for “Other”, the system will ask you to enter a measurement unit to describe the value you provided.

- **Enter** values which quantify the impact for each project type and note any change in values from the baseline

Quantify Benefits:

You will also be asked to quantify the benefits for the project. Nearly 20 commonly used measurement units are provided, and the user can specify up to 2 additional measurement units by entering a quantity in the “Other” category. If you enter a value for “Other”, the system will ask for the measurement unit to describe the value entered. This quantification is meant to provide a general sense of the positive aspects of the project.

- **Enter** values which quantify the habitat benefits of the project.

Mitigation

The department defines mitigation as sequentially avoiding impacts, minimizing and rectifying unavoidable impacts, and compensating for remaining impacts ([WAC 220-660-080](#)). Mitigation must achieve no net loss. You must determine if the project actions proposed will mitigate for the project impacts to fish life and the habitat that supports fish life based on the available information. The Review Form helps to document your determination.

Here’s a brief synopsis of each level of mitigation:

Avoiding the impact altogether means not taking a certain action or parts of an action, or taking an action at a specific time. Minimizing impacts entails limiting the degree or magnitude of the action and its implementation. Rectifying impacts is done by repairing, rehabilitating, or restoring the affected environment. Steps may also be taken to reduce or eliminate any impacts over time through preservation and maintenance operations during the life of the action.

Compensating for impacts is done by replacing or providing substitute resources or environments after all of the above options have been exhausted. Additionally, monitoring the impact and taking appropriate corrective measures (contingency plan) to achieve the identified goal may be required to reach no net loss.

For more info, please view the [Mitigation Overview video](#), refer to the Mitigation Guidance document (still in draft), and Policy M5002 [Requiring or Recommending Mitigation](#).

Provision Groups:

The technical provisions included in an HPA are a portion of the mitigation for the project. For this step, simply select the provision groups from which technical provisions will be sourced from. This step simply guides your thoughts through the measures needed to avoid, minimize, and rectify as many impacts as possible, and can be used to guide the process of drafting the HPA.

- **Choose** which Technical Provision groups will be represented within the HPA to avoid, minimize and rectify potential impacts

Custom Provisions:

Beyond the technical provisions, it is sometimes necessary to include additional best practices, limitations, or other rectifying actions that will be required to offset project impacts based on site conditions or other factors. These take the form of custom provisions. These provisions, or at least the building blocks of the provisions, should be entered here and eventually included as provisions in the

HPA. A third party should be able to compare your final review form and HPA and verify that all custom provisions were included.

- **Enter** all appropriate custom provisions

Compensatory mitigation:

Compensatory mitigation is only needed when the project is expected to have measurable adverse impacts even after all avoidance, minimization, and rectification steps have been taken. Compensatory mitigation can be defined as replacing, enhancing, or providing substitute resources or environments for habitat that is being damaged or lost because of the hydraulic project. Compensatory mitigation could also include preservation of high-functioning, irreplaceable aquatic habitat areas, which is acceptable only if important habitat functions are not being lost, and when high priority habitats are at risk.

- **Determine** if compensatory mitigation is required.
 - Click “CORRECT” if not required, or
 - Click “Compensatory Mitigation is required”

If compensatory mitigation is not required, the system will skip to the final form where you can provide additional comments.

Please note that if you have received an application and believe that compensatory mitigation will be required, you may need to ask the applicant to put the application on Hold to allow adequate time to complete negotiations. If they are unwilling to place the application processing on Hold and you believe you will need more time to properly protect fish life through appropriate mitigation actions, you may need to discuss denying the application with your regional manager (RHPM).

If compensatory mitigation is required, you will need to check each applicable box for the type(s) of additional unavoidable impacts expected. You must consider temporal losses (habitat function recovery will take an extended amount of time), uncertainty of performance (experimental method, poor site location for method, etc.), loss of habitat quantity by habitat type (loss of pool habitat in a pool starved reach), and differences in habitat function and value (resulting habitat type disfavors priority species).

- **Select** which additional unavoidable impacts are expected
- **Explain** your determination of the impacts relative to each selected type

A list of typical compensatory mitigation actions is provided. Please select which action(s) will be required to offset remaining impacts.

- **Select** each mitigation action

The impacts you associated with the project will be pre-selected and displayed in a new impacts form, now related to the mitigation action(s) required. Please select which impacts will be offset by each mitigation action. [Appendix E](#) contains matrices for freshwater and marine mitigation actions with predicted responses. You may need to deselect impacts not associated to the specific action or those that are not being offset (out-of-kind) by this specific action. As before, please see the title of the form which references the mitigation action.

- **Select** each impact being offset by the specific mitigation action

Each mitigation action provides value in reducing impacts in its own way. We use the term priority to sequentially order the preference for mitigation locations and type. Actions that occur at or adjacent to the site of the impact are termed "On-site". Actions that directly offset the impacts to the same species or habitat are considered "In-kind". Actions that meet both of these preferences are the highest priority. For each mitigation action, please determine the priority of the mitigation location and type.

- **Select** the priority for each mitigation action:
 - On-site, In-kind
 - Off-site, In-kind
 - On-site, Out-of-kind
 - Off-site, Out-of-kind

In some cases, it is important to document conversations, email, or other correspondence that provides information pertaining to the outcome of this HPA. You may summarize conversations, paste relevant and pertinent correspondence, and summarize conclusions. Be careful about arbitrarily skipping or modifying correspondence, or unnecessarily bloating the file. The goal is to include enough information to demonstrate why decisions were made. The text box allows 32,767 characters, but this is not recommended as the form can only print 27 lines per entry. You may click Add Textbox if additional space is needed, for up to a total of 4 text boxes, or 108 lines of text. Additional correspondence may be attached to the application record and referenced in this summary.

- **Record** relevant/pertinent communications with the applicant, especially the solution(s) or conclusions.

Mitigation Plan:

In some cases, a mitigation plan may be required. "Mitigation plan" means a document or set of documents developed through joint discussions between a project proponent and environmental regulatory agencies that describe the unavoidable wetland or aquatic resource impacts of a proposed infrastructure development or non-infrastructure development and the proposed compensatory mitigation for those impacts ([RCW 90.74.010](#)). WDFW only requires mitigation plans for projects with significant impacts which cannot be mitigated within the technical provisions. A mitigation agreement is a legally enforceable contract which extends the life of a mitigation plan beyond the 5-year statutory limit of the HPA. A mitigation plan could include methods such as purchasing credits from an existing mitigation bank or In-Lieu-Fee (ILF) program. The credits purchased are required to meet mitigation plan requirements. See [WAC 220-660-080\(5\)](#) for mitigation plan requirements.

- **Determine** if a mitigation plan is required:
 - Click "YES" if a mitigation plan is required for this project because of ongoing, complex, and experimental mitigation actions
 - Click "NO" if not required

Mitigation plans **must** do all three of the provided bullets. This, and the following form, records your verification of the WAC requirements.

- **Check** each bullet if you can verify that each will be met by the mitigation plan.

The mitigation plan **must** also provide equal or greater habitat functions, value, and quantity by habitat type compared to the existing conditions.

- In the list provided, **check all that apply** to justify acceptance of the plan.
- **Explain** how the plan provides each of the selected options
 - **Describe** how any credits purchased from a mitigation bank or ILF program provides the selected options

Additional Comments

Please record any additional comments, reasoning, or justification for the determinations made above. These comments are especially important if the permit requires or allows activities that are contrary to or different than the technical provisions of [WAC 220-660](#). For example, if you determine due to exceptional visibility that transects for a seagrass and macroalgae survey can be conducted on 25 foot transects instead of the required 10 feet, you should include a comment explaining this decision.

This review form should provide a complete picture for others who would assess this project and the decisions you have made, thereby clearly demonstrate how WDFW is meeting its statutory requirement to protect fish life. Any explanation of selections or entries made above, or clarification you believe is necessary should be included here.

- **Enter** any additional necessary comments

Conclude – or complete later:

You may click “Save and Exit” to postpone the completion of the form. This allows you to come back and make changes before your review or negotiations are complete. This saves the data in a format that can be amended when you are ready. Simply click the button to fill out the form again, then choose the top button to Amend or Correct the existing data.

Once you have completed your review and recorded those details within the forms, you may click FINISHED. The system will populate the Project Review Form with the data choices and entries you made and create a pdf of the form for you to upload to APPS. Please examine the pdf to ensure it contains all of the information you intended, and that it is displayed appropriately.

If changes need to be made, you may click the button to start again and move through the forms to make changes as needed.

WARNING: If a previous pdf for this APPID exists, it will be replaced when you click FINISHED – you will not be asked if that is ok. If you want to preserve the previous copy for some reason, you must do that outside of this tool prior to clicking FINISHED. Please note that you cannot have the existing pdf open when you click FINISHED – the system will create an error.

The system automatically creates and attempts to send your data file via email to Jeff Kamps for data compilation and analysis. If you use Simply File for Outlook, you will be prompted to send and properly file this email. It is not necessary to store this email as the original file is resident on your computer for PDR purposes, so you may click Send and Delete. If you notice an error on the pdf summary, terminate (click the X in the top right corner) the SimplyFile dialog box. Outlook will save the email in your Drafts folder. If changes are needed, delete the draft email. Then click the “Click here to fill out the form” button to initiate the tool and make changes to the record as needed.

Final Step

The final step is to upload the review form pdf to the application record in APPS. As noted previously, the pdf is located in the “C:/My Documents/ HPA_Project Review\Review Forms” folder. You are now ready to issue/deny the HPA.

Amendments/Changes, Modifications, Templates

The system provides the opportunity to open a previously saved project review file to make necessary changes or additions. The system also provides the opportunity to complete a review form when a “major modification” is requested. A review form should be completed if the project changes significantly such that the impacts or mitigation requirements change.

For a major modification, simply open the existing file, click the “Click here to fill out the form” button, and click the button “Click here to create a Major Modification Review Form using the existing data”. This will reload the existing data into each form, and will rename the file with the format “APPID Modified Review Form.xlsm”.

Alternatively, an existing review form can be used as a template form. This may be useful when similar projects have similar impacts and mitigation requirements. Simply complete a review form with a name for your template in the APP ID box. To use the template, simply open the template file, click the button “Click here to fill out the form”, select the “Click here to Amend or Correct the existing data file”.

Change the Project Name and the APP ID number. This new file will be saved based on the new APP ID number when you click Next on the Baseline form. Then you must work through each form to make any necessary changes.

APPENDIX A – Blank Review Form

Graphic presentation of page 1 of the Mitigation Review Form template.

Hydraulic Project Review for Mitigation Form

Project and Site Review

Reviewer's Name:
Project Name:
Application ID#:

List habitat characteristics, measurable parameters, and **describe** the existing FRESHWATER habitat conditions:

List habitat characteristics, measurable parameters, and **describe** the existing MARINE habitat conditions:

List all species at risk of impact from the project activities:

List the existing Habitat Functions for the impact area:

Impact Analysis


List project types and associated potential impacts:

| <u>Project Type</u> | <u>Associated Impacts</u> |
|---------------------|---------------------------|
|---------------------|---------------------------|

Quantify the impact area, length, or volume:


Quantify the project benefits:

Mitigation Alternatives

 Check if the project actions alone will mitigate all adverse impacts – **NO** compensatory mitigation will be required

Which Technical provision groups will be required to avoid, minimize and rectify potential impacts:

List additional best practices, limitations, or other rectifying actions to be required (e.g. Custom Provisions):

 Additional impacts exist that cannot be offset by the above measures.
Temporal Losses

Hydraulic Project Review for Mitigation Form

Uncertainty of performance
 Loss of habitat quantity - List habitat type(s) being lost
 Differences in habitat function and value from baseline

Explain:

| <u>Mitigation Action</u> | <u>Impact(s) Offset</u> | <u>Priority</u> |
|--------------------------|-------------------------|-----------------|
|--------------------------|-------------------------|-----------------|

Record pertinent communications (e.g. paste correspondence, summarize conclusions, etc.) with the applicant and third-parties:

| | |
|--|---|
| | Check if a mitigation plan is required for this project because of ongoing, complex, and experimental mitigation actions. |
| | Check if credits will be purchased from a mitigation bank. |
| | Check if credits will be purchased from an in-lieu-fee program. |

The mitigation plan must do all of the following. Check each upon verification:

| | |
|--|---|
| | Guarantee long-term viability of the created, restored, enhanced, or preserved habitat, including assurances for protecting any essential habitat functions and values defined in the mitigation plan |
| | Provide long-term monitoring of any created, restored, or enhanced mitigation site |
| | Is consistent with the local comprehensive land use plan and any other applicable planning process in effect for the development area, such as an adopted subbasin or watershed plan. |

The mitigation plan must provide equal or greater habitat functions, value, and quantity by habitat type compared to the existing conditions. Please **check all that apply** to justify acceptance of the plan:

| | |
|--|--|
| | The relative value of the mitigation for the target fish life, in terms of the habitat functions, value, and quantity by habitat type |
| | The compatibility of the proposal with broader resource management and habitat management objectives and plans, such as existing resource management plans, species recovery plans and associated habitat restoration strategies, watershed plans, critical areas ordinances, the forestry riparian easement program, the riparian open space program, the family forest fish passage program, and shoreline master programs |
| | The ability of the mitigation to address scarce habitat functions or types within a watershed |
| | The benefits of the proposal to the broader watershed landscape, including the benefits of connecting various habitat units and reducing fish life-limiting habitats |
| | The benefits of implementing advance compensatory mitigation before the project's anticipated impacts occur |
| | The significance of any negative impacts to non-target fish life |

Page 3 of the blank template. The system will expand/contract the template based on data entered via the forms.

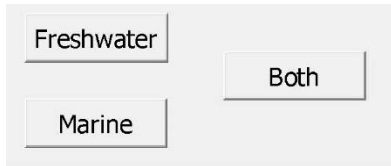
Hydraulic Project Review for Mitigation Form

Explain:

Provide any additional comments, reasoning, pictures, or additional justification for the determinations made herein:

APPENDIX B – Data Review Forms

Environment selection form

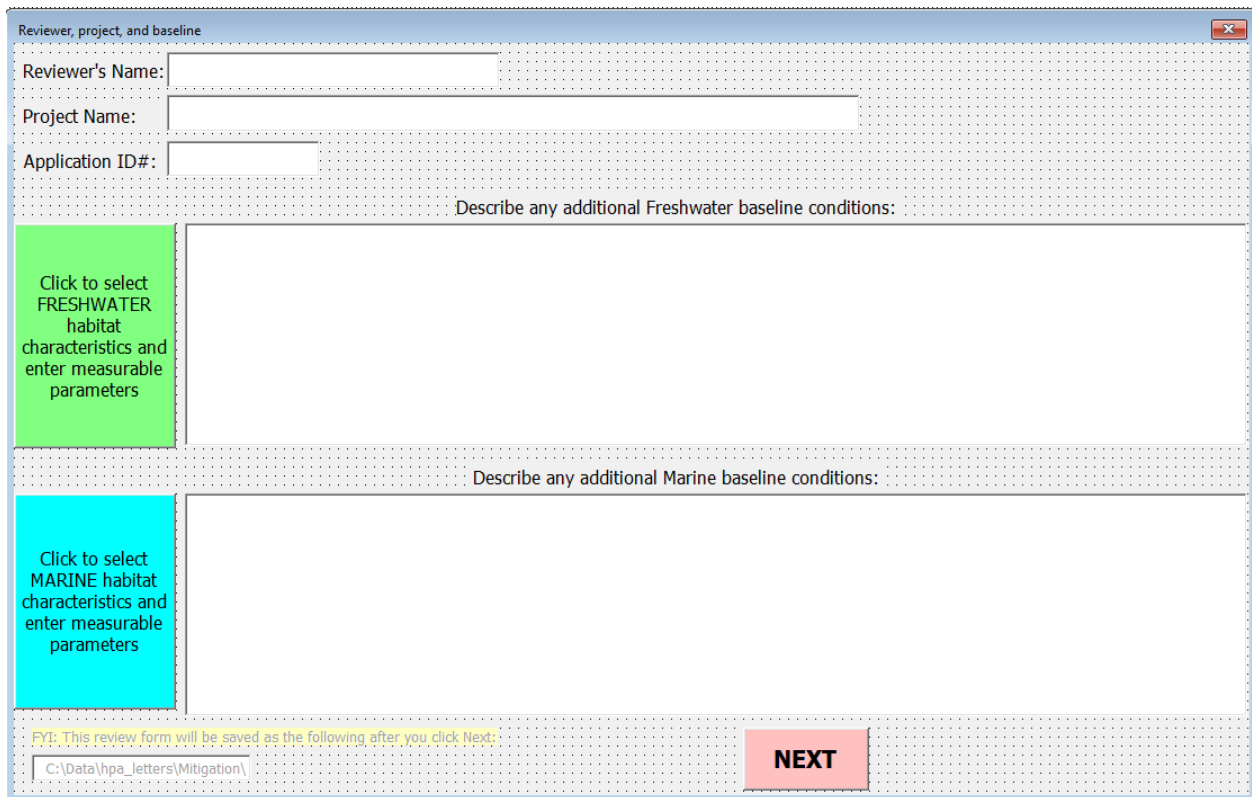


Freshwater

Marine

Both

Baseline Condition form



Reviewer, project, and baseline

Reviewer's Name:

Project Name:

Application ID#:

Describe any additional Freshwater baseline conditions:

Click to select FRESHWATER habitat characteristics and enter measurable parameters

Describe any additional Marine baseline conditions:

Click to select MARINE habitat characteristics and enter measurable parameters

FYI: This review form will be saved as the following after you click Next:

C:\Data\hpa_letters\Mitigation\

NEXT

Freshwater habitat characteristics and measurements form

Please select or enter a value for all applicable existing common freshwater habitat characteristics

| Riparian Condition | Substrate | Banks | Channel Info | Stream Type | Habitat Features |
|---|--|------------------------------------|--|---|---|
| <input type="checkbox"/> Intact, mature trees | <input type="checkbox"/> Cobble | <input type="checkbox"/> Incised | <input type="checkbox"/> Confined | <input type="checkbox"/> Fish habitat | <input type="checkbox"/> Large wood |
| <input type="checkbox"/> Fragmented, mature trees | <input type="checkbox"/> Gravel | <input type="checkbox"/> Undercut | <input type="checkbox"/> Unconfined | <input type="checkbox"/> Non-fish habitat | <input type="checkbox"/> Small woody debris |
| <input type="checkbox"/> Intact, mature shrubs | <input type="checkbox"/> Sand | <input type="checkbox"/> High bank | <input type="checkbox"/> Unconfined Lake | <input type="checkbox"/> Seasonal | <input type="checkbox"/> Beaver dam |
| <input type="checkbox"/> Fragmented, mature shrubs | <input type="checkbox"/> Mud/Silt | <input type="checkbox"/> Low bank | <input type="checkbox"/> Dune ripple | <input type="checkbox"/> Perennial | <input type="checkbox"/> Overhanging vegetation |
| <input type="checkbox"/> Intact, other | <input type="checkbox"/> Vegetated bed | <input type="checkbox"/> Ravine | <input type="checkbox"/> Pool-riffle | | <input type="checkbox"/> Adjacent wetlands |
| <input type="checkbox"/> Fragmented, other | <input type="checkbox"/> Bedrock | <input type="checkbox"/> Other | <input type="checkbox"/> Plane bed | | <input type="checkbox"/> Off-channel habitat |
| <input type="checkbox"/> Wetland | <input type="checkbox"/> Documented spawning | | <input type="checkbox"/> Step-pool | | <input type="checkbox"/> Gravel bars |
| <input type="checkbox"/> Developed | <input type="checkbox"/> Suitable spawning | | <input type="checkbox"/> Cascade | | <input type="checkbox"/> Braided channels |
| <input type="checkbox"/> Invasive Species dominated | <input type="checkbox"/> Other | | <input type="checkbox"/> Waterfalls | | <input type="checkbox"/> Aquatic vegetation |
| | | | | | <input type="checkbox"/> Native Boulders |
| | | | | | <input type="checkbox"/> Other |

| Existing Structures | Common Measurements |
|---|---|
| <input type="checkbox"/> Culvert | <input type="text"/> Bridge/culvert span (ft) |
| <input type="checkbox"/> Bridge | <input type="text"/> Bridge/culvert freeboard (in.) |
| <input type="checkbox"/> Overwater structure | <input type="text"/> Water surface drop (in.) |
| <input type="checkbox"/> Armor | <input type="text"/> Priority Index |
| <input type="checkbox"/> Outfall | <input type="text"/> Armor length (ft) |
| <input type="checkbox"/> Grade control | <input type="text"/> Armor distance to benchmark (ft) |
| <input type="checkbox"/> Fish passage structure | <input type="text"/> Bankfull width (ft) |
| <input type="checkbox"/> Engineered log jam | <input type="text"/> Bankfull depth (ft) |
| <input type="checkbox"/> Other | <input type="text"/> Channel length (ft) |
| | <input type="text"/> Channel slope |

| | |
|----------------------|----------------------------|
| <input type="text"/> | Flow rate (cfs) |
| <input type="text"/> | Velocity (fps) |
| <input type="text"/> | Turbidity (NTU) |
| <input type="text"/> | # of piling within OHW |
| <input type="text"/> | # of pieces of LWD present |
| <input type="text"/> | Other |
| <input type="text"/> | Other |
| <input type="text"/> | Other |
| <input type="text"/> | Other |
| <input type="text"/> | Other |

DONE

Saltwater habitat characteristics and measurements form

Please select or enter a value for all applicable existing common freshwater habitat characteristics

| Riparian Condition | Substrate | Shoreline | Energy | Habitat Features |
|--|---|--|--------------------------------------|--|
| <input type="checkbox"/> Intact, mature trees | <input type="checkbox"/> Sand | <input type="checkbox"/> Feeder bluff | <input type="checkbox"/> Low energy | <input type="checkbox"/> Large wood |
| <input type="checkbox"/> Fragmented, mature trees | <input type="checkbox"/> Fine gravel with sand base | <input type="checkbox"/> High Bank | <input type="checkbox"/> High energy | <input type="checkbox"/> Intertidal wetland vegetation |
| <input type="checkbox"/> Intact, mature shrubs | <input type="checkbox"/> Coarse gravel with sand base | <input type="checkbox"/> Low Bank | <input type="checkbox"/> Other | <input type="checkbox"/> Kelp/macroalgae |
| <input type="checkbox"/> Fragmented, mature shrubs | <input type="checkbox"/> Mud | <input type="checkbox"/> Hard armored | | <input type="checkbox"/> Eelgrass |
| <input type="checkbox"/> Intact, other | <input type="checkbox"/> Cobble with gravel and sand base | <input type="checkbox"/> Soft armored | | <input type="checkbox"/> Undercut banks |
| <input type="checkbox"/> Fragmented, other | <input type="checkbox"/> Bedrock/Clay | <input type="checkbox"/> Accretion point | | <input type="checkbox"/> Native boulders |
| <input type="checkbox"/> Wetland/Salt Marsh | <input type="checkbox"/> Documented forage fish spawning | <input type="checkbox"/> Transport zone | | <input type="checkbox"/> Tide pools |
| <input type="checkbox"/> Dunes | <input type="checkbox"/> Suitable forage fish spawning | <input type="checkbox"/> Other | | <input type="checkbox"/> Dendritic channels |
| <input type="checkbox"/> Developed | <input type="checkbox"/> Other | | | <input type="checkbox"/> Delta |
| | | | | <input type="checkbox"/> Reef |
| | | | | <input type="checkbox"/> Tide flats |
| | | | | <input type="checkbox"/> Other |

| Existing Structures | Common Measurements |
|--|---|
| <input type="checkbox"/> Overwater structure | <input type="text"/> Water depth (ft) |
| <input type="checkbox"/> Boat ramp | <input type="text"/> Water temperature (F) |
| <input type="checkbox"/> Armor | <input type="text"/> Velocity (fps) |
| <input type="checkbox"/> Outfall | <input type="text"/> Flow rate (cfs) |
| <input type="checkbox"/> Mooring buoy | <input type="text"/> Turbidity (NTU) |
| <input type="checkbox"/> Pilings | <input type="text"/> Armor length (ft) |
| <input type="checkbox"/> Jetties | <input type="text"/> Armor distance to benchmark (ft) |
| <input type="checkbox"/> Breakwaters | <input type="text"/> # of piling present |
| <input type="checkbox"/> Other | <input type="text"/> Other |
| | <input type="text"/> Other |

DONE

Freshwater species selection form

| | Salmonids | Cyprinids | Suckers | Centrarchids | Sculpin |
|--|--|--|--|--|--|
| <input type="checkbox"/> Pacific Lamprey | <input type="checkbox"/> Arctic Grayling | <input type="checkbox"/> Chiselmouth | <input type="checkbox"/> Longnose Sucker | <input type="checkbox"/> Black Crappie | <input type="checkbox"/> Coastrange Sc |
| <input type="checkbox"/> River Lamprey | <input type="checkbox"/> Atlantic Salmon | <input type="checkbox"/> Goldfish | <input type="checkbox"/> Salish Sucker | <input type="checkbox"/> Bluegill | <input type="checkbox"/> Shorthead Scu |
| <input type="checkbox"/> Western Brook Lamprey | <input type="checkbox"/> Brook Trout | <input type="checkbox"/> Lake Chub | <input type="checkbox"/> Bridgelip Sucker | <input type="checkbox"/> Green Sunfish | <input type="checkbox"/> Slimy Sculpin |
| <input type="checkbox"/> Green Sturgeon | <input type="checkbox"/> Brown Trout | <input type="checkbox"/> Grass Carp | <input type="checkbox"/> Largescale Sucker | <input type="checkbox"/> Largemouth Bass | <input type="checkbox"/> Torrent Sculpi |
| <input type="checkbox"/> White Sturgeon | <input type="checkbox"/> Bull Trout | <input type="checkbox"/> Common Carp | <input type="checkbox"/> Mountain Sucker | <input type="checkbox"/> Pumpkinseed | <input type="checkbox"/> Margined Sculj |
| | <input type="checkbox"/> Dolly Varden | <input type="checkbox"/> Tui Chub | | <input type="checkbox"/> Rock Bass | <input type="checkbox"/> Mottled Sculpii |
| | <input type="checkbox"/> Coastal Cutthroat Trout | <input type="checkbox"/> Peamouth | Bullheads | <input type="checkbox"/> Smallmouth Bass | <input type="checkbox"/> Pacific Staghor |
| <input type="checkbox"/> American Shad | <input type="checkbox"/> Lahontan Cutthroat Trout | <input type="checkbox"/> Golden Shiner | <input type="checkbox"/> Black Bullhead | <input type="checkbox"/> White Crappie | <input type="checkbox"/> Paiute Sculpin |
| <input type="checkbox"/> Euiachon | <input type="checkbox"/> Westslope Cutthroat Trout | <input type="checkbox"/> Fathead Minnow | <input type="checkbox"/> Brown Bullhead | <input type="checkbox"/> Warmouth | <input type="checkbox"/> Prickly Sculpin |
| <input type="checkbox"/> Longfin Smelt | <input type="checkbox"/> Golden Trout | <input type="checkbox"/> Northern Pikeminnow | <input type="checkbox"/> Channel Catfish | | <input type="checkbox"/> Reticulate Scul |
| <input type="checkbox"/> Shiner Perch | <input type="checkbox"/> Lake Trout | <input type="checkbox"/> Longnose Dace | <input type="checkbox"/> Tadpole Madtom | <input type="checkbox"/> Sand Roller | <input type="checkbox"/> Riffie Sculpin |
| <input type="checkbox"/> Starry Flounder | <input type="checkbox"/> Rainbow Trout and Steelhead | <input type="checkbox"/> Leopard Dace | <input type="checkbox"/> Yellow Bullhead | <input type="checkbox"/> Striped Bass | |
| | <input type="checkbox"/> Chinook Salmon | <input type="checkbox"/> Speckled Dace | <input type="checkbox"/> Flathead Catfish | | <input type="checkbox"/> Mussels |
| | <input type="checkbox"/> Chum Salmon | <input type="checkbox"/> Umatilla Dace | <input type="checkbox"/> Banded killifish | <input type="checkbox"/> Walleye | <input type="checkbox"/> Clams |
| <input type="checkbox"/> Olympic Mudminnow | <input type="checkbox"/> Coho Salmon | <input type="checkbox"/> Redside Shiner | <input type="checkbox"/> Mosquitofish | <input type="checkbox"/> Yellow Perch | <input type="checkbox"/> Invasive s |
| <input type="checkbox"/> Grass Pickerel | <input type="checkbox"/> Pink Salmon | <input type="checkbox"/> Tench | <input type="checkbox"/> Burbot | | |
| <input type="checkbox"/> Northern Pike | <input type="checkbox"/> Sockeye Salmon | | | | |
| <input type="checkbox"/> Tiger Muskellunge | <input type="checkbox"/> Lake Whitefish | | <input type="checkbox"/> Three-Spine Stickleback | | |
| | <input type="checkbox"/> Mountain Whitefish | | <input type="checkbox"/> Brook Stickleback | | |
| <input type="checkbox"/> Oriental Weatherfish | <input type="checkbox"/> Pygmy Whitefish | | | | |

Saltwater species selection form

| Food Fish | Bottom Fish | Shellfish |
|--|--|--|
| <input type="checkbox"/> Anchovy | <input type="checkbox"/> Cabezon | <input type="checkbox"/> Abalone |
| <input type="checkbox"/> Herring | <input type="checkbox"/> Dab | <input type="checkbox"/> Geoduck Clam |
| <input type="checkbox"/> Sand Lance | <input type="checkbox"/> Flounder | <input type="checkbox"/> Horse Clam |
| <input type="checkbox"/> Sardine | <input type="checkbox"/> Giant Wrymouth | <input type="checkbox"/> Razor Clam |
| <input type="checkbox"/> Smelt | <input type="checkbox"/> Greenling | <input type="checkbox"/> Clams - all other |
| <input type="checkbox"/> Eulachon | <input type="checkbox"/> Irish Lord | <input type="checkbox"/> Crab |
| <input type="checkbox"/> Pacific Halibut | <input type="checkbox"/> Lingcod | <input type="checkbox"/> Crayfish |
| <input type="checkbox"/> Green Sturgeon | <input type="checkbox"/> Pacific cod | <input type="checkbox"/> Goose Barnacle |
| <input type="checkbox"/> White Sturgeon | <input type="checkbox"/> Pacific Hake | <input type="checkbox"/> Mussels |
| <input type="checkbox"/> American Shad | <input type="checkbox"/> Pacific Tomcod | <input type="checkbox"/> Octopus |
| <input type="checkbox"/> Dolly Varden | <input type="checkbox"/> Plainfin Midshipman | <input type="checkbox"/> Oysters |
| <input type="checkbox"/> Bull Trout | <input type="checkbox"/> Ratfish | <input type="checkbox"/> Sand Shrimp |
| <input type="checkbox"/> Coastal Cutthroat Trout | <input type="checkbox"/> Rattail | <input type="checkbox"/> Shrimp |
| <input type="checkbox"/> Steelhead | <input type="checkbox"/> Rockfish | <input type="checkbox"/> Scallops |
| <input type="checkbox"/> Atlantic Salmon | <input type="checkbox"/> Sablefish | <input type="checkbox"/> Sea Cucumber |
| <input type="checkbox"/> Chinook Salmon | <input type="checkbox"/> Sculpin | <input type="checkbox"/> Sea Urchin |
| <input type="checkbox"/> Coho Salmon | <input type="checkbox"/> Shark | <input type="checkbox"/> Squid |
| <input type="checkbox"/> Chum Salmon | <input type="checkbox"/> Skate | |
| <input type="checkbox"/> Pink Salmon | <input type="checkbox"/> Sole | |
| <input type="checkbox"/> Sockeye Salmon | <input type="checkbox"/> Surfperch | |
| | <input type="checkbox"/> Walleye Pollock | |
| | <input type="checkbox"/> Wolfeel | |

Habitat Functions form

Spawning: Areas with clean, stable substrate suitable for successful egg to fry survival.

High Flow Refuge: Areas where fish seek shelter when mainstem channels are less habitable due to flood flows.

Low Flow Refuge: Areas that remain hospitable when stream flows reduce and other areas dry up or become too warm to support fish life.

Predator Refuge: Areas where fish hide from or otherwise avoid predators.

Rearing: Areas where juvenile fish can shelter, feed, grow, and avoid predators.

Thermal Refuge: Pockets, locations, or layers of water (both hot and cold) that fish seek to avoid excessively high or low temperature depending on the time of the year.

Food Production: Areas that produce prey for fish (such as insects, aquatic invertebrates or smaller fish).

Adult Migration: Areas with the structure, hydrology and gradient that allow fish to move between habitats for feeding, refuge, and reproduction.

Juvenile Migration: Areas with the structure, hydrology and gradient that allow fish to move between habitats for feeding and refuge.

Holding Habitats: Areas where fish can rest (hold) while migrating.

Over-wintering Habitats: Areas where juvenile salmonid species overwinter in freshwater systems.

Freshwater project types

Select FRESHWATER Project Type(s)

| | | |
|--|---|---|
| <input type="checkbox"/> Aquatic Plant Control | <input type="checkbox"/> Bank Protection | <input type="checkbox"/> Barge Landing |
| <input type="checkbox"/> Boat Access | <input type="checkbox"/> Buoy | <input type="checkbox"/> Channel Change/Realignment |
| <input type="checkbox"/> Diversion Structure | <input type="checkbox"/> Dredging | <input type="checkbox"/> Fish Trap or Diversion Weir |
| <input type="checkbox"/> Fishways | <input type="checkbox"/> Foot Access - beach stairs, cable car, etc | <input type="checkbox"/> Garbage and Debris Removal |
| <input type="checkbox"/> Gravel Extraction | <input type="checkbox"/> Habitat | <input type="checkbox"/> Logging |
| <input type="checkbox"/> Outfall structure | <input type="checkbox"/> Overwater Structure | <input type="checkbox"/> Water Surface Control |
| <input type="checkbox"/> Utility Crossing | <input type="checkbox"/> Water Crossing Structure | |
| <input type="checkbox"/> Other | | |
| <input type="checkbox"/> Beaver Dam Modification | <input type="checkbox"/> Dock Maintenance/Repair | <input type="checkbox"/> Fish Screen Maintenance or Replacement |
| <input type="checkbox"/> Mineral Prospecting | <input type="checkbox"/> Repositioning or Removal of Large Wood | <input type="checkbox"/> Road Maintenance Work |
| <input type="checkbox"/> Scientific Instruments | <input type="checkbox"/> Trenchless Conduit (Utility) Crossing | |

Project types not available in APPS

| | | |
|--------------------------------------|---------------------------------|--|
| <input type="checkbox"/> Aquaculture | <input type="checkbox"/> Marina | <input type="checkbox"/> Non-structural Piling |
|--------------------------------------|---------------------------------|--|

BACK **NEXT**

Saltwater project types

Select SALTWATER Project Type(s)

| | | |
|--|---|---|
| <input type="checkbox"/> Aquatic Plant Control | <input type="checkbox"/> Bank Protection | <input type="checkbox"/> Barge Landing |
| <input type="checkbox"/> Boat Access | <input type="checkbox"/> Buoy | <input type="checkbox"/> Channel Change/Realignment |
| <input type="checkbox"/> Diversion Structure | <input type="checkbox"/> Dredging | <input type="checkbox"/> Fish Trap or Diversion Weir |
| <input type="checkbox"/> Fishways | <input type="checkbox"/> Foot Access - beach stairs, cable car, etc | <input type="checkbox"/> Garbage and Debris Removal |
| <input type="checkbox"/> Gravel Extraction | <input type="checkbox"/> Habitat | <input type="checkbox"/> Logging |
| <input type="checkbox"/> Outfall structure | <input type="checkbox"/> Overwater Structure | <input type="checkbox"/> Shoreline Armoring - Marine |
| <input type="checkbox"/> Utility Crossing | <input type="checkbox"/> Water Crossing Structure | <input type="checkbox"/> Water Surface Control |
| <input type="checkbox"/> Other | | |
| <input type="checkbox"/> Beaver Dam Modification | <input type="checkbox"/> Dock Maintenance/Repair | <input type="checkbox"/> Fish Screen Maintenance or Replacement |
| <input type="checkbox"/> Mineral Prospecting | <input type="checkbox"/> Repositioning or Removal of Large Wood | <input type="checkbox"/> Road Maintenance Work |
| <input type="checkbox"/> Scientific Instruments | <input type="checkbox"/> Trenchless Conduit (Utility) Crossing | |

Project types not available in APPS

| | | |
|--------------------------------------|---------------------------------|--|
| <input type="checkbox"/> Aquaculture | <input type="checkbox"/> Marina | <input type="checkbox"/> Non-structural Piling |
|--------------------------------------|---------------------------------|--|

Save and Exit **BACK** **NEXT**

Freshwater Impacts form. This is duplicated up to 6 times, as needed per project type. Common impacts associated with the noted project type will be highlighted blue. The project type will be noted in the title bar at the top of the form during data entry.

Freshwater Impacts - Please select all applicable impacts from the following list

| Impacted Processes | Structural Changes | Functional Responses |
|--|---|--|
| <input type="checkbox"/> Sediment supply | <input type="checkbox"/> Decreased sediment heterogeneity | <input type="checkbox"/> Reduced quality and quantity of spawning habitat |
| <input type="checkbox"/> Sediment transport | <input type="checkbox"/> Decreased channel roughness | <input type="checkbox"/> Reduced egg to fry survival |
| <input type="checkbox"/> Sediment storage | <input type="checkbox"/> Increased fine sediment | <input type="checkbox"/> Entrainment and impingement |
| <input type="checkbox"/> Sediment sorting | <input type="checkbox"/> Decreased incision or aggradation | <input type="checkbox"/> Decreased predator avoidance and refugia |
| <input type="checkbox"/> Surface water storage | <input type="checkbox"/> Decreased pool formation | <input type="checkbox"/> Decreased prey production |
| <input type="checkbox"/> Floodplain water storage | <input type="checkbox"/> Decreased undercut banks | <input type="checkbox"/> Decreased nutrient retention |
| <input type="checkbox"/> Channel hydraulics and velocities | <input type="checkbox"/> Decrease/increase backwater | <input type="checkbox"/> Decreased hiding cover |
| <input type="checkbox"/> Flow regime | <input type="checkbox"/> Decreased water access to floodplain | <input type="checkbox"/> Decreased slow-water velocity cover |
| <input type="checkbox"/> Groundwater recharge/discharge | <input type="checkbox"/> Decreased floodplain channels | <input type="checkbox"/> Decreased thermal refugia |
| <input type="checkbox"/> Hyporheic exchange | <input type="checkbox"/> Decreased aquatic vegetation | <input type="checkbox"/> Decreased flood-flow refugia |
| <input type="checkbox"/> Erosion | <input type="checkbox"/> Increased water temperature | <input type="checkbox"/> Decreased low-flow refugia |
| <input type="checkbox"/> LWD input and transport | <input type="checkbox"/> Decreased riparian vegetation | <input type="checkbox"/> Decreased holding pools |
| <input type="checkbox"/> Accumulation of wood and detritus | <input type="checkbox"/> Decreased channel/structural diversity and heterogeneity | <input type="checkbox"/> Decreased floodplain habitats |
| <input type="checkbox"/> Nutrient and carbon cycling | <input type="checkbox"/> Decreased shoreline length | <input type="checkbox"/> Reduced fish access to floodplain and channel habitat |
| <input type="checkbox"/> Microclimate | | <input type="checkbox"/> Reduced riparian function |
| <input type="checkbox"/> Microhabitat | | <input type="checkbox"/> Decreased species diversity |
| <input type="checkbox"/> Primary production (photosynthesis) | | <input type="checkbox"/> Decreased connectivity |
| <input type="checkbox"/> Solar radiation protection | | <input type="checkbox"/> Reduced water quality |

NEXT

Saltwater Impacts form. This is duplicated up to 6 times, as needed per project type. Common impacts associated with the noted project type will be highlighted blue. The project type will be noted in the title bar at the top of the form during data entry.

Marine Impact Offsets - Please select which impacts are being offset by

| Impacted Processes | | Functional Impacts |
|--|---|---|
| <input type="checkbox"/> Sediment supply | <input type="checkbox"/> Accumulation of wood and detritus | <input type="checkbox"/> Entrainment and impingement |
| <input type="checkbox"/> Littoral/net shore drift | <input type="checkbox"/> Sediment supply and transport to marsh | <input type="checkbox"/> Decreased barrier lagoon or salt marsh stability |
| <input type="checkbox"/> Beach profile (topography) | <input type="checkbox"/> Tidal inundation in marsh | <input type="checkbox"/> Decreased juvenile salmon residence time |
| <input type="checkbox"/> Sediment dynamics | <input type="checkbox"/> Nutrient delivery and transformations | <input type="checkbox"/> Lower juvenile salmon growth and survival in nearshore |
| <input type="checkbox"/> Sediment composition | <input type="checkbox"/> Tidal prism | <input type="checkbox"/> Decreased juvenile salmon prey consumption |
| <input type="checkbox"/> Substrate heterogeneity | <input type="checkbox"/> Nutrient and carbon cycle | <input type="checkbox"/> Decreased predator avoidance and refugia |
| <input type="checkbox"/> Moisture retention in beach sediment | <input type="checkbox"/> Hydrologic cycle effects | <input type="checkbox"/> Decreased salmon prey production |
| <input type="checkbox"/> Wave energy | <input type="checkbox"/> Microclimate | <input type="checkbox"/> Decreased insect production |
| <input type="checkbox"/> Circulation and current velocities | <input type="checkbox"/> Microhabitat | <input type="checkbox"/> Decreased benthos production |
| <input type="checkbox"/> Erosion and accretion | <input type="checkbox"/> Primary production (photosynthesis) | <input type="checkbox"/> Loss of forage fish spawning |
| <input type="checkbox"/> LWD input | <input type="checkbox"/> Solar radiation protection | <input type="checkbox"/> Decreased shellfish production |
| Structural Changes | | <input type="checkbox"/> Loss of estuary community |
| <input type="checkbox"/> Downdrift accretion/erosion pattern | <input type="checkbox"/> Loss of tidal marsh vegetation | <input type="checkbox"/> Decreased connectivity |
| <input type="checkbox"/> Substrate moisture and temperature | <input type="checkbox"/> Loss of backshore vegetation | <input type="checkbox"/> Water quality |
| <input type="checkbox"/> Decreased high tidal channel network complexity | <input type="checkbox"/> Decreased intertidal vascular plants | |
| <input type="checkbox"/> Shallowing and narrowing of downstream channels | <input type="checkbox"/> Decreased eelgrass and kelp | |
| <input type="checkbox"/> Sediment accretion on subsided surface | <input type="checkbox"/> Loss of microtopography | |
| <input type="checkbox"/> Decreased fish access to shallow water | <input type="checkbox"/> Decreased structural diversity and heterogeneity | |
| | <input type="checkbox"/> Increased shoreline erosion | |

NEXT

Impact quantification form. Enter any quantifiable impacts for each project type. Project type will be noted at the top of each group based on selections made.

| | | | | | |
|----------------------|--------------------------------------|----------------------|--------------------------------------|----------------------|--------------------------------------|
| <input type="text"/> | Square Feet - Area | <input type="text"/> | Square Feet - Area | <input type="text"/> | Square Feet - Area |
| <input type="text"/> | Cubic yards - Volume | <input type="text"/> | Cubic yards - Volume | <input type="text"/> | Cubic yards - Volume |
| <input type="text"/> | Linear Feet - Length | <input type="text"/> | Linear Feet - Length | <input type="text"/> | Linear Feet - Length |
| <input type="text"/> | Quantity | <input type="text"/> | Quantity | <input type="text"/> | Quantity |
| <input type="text"/> | # of Mature Trees Lost (>4-inch dbh) | <input type="text"/> | # of Mature Trees Lost (>4-inch dbh) | <input type="text"/> | # of Mature Trees Lost (>4-inch dbh) |
| <input type="text"/> | # of Key Pieces Lost | <input type="text"/> | # of Key Pieces Lost | <input type="text"/> | # of Key Pieces Lost |
| <input type="text"/> | CY/Yr Lost Sediment Supply | <input type="text"/> | CY/Yr Lost Sediment Supply | <input type="text"/> | CY/Yr Lost Sediment Supply |
| <input type="text"/> | Cubic Feet per Second - Flow Change | <input type="text"/> | Cubic Feet per Second - Flow Change | <input type="text"/> | Cubic Feet per Second - Flow Change |
| <input type="text"/> | Other | <input type="text"/> | Other | <input type="text"/> | Other |

| | | | | | |
|----------------------|--------------------------------------|----------------------|--------------------------------------|----------------------|--------------------------------------|
| <input type="text"/> | Square Feet - Area | <input type="text"/> | Square Feet - Area | <input type="text"/> | Square Feet - Area |
| <input type="text"/> | Cubic yards - Volume | <input type="text"/> | Cubic yards - Volume | <input type="text"/> | Cubic yards - Volume |
| <input type="text"/> | Linear Feet - Length | <input type="text"/> | Linear Feet - Length | <input type="text"/> | Linear Feet - Length |
| <input type="text"/> | Quantity | <input type="text"/> | Quantity | <input type="text"/> | Quantity |
| <input type="text"/> | # of Mature Trees Lost (>4-inch dbh) | <input type="text"/> | # of Mature Trees Lost (>4-inch dbh) | <input type="text"/> | # of Mature Trees Lost (>4-inch dbh) |
| <input type="text"/> | # of Key Pieces Lost | <input type="text"/> | # of Key Pieces Lost | <input type="text"/> | # of Key Pieces Lost |
| <input type="text"/> | CY/Yr Lost Sediment Supply | <input type="text"/> | CY/Yr Lost Sediment Supply | <input type="text"/> | CY/Yr Lost Sediment Supply |
| <input type="text"/> | Cubic Feet per Second - Flow Change | <input type="text"/> | Cubic Feet per Second - Flow Change | <input type="text"/> | Cubic Feet per Second - Flow Change |
| <input type="text"/> | Other | <input type="text"/> | Other | <input type="text"/> | Other |

Benefits quantification form

Please enter the positive quantifiable aspects of this project ✖

Project BENEFITS, enter values to show planned impact offsets:

| | | | |
|----------------------|---|----------------------|---|
| <input type="text"/> | Square Feet - Reduction in Structure Size | <input type="text"/> | Linear feet of bank protection removed |
| <input type="text"/> | Sq Ft of Overwater Structure relocated | <input type="text"/> | Linear feet of Levee removed |
| <input type="text"/> | Square Feet - Grating added | <input type="text"/> | Linear feet of Channel added |
| <input type="text"/> | Feet of clearance increased | <input type="text"/> | Linear feet of Side channel made accessible |
| <input type="text"/> | # of Piles removed/Not replaced | <input type="text"/> | Acres of Floodplain reconnected |
| <input type="text"/> | Square Feet of Revegetation area | <input type="text"/> | Linear feet of Forest road treated |
| <input type="text"/> | Square feet of Aquatic veg planted | <input type="text"/> | # of Water crossings removed |
| <input type="text"/> | # of LWM pieces placed | <input type="text"/> | Cubic feet per second of Restored flow |
| <input type="text"/> | Cubic Yards of Beach nourishment placed | <input type="text"/> | Other 1 |
| <input type="text"/> | Cubic Yards of Riprap/Debris removed | <input type="text"/> | Other 2 |
| <input type="text"/> | Square feet of Riprap/Debris removed | | |

Freshwater technical provision groups

| | | |
|---|--|-------------------------------------|
| <input type="checkbox"/> TIMING - PLANS - INVASIVE SPECIES CONTROL | <input type="checkbox"/> DIVERSION/INTAKES | |
| <input type="checkbox"/> NOTIFICATION REQUIREMENTS | <input type="checkbox"/> DREDGING | |
| <input type="checkbox"/> STAGING, JOB SITE ACCESS, AND EQUIPMENT | <input type="checkbox"/> SAND AND GRAVEL REMOVAL | |
| <input type="checkbox"/> CONSTRUCTION-RELATED SEDIMENT, EROSION AND POLLUTION CONTAINMENT | <input type="checkbox"/> DRILLING | |
| <input type="checkbox"/> CONSTRUCTION MATERIALS | <input type="checkbox"/> FELLING AND YARDING | |
| <input type="checkbox"/> IN-WATER WORK AREA ISOLATION USING BLOCK NETS | <input type="checkbox"/> LARGE WOODY MATERIAL | |
| <input type="checkbox"/> IN-WATER WORK AREA ISOLATION USING A TEMPORARY BYPASS | <input type="checkbox"/> OUTFALL | |
| <input type="checkbox"/> IN-WATER WORK AREA ISOLATION USING A COFFERDAM STRUCTURE | <input type="checkbox"/> MARINAS AND TERMINALS | |
| <input type="checkbox"/> IN-WATER WORK WITHOUT A BYPASS OR COFFERDAM | <input type="checkbox"/> PIER, RAMP, AND FLOAT | |
| <input type="checkbox"/> FISH LIFE REMOVAL | <input type="checkbox"/> DOCK AND FLOAT | |
| <input type="checkbox"/> STREAM BANK PROTECTION | <input type="checkbox"/> PILE REMOVAL, DRIVING | |
| <input type="checkbox"/> LAKE SHORELINE STABILIZATION | <input type="checkbox"/> WATERCRAFT LIFT/GRID CONSTRUCT | |
| <input type="checkbox"/> BLASTING | <input type="checkbox"/> BOATHOUSE | |
| <input type="checkbox"/> BEAVER DAM MANAGEMENT | <input type="checkbox"/> BOAT RAMPS AND LAUNCHES - CONSTRUCT | |
| <input type="checkbox"/> BRIDGE | <input type="checkbox"/> RAMP AND HAND LAUNCH - MAINTENANCE | |
| <input type="checkbox"/> CHANNEL RELOCATION AND REALIGNMENT | <input type="checkbox"/> BUOY CONSTRUCTION | |
| <input type="checkbox"/> UTILITY CROSSING | <input type="checkbox"/> POND | |
| <input type="checkbox"/> CULVERT | <input type="checkbox"/> STREAM GAUGE | <input type="button" value="BACK"/> |
| <input type="checkbox"/> FORD | <input type="checkbox"/> MINERAL PROSPECTING | <input type="button" value="NEXT"/> |
| <input type="checkbox"/> WATER CROSSING REMOVAL | <input type="checkbox"/> DEMOBILIZATION AND CLEANUP | |
| <input type="checkbox"/> FISH PASSAGE IMPROVEMENT | | |

Saltwater technical provision groups

| | | |
|---|---|--|
| <input type="checkbox"/> AUTHORIZED WORK TIMES | | |
| <input type="checkbox"/> NOTIFICATION | | |
| <input type="checkbox"/> STAGING, JOB SITE ACCESS AND EQUIPMENT | | |
| <input type="checkbox"/> CONSTRUCTION-RELATED SEDIMENT, EROSION AND POLLUTION CONTAINMENT | | |
| <input type="checkbox"/> CONSTRUCTION MATERIALS | | <input type="button" value="Save and Exit"/> |
| <input type="checkbox"/> BULKHEAD - CONCRETE | | |
| <input type="checkbox"/> BULKHEAD - FOOTING | | |
| <input type="checkbox"/> BULKHEAD - ROCK | <input type="checkbox"/> BOAT RAMP MAINTENANCE | |
| <input type="checkbox"/> BULKHEAD - TIMBER | <input type="checkbox"/> MARINAS & TERMINALS | |
| <input type="checkbox"/> SOFT BANK PROTECTION | <input type="checkbox"/> PILE REMOVAL, DRIVING | |
| <input type="checkbox"/> PIER, RAMP AND FLOAT | <input type="checkbox"/> DREDGING | |
| <input type="checkbox"/> DOCK AND FLOAT | <input type="checkbox"/> ARTIFICIAL HABITAT | |
| <input type="checkbox"/> WATERCRAFT LIFT/GRID CONSTRUCT | <input type="checkbox"/> OUTFALL & TIDE & FLOOD GATES | |
| <input type="checkbox"/> BOATHOUSE | <input type="checkbox"/> UTILITY CROSSING | <input type="button" value="BACK"/> |
| <input type="checkbox"/> BUOY CONSTRUCTION | <input type="checkbox"/> TEST BORING | <input type="button" value="NEXT"/> |
| <input type="checkbox"/> BOAT RAMP & LAUNCH | <input type="checkbox"/> HABITAT FEATURES | |
| <input type="checkbox"/> MARINE RAILWAY | <input type="checkbox"/> DEMOBILIZATION/CLEANUP | |

Custom provisions form

List additional best practices, limitations, or other rectifying actions to be required (e.g. Custom Provisions, additional requirements). These should be reflected in the HPA provisions. These may be combined.

| |
|--|
| |
| |
| |
| |
| |

BACK **NEXT**

Compensatory mitigation determination

The project actions alone, as covered by the HPA technical provisions and any custom provisions, fully offset all adverse impacts.
Click CORRECT if NO compensatory mitigation is needed.

Compensatory Mitigation is required

BACK **CORRECT**

Additional impact designation and explanation

- Temporal Losses
- Uncertainty of performance
- Loss of habitat quantity
- Differences in habitat function from the baseline

Please explain your selection(s) above:

BACK **NEXT**

Freshwater mitigation actions

- Armor removal or modification
- Beaver re-introduction
- Boulder clusters
- Levee removal or modification
- Channel rehabilitation and creation
- Debris removal
- Drop structures
- Fish passage restoration
- Flow control structure removal and modification
- Large wood placement
- Nutrient supplementation
- Overwater structure removal
- Physical exclusion
- Porous weirs
- Revegetation
- Side channel/off channel restoration
- Spawning gravel cleaning and placement
- Topography restoration

BACK **NEXT**

Saltwater mitigation actions

| | |
|--|-------------------------------------|
| <input type="checkbox"/> Armor removal or modification | |
| <input type="checkbox"/> Beach nourishment | |
| <input type="checkbox"/> Berm or dike removal or modification | |
| <input type="checkbox"/> Channel rehabilitation and creation | |
| <input type="checkbox"/> Debris removal | |
| <input type="checkbox"/> Groin removal and modification | |
| <input type="checkbox"/> Flow control structure removal and modification | |
| <input type="checkbox"/> Large wood placement | |
| <input type="checkbox"/> Overwater structure removal and modification | |
| <input type="checkbox"/> Physical exclusion | |
| <input type="checkbox"/> Revegetation | <input type="button" value="BACK"/> |
| <input type="checkbox"/> Species habitat enhancement | |
| <input type="checkbox"/> Reintroduction of native animals (aquaculture) | |
| <input type="checkbox"/> Substrate modification | |
| <input type="checkbox"/> Topography restoration | <input type="button" value="NEXT"/> |

Freshwater impacts being offset by mitigation actions. Duplicated per mitigation action selected.

| Impacted Processes | Structural Changes | Functional Responses |
|--|---|--|
| <input type="checkbox"/> Sediment supply | <input type="checkbox"/> Decreased sediment heterogeneity | <input type="checkbox"/> Reduced quality and quantity of spawning habitat |
| <input type="checkbox"/> Sediment transport | <input type="checkbox"/> Decreased channel roughness | <input type="checkbox"/> Reduced egg to fry survival |
| <input type="checkbox"/> Sediment storage | <input type="checkbox"/> Increased fine sediment | <input type="checkbox"/> Entrainment and impingement |
| <input type="checkbox"/> Sediment sorting | <input type="checkbox"/> Decreased incision or aggradation | <input type="checkbox"/> Decreased predator avoidance and refugia |
| <input type="checkbox"/> Surface water storage | <input type="checkbox"/> Decreased pool formation | <input type="checkbox"/> Decreased prey production |
| <input type="checkbox"/> Floodplain water storage | <input type="checkbox"/> Decreased undercut banks | <input type="checkbox"/> Decreased nutrient retention |
| <input type="checkbox"/> Channel hydraulics and velocities | <input type="checkbox"/> Decrease/increase backwater | <input type="checkbox"/> Decreased hiding cover |
| <input type="checkbox"/> Flow regime | <input type="checkbox"/> Decreased water access to floodplain | <input type="checkbox"/> Decreased slow-water velocity cover |
| <input type="checkbox"/> Groundwater recharge/discharge | <input type="checkbox"/> Decreased floodplain channels | <input type="checkbox"/> Decreased thermal refugia |
| <input type="checkbox"/> Hyporheic exchange | <input type="checkbox"/> Decreased aquatic vegetation | <input type="checkbox"/> Decreased flood-flow refugia |
| <input type="checkbox"/> Erosion | <input type="checkbox"/> Increased water temperature | <input type="checkbox"/> Decreased low-flow refugia |
| <input type="checkbox"/> LWD input and transport | <input type="checkbox"/> Decreased riparian vegetation | <input type="checkbox"/> Decreased holding pools |
| <input type="checkbox"/> Accumulation of wood and detritus | <input type="checkbox"/> Decreased channel/structural diversity and heterogeneity | <input type="checkbox"/> Decreased floodplain habitats |
| <input type="checkbox"/> Nutrient and carbon cycling | <input type="checkbox"/> Decreased shoreline length | <input type="checkbox"/> Reduced fish access to floodplain and channel habitat |
| <input type="checkbox"/> Microclimate | | <input type="checkbox"/> Reduced riparian function |
| <input type="checkbox"/> Microhabitat | | <input type="checkbox"/> Decreased species diversity |
| <input type="checkbox"/> Primary production (photosynthesis) | | <input type="checkbox"/> Decreased connectivity |
| <input type="checkbox"/> Solar radiation protection | | <input type="checkbox"/> Reduced water quality |
| | <input type="button" value="NEXT"/> | |

Saltwater impacts being offset by mitigation actions. Duplicated per mitigation action selected.

| Impacted Processes | | Functional Impacts |
|--|---|---|
| <input type="checkbox"/> Sediment supply | <input type="checkbox"/> Accumulation of wood and detritus | <input type="checkbox"/> Entrainment and impingement |
| <input type="checkbox"/> Littoral/net shore drift | <input type="checkbox"/> Sediment supply and transport to marsh | <input type="checkbox"/> Decreased barrier lagoon or salt marsh stability |
| <input type="checkbox"/> Beach profile (topography) | <input type="checkbox"/> Tidal inundation in marsh | <input type="checkbox"/> Decreased juvenile salmon residence time |
| <input type="checkbox"/> Sediment dynamics | <input type="checkbox"/> Nutrient delivery and transformations | <input type="checkbox"/> Lower juvenile salmon growth and survival in nearshore |
| <input type="checkbox"/> Sediment composition | <input type="checkbox"/> Tidal prism | <input type="checkbox"/> Decreased juvenile salmon prey consumption |
| <input type="checkbox"/> Substrate heterogeneity | <input type="checkbox"/> Nutrient and carbon cycle | <input type="checkbox"/> Decreased predator avoidance and refugia |
| <input type="checkbox"/> Moisture retention in beach sediment | <input type="checkbox"/> Hydrologic cycle effects | <input type="checkbox"/> Decreased salmon prey production |
| <input type="checkbox"/> Wave energy | <input type="checkbox"/> Microclimate | <input type="checkbox"/> Decreased insect production |
| <input type="checkbox"/> Circulation and current velocities | <input type="checkbox"/> Microhabitat | <input type="checkbox"/> Decreased benthos production |
| <input type="checkbox"/> Erosion and accretion | <input type="checkbox"/> Primary production (photosynthesis) | <input type="checkbox"/> Loss of forage fish spawning |
| <input type="checkbox"/> LWD input | <input type="checkbox"/> Solar radiation protection | <input type="checkbox"/> Decreased shellfish production |
| Structural Changes | | <input type="checkbox"/> Loss of estuary community |
| <input type="checkbox"/> Downdrift accretion/erosion pattern | <input type="checkbox"/> Loss of tidal marsh vegetation | <input type="checkbox"/> Decreased connectivity |
| <input type="checkbox"/> Substrate moisture and temperature | <input type="checkbox"/> Loss of backshore vegetation | <input type="checkbox"/> Water quality |
| <input type="checkbox"/> Decreased high tidal channel network complexity | <input type="checkbox"/> Decreased intertidal vascular plants | |
| <input type="checkbox"/> Shallowing and narrowing of downstream channels | <input type="checkbox"/> Decreased eelgrass and kelp | |
| <input type="checkbox"/> Sediment accretion on subsided surface | <input type="checkbox"/> Loss of microtopography | |
| <input type="checkbox"/> Decreased fish access to shallow water | <input type="checkbox"/> Decreased structural diversity and heterogeneity | |
| | <input type="checkbox"/> Increased shoreline erosion | |

NEXT

Priority designation for each mitigation action

- On-Site, In-Kind
- Off-Site, In-Kind
- On-Site, Out-of-Kind
- Off-Site, Out-of-Kind

Communications summary form. Additional forms (up to 4 total) may be added. 27 lines of text each.

Summarize pertinent communications with the applicant and third-parties that provide substance to the decisions made for this application. Attach full records to the application as needed.

DO NOT ENTER TEXT BEYOND THE VISIBLE LIMITS OF THE BOX - ADD UP TO 3 MORE BOXES
(additional text will not print on the pdf)

BACK **ADD TEXTBOX** **NEXT**

Mitigation Plan determination, and optional types to select if appropriate.

Mitigation Plan - Bank or ILF credits?

Check if a mitigation plan is required for this project because of ongoing, complex, and experimental mitigation actions (WAC 220-600-080(5))

Check if credits will be purchased from a mitigation bank

Check if credits will be purchased from an in-lieu-fee program

BACK **NEXT**

Verification of required mitigation plan details. All three should be checked as required by WAC 220-660-080(5) (c).

Guarantee long-term viability of the created, restored, enhanced, or preserved habitat, including assurances for protecting any essential habitat functions and values defined in the mitigation plan

Provide long-term monitoring of any created, restored, or enhanced mitigation site

Is consistent with the local comprehensive land use plan and any other applicable planning process in effect for the development area, such as an adopted subbasin or watershed plan.

BACK **YES**

Selection of justification options based on the mitigation plan components.

The mitigation plan must provide equal or greater habitat functions, value, and quantity by habitat type compared to the existing conditions. Please check all that apply to justify acceptance of the plan - AND explain below:

The relative value of the mitigation for the target fish life, in terms of the habitat functions, value, and quantity by habitat type

The compatibility of the proposal with broader resource management and habitat management objectives and plans, such as existing resource management plans, species recovery plans and associated habitat restoration strategies, watershed plans, critical areas ordinances, the forestry riparian easement program, the riparian open space program, the family forest fish passage program, and shoreline master programs

The ability of the mitigation to address scarce habitat functions or types within a watershed

The benefits of the proposal to the broader watershed landscape, including the benefits of connecting various habitat units and reducing fish life-limiting habitats

The benefits of implementing advance compensatory mitigation before the project's anticipated impacts occur

The significance of any negative impacts to non-target fish life

BACK **NEXT**

Additional comment form

Provide any additional comments, reasoning, or additional justification for the determinations made:

BACK **Save and Exit** **FINISHED**

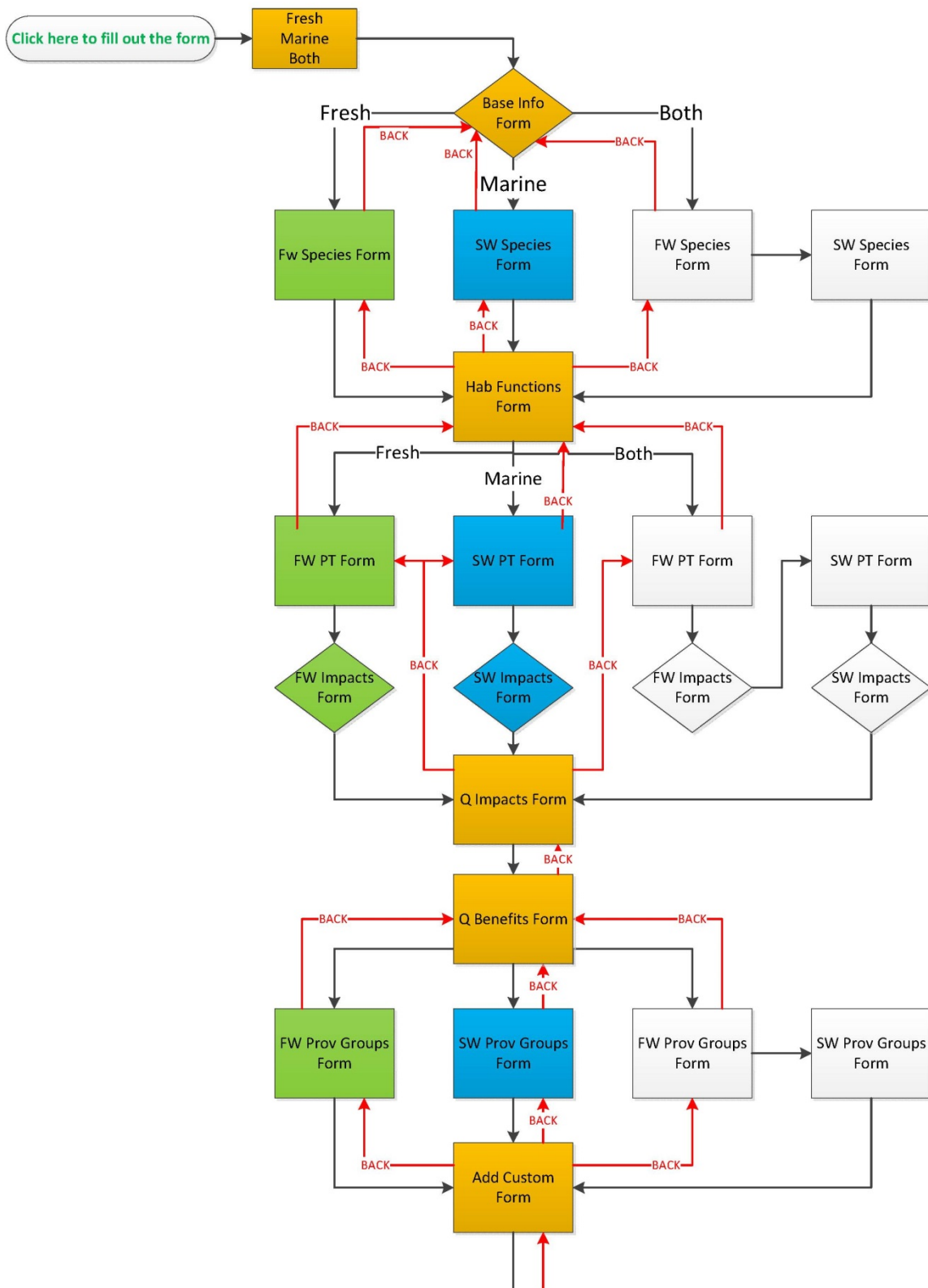
Amend/Correct or Modification form. After data has been entered and saved into the application review form, and the user clicks to start the system again, the user is presented with the option to Amend/Correct, or create a form for a Major Modification.

Click here to Amend or Correct the existing data file

Click here to create a Major Modification Review Form using the existing data

APPENDIX C – Review Form Flow Chart

Flow chart of the WDFW Project Review for Mitigation Forms (2 pages).



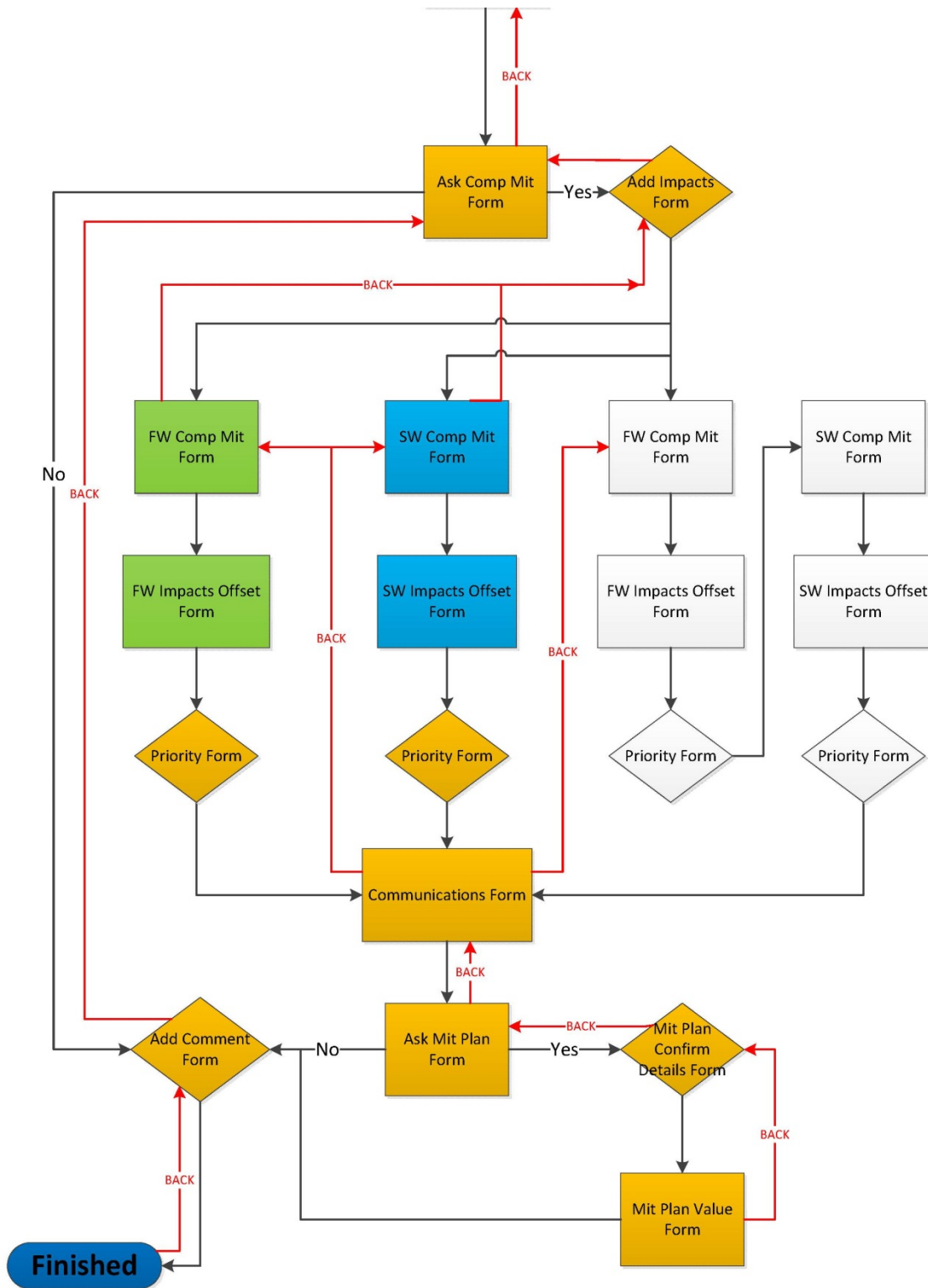


Table D2. Impacts associated with saltwater HPA permitted project

| Marine Impact Types | Impacted Processes | | | | | | | | | | | | | | | | | Structural Changes | | | | | | | | | | Functional Response | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|--------------------|--------------------------|----------------------------|-------------------|----------------------|-------------------------|--------------------------------------|-------------|------------------------------------|-----------------------|-----------|-----------------------------------|--|---------------------------|---------------------------------------|-------------|---------------------------|--------------------------|--------------|--------------|-------------------------------------|----------------------------|-------------------------------------|------------------------------------|---|---|--|--|--------------------------------|------------------------------|--------------------------------------|-----------------------------|-------------------------|--|-----------------------------|-----------------------------|--|--|--|--|--|----------------------------------|-----------------------------|------------------------------|------------------------------|--------------------------------|---------------------------|------------------------|---------------|---|
| | Sediment supply | Littoral/net shore drift | Beach profile (topography) | Sediment dynamics | Sediment composition | Substrate heterogeneity | Moisture retention in beach sediment | Wave energy | Circulation and current velocities | Erosion and accretion | LWD input | Accumulation of wood and detritus | Sediment supply and transport to marsh | Tidal inundation in marsh | Nutrient delivery and transformations | Tidal prism | Nutrient and carbon cycle | Hydrologic cycle effects | Microclimate | Microhabitat | Primary production (photosynthesis) | Solar radiation protection | Downdrift accretion/erosion pattern | Substrate moisture and temperature | Decreased high tidal channel network complexity | Shallowing and narrowing of downstream channels | Sediment accretion on subsided surface | Decreased fish access to shallow water | Loss of tidal marsh vegetation | Loss of backshore vegetation | Decreased intertidal vascular plants | Decreased eelgrass and kelp | Loss of microtopography | Decreased structural diversity and heterogeneity | Increased shoreline erosion | Entrainment and impingement | Decreased barrier lagoon or salt marsh stability | Decreased juvenile salmon residence time | Lower juvenile salmon growth and survival in nearshore | Decreased juvenile salmon prey consumption | Decreased predator avoidance and refugia | Decreased salmon prey production | Decreased insect production | Decreased benthos production | Loss of forage fish spawning | Decreased shellfish production | Loss of estuary community | Decreased connectivity | Water quality | |
| Aquaculture * | | | | | X | | | | | | | | | X | | | | | X | | X | X | | | | | | | | | | X | | | | | | | | | | | X | | | | | X | | |
| Bank protection | X | X | X | X | X | X | X | X | | X | X | X | | | | X | | X | X | X | X | X | X | X | | | | | X | X | | | X | X | | | | | | | | | X | X | X | X | X | X | | X |
| Barge landing site | | | X | | X | | | | | | | | | | | | | X | X | | X | X | | | | | | X | | X | X | | | | | | | | | | | X | X | X | X | | | | | |
| Boat access | | X | X | | X | | | | | | | | | | | | | X | | | X | X | | | | | | X | | X | X | X | | | X | | | | | | | X | X | X | X | | X | | | |
| Buoy | | | | | X | | | | | | | | | | | | | | | | X | | | | | | | | | | X | | | | | | | | | | | | X | | | | | X | | |
| Channel modification | X | | X | | | | X | X | | | | | | | | X | | X | X | | X | X | | | | X | X | X | X | X | X | | | X | X | | | | | | | | X | | | | | X | | |
| Flow control structure | | X | | | X | | X | X | | | | X | X | X | X | X | | X | X | | X | X | | | X | X | X | X | X | X | X | X | X | X | | | | X | X | X | X | | | X | X | | X | X | | |
| Marina | X | X | X | X | X | X | | X | X | X | X | | | | | X | | X | X | | X | X | X | | | X | X | X | X | X | X | X | X | X | | | | | | | X | | X | | X | X | X | X | X | |
| Overwater structure | | | | | X | | X | | | | | | | | | | | | | | X | | | | | | X | | X | X | X | | | | | | X | X | X | | | | X | | | X | | X | | |
| Non-structural piling | | | | | X | | X | | | | | | | | | | | | | X | X | | | | | | | | X | X | | | | | | | | | | | | | | X | | | | | | |
| Scientific instruments | | | | | X | | | | | | | | | | | | | | | | | X | | | | | | | | X | | | | | | | | | | | | | | X | | | | | | |
| Shoreline modification | X | X | X | X | X | X | | X | | X | X | X | X | X | | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | X | X | X | X | X | | X | | |
| Water crossing structures | X | X | | | | | X | X | | | | | | | | | | X | X | | X | X | | | | | | | X | | X | | | | | | | | | | | | X | | | | | | | |

*Non-Commercial Aquaculture Only

APPENDIX E – Mitigation Option and Predicted Response Matrices

Table E1. Freshwater mitigation measures

| Freshwater Compensatory Mitigation Actions | Restored Processes | | | | | | | | | | | | | | Structural Changes | | | | | | | | | | Functional Responses | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--------------------|--------------------|------------------|------------------|-----------------------|--------------------------|-----------------------------------|-------------|--------------------------------|--------------------|---------|-------------------------|-----------------------------------|-----------------------------|--------------------|--------------|-------------------------------------|----------------------------|----------------------------------|-----------------------------|----------------------------|-----------------------------------|--------------------------|--------------------------|----------------------|--------------------------------------|-------------------------------|------------------------------|---------------------------------|----------------------------------|--|----------------------------|--|-----------------------------|--|---------------------------|------------------------------|------------------------|-------------------------------------|--------------------------|------------------------------|----------------------------|------------------------|------------------------------|---|----------------------------|-----------------------------|------------------------|------------------------|---|---|
| | Sediment supply | Sediment transport | Sediment storage | Sediment sorting | Surface water storage | Floodplain water storage | Channel hydraulics and velocities | Flow regime | Groundwater recharge/discharge | Hyporheic exchange | Erosion | LWD input and transport | Accumulation of wood and detritus | Nutrient and carbon cycling | Microclimate | Microhabitat | Primary production (photosynthesis) | Solar radiation protection | Increased sediment heterogeneity | Increased channel roughness | Reduction in fine sediment | Decreased incision or aggradation | Increased pool formation | Increased undercut banks | Increased backwater | Increased water access to floodplain | Increased floodplain channels | Increased aquatic vegetation | Moderation of water temperature | Re-establish riparian vegetation | Increased channel/structural diversity and heterogeneity | Increased shoreline length | Improve quality and quantity of spawning habitat | Improve egg to fry survival | Increased predator avoidance and refugia | Increased prey production | Increased nutrient retention | Increased hiding cover | Increased slow-water velocity cover | Increase thermal refugia | Increased flood-flow refugia | Increased low-flow refugia | Increase holding pools | Increase floodplain habitats | Improve fish access to floodplain and channel habitat | Improved riparian function | Increased species diversity | Increased connectivity | Improved water quality | | |
| Armor removal or modification | X | | | | | X | | | | X | X | | | X | | X | X | | | X | | | | X | | | | | X | X | | | | | | | X | X | | | | | | | | | | X | | X | |
| Beaver re-introduction | | | | X | X | | X | | | X | | | | X | X | | | | | X | | | X | | | | | | | | | | | | | | X | X | | | | | | | X | X | | | | | X |
| Boulder clusters | | | X | | | X | | | | X | | | | | | X | | | X | X | | | | X | | | | | | | | | | | | | | | | X | | | | | | | | | | | |
| Levee removal or modification | | | X | | X | X | | X | X | | | | | | | | | | | X | X | | | | | X | X | | | | | | | | | | | | | | | X | X | | X | | | | | X | |
| Channel rehabilitation and creation | | X | X | X | | X | X | | X | X | | | | X | | | | | X | | | | | | | X | | | | X | X | X | X | | | | | | | | | | X | X | | | | | X | | |
| Debris removal | | | | | | | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | X | | | | | | | | | | | | | | | | | X |
| Drop structures | X | | X | X | | | | | | X | | | | | | | | | | | X | X | | X | X | | | | | | | X | | | | | | | | | | | | | | X | | | | X | |
| Fish passage restoration | | X | | | | | | | | | X | | | | | | | | | | X | | | | | | | | | | X | | | | | | | | | | | | | | X | | X | X | | | |
| Flow control structure removal and modification | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | X | X | | | X | X | | | | |
| Large wood placement | | | X | X | | X | | | | X | X | X | X | X | X | | | | X | X | | | X | X | X | | | | | | X | | | | | | X | X | X | X | X | X | X | X | | | | | | X | |
| Nutrient supplementation | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Overwater structure removal | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | X |
| Physical exclusion | | | | | | | | | | X | | | | | X | | | | | | X | | | | | | | | | X | | | | | | | | | | | | | | | | X | | | | | |
| Porous weirs | | | X | X | | X | | | | X | | | | | | | | | | | X | | | X | X | | | | | | X | | | | | | | | | | | | | | | | X | | | | X |
| Revegetation | | | | X | X | | | | | X | X | X | X | X | X | | | | | X | | | | X | X | | | | | X | X | | | | | | | | | | | | | | | | X | | | | X |
| Side channel/off channel restoration | | | X | | X | X | | X | X | | | | | X | | | | | X | | | | | | | X | | | | X | | | | | | | | | | | | | X | X | | | | | X | | |
| Spawning gravel cleaning and placement | X | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | |
| Topography restoration | | | | | | | | | | | X | | | X | | X | X | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | X | | | X |

