Attachment A

Fisheries Engineering Review Checklists
Coho HELP Act Projects

The following lists include information necessary for the adequate review of treatments that may be necessary to complete a Coho HELP Act fish passage project. Use of these lists by project proponents and Department staff will streamline the engineering review process and ensure that projects provide sustainable fish protection and passage. The project applicant should submit this information with the design plans in the project description. If a listed item is considered unnecessary, the rationale for excluding it should be provided by the project applicant. Conversely, while these lists attempt to cover the key parameters for most projects, there may be site-specific opportunities to provide better fish passage and that cannot be easily translated into a simple checklist (e.g., avoidance of predation habitat).

Bank Protection

1. Calculation of design flow and 100-year flow
2. Water surface profiles and average channel velocities for design and 100-year flows
3. Geotechnical assessment may be necessary to ensure project design is structurally appropriate.
4. Design calculations, i.e. shear stress, rock sizing; root strength and suitability of selected vegetation; and determination of spur, groin, bendway weir dimensions, spacing, angle, etc.
5. Alternatives analysis and justification for using rock slope protection, if applicable.
6. Design drawings showing site topography, control points, dimensions of the bank protection in plan, elevation, longitudinal profile, and cross-sectional views, and important component details, and planting plans.

Boulder Weirs: *See Parts IX and XII, California Salmonid Stream Habitat Restoration Manual, 4rd edition, California Department of Fish and Game.*

1. Target species, life stages and migration timing at project site.
2. Calculation of lower and upper fish passage stream flows for each life stage and species and 100-year flow.
3. Water surface profiles at existing conditions for upper and lower fish passage stream flows and 100-year flow.
4. Water surface profiles with proposed boulder weirs for upper and lower fish passage stream flows and 100-year flow.
5. Spacing of, drops over, cross-sections shape of, and pool depths above and below boulder weirs.
6. If specific low flow notches are planned, calculations of depths and velocities within notches at fish passage flows.
7. Rock sizing calculations

8. Ditch/pump hydraulic calculations showing boulder weirs provide sufficient head to divert maximum diversion flow and bypass flow at minimum stream flow considering head losses at flow measurement devices, fish screens, pipes, open ditches, headgates, etc.
9. Geotechnical information may be necessary to ensure project design is structurally appropriate.
10. Design drawings showing site topography, control points, structural dimensions in plan, elevation, longitudinal profile, and cross-sectional views, and important component details, including construction notes on placement of bed material and boulders.
11. Post construction evaluation and monitoring plan with allocated money in the construction budget.

Rock Chutes: *See Parts IX and XII, California Salmonid Stream Habitat Restoration Manual, 4rd edition, California Department of Fish and Game*

1. Target species, life stages and migration timing at project site.
2. Calculation of lower and upper fish passage stream flows for each life stage and species and 100-year flow.
3. Water surface profiles at existing conditions for upper and lower fish passage stream flows and 100-year flow.
4. Water surface profiles with proposed rock chutes for upper and lower fish passage stream flows and 100-year flow.
5. Calculations of depths, velocities, and slope at fish passage flows along length of individual rock chutes.
6. Rock and engineered streambed material sizing calculations for both bed and banks.
7. If at a water diversion, ditch/pump hydraulic calculations showing rock chutes provide sufficient head to divert maximum diversion flow and bypass flow at minimum stream flow considering head losses at flow measurement devices, fish screens, pipes, open ditches, headgates, etc.
8. Geotechnical information may be necessary to ensure project design is structurally appropriate.
9. Design drawings showing site topography, control points, structural dimensions in plan, elevation, longitudinal profile, and cross-sectional views, and important component details, including construction notes on placement of bed material and boulders.
10. Post construction evaluation and monitoring plan with allocated money in the construction budget.

Roughened Channels: *See Parts IX and XII, California Salmonid Stream Habitat Restoration Manual, 4rd edition, California Department of Fish and Game.*

1. Target species, life stages and migration timing at project site.
2. Calculation of lower and upper fish passage stream flows for each life stage and species and 100-year flow.
3. Water surface profiles at existing conditions for upper and lower fish passage stream flows and 100-year flow.

4. Water surface profiles with proposed roughened channel for upper and lower fish passage stream flows and 100-year flow.
5. Rock and engineered streambed material sizing and thickness calculations for bed and banks.
6. Geotechnical information may be necessary to ensure project design is structurally appropriate.
7. Calculations of depths and velocities at fish passage flows along length of roughened channel.
8. Calculation of overall drop and slope along roughened channel.
9. If at a water diversion, ditch/pump hydraulic calculations showing roughened channel provides sufficient head to divert maximum diversion flow + bypass flow at minimum stream flow considering head losses at flow measurement devices, fish screens, pipes, open ditches, headgates, etc.
10. Design drawings showing site topography, control points, structural dimensions in plan, elevation, longitudinal profile, and cross-sectional views, and important component details, including construction notes on placement of bed material and boulders.
11. Post construction evaluation and monitoring plan with allocated money in the construction budget.

No-slope Culvert Design: *See Parts IX, and XII, California Salmonid Habitat Restoration Manual, 4rd edition, California Department of Fish and Game*

1. Target species, life stages and migration timing at project site.
2. Documentation that other fish passage methods are not feasible at site and that this installment meets the appropriate criteria for the no-slope method.
3. Documentation of natural channel slope in reach of crossing.
4. Demonstration of natural channel bankfull width.
5. Geotechnical information may be necessary to ensure project design is structurally appropriate.
6. Design drawings showing site topography, control points, structural dimensions in plan, elevation, and cross-sectional views, and important component details such as embedment. Channel and culvert slope as well as channel width outside the influence of the culvert must be shown. If profile control is being used, these elements (and appropriate items from other checklists) must be included.
7. Cattle exclusion, if planned, must be included in design drawings.
8. Maintenance plan which includes preventative and corrective measures (such as trash racks, if used), assignment of personnel for maintenance during storms, inspection and reporting requirements, maintenance logs, etc.
9. Post construction evaluation and monitoring plan with allocated money in the construction budget.

Hydraulic Design Culvert (new): *See Parts IX, and XII, California Salmonid Habitat Restoration Manual, 4rd edition, California Department of Fish and Game.*

1. Completed Design Form from Part XII.
2. Target species, life stages and migration timing at project site.

3. Documentation that other fish passage methods are not feasible at site.

4. Calculation of lower and upper fish passage stream flows.

5. Calculation of average water velocities and depths at lower and upper fish passage flows for each target species and life stage.

6. Demonstration that inlet and outlet conditions are not forming a velocity or height barrier over the range of fish flows.

7. Geotechnical information may be necessary to ensure project design is structurally appropriate.

8. Design drawings showing site topography, control points, structural dimensions in plan, elevation, and cross-sectional views, and important component details. Plan view must be of sufficient channel length to show culvert alignment with respect to the existing channel. Channel and culvert slope as well as channel width outside the influence of the culvert must be shown. If profile control is being used, these elements (and appropriate items from other checklists) must be included.

9. If crossing has multiple bores, all bores must be shown. If one is being designated or designed for fish passage, that bore must be so labeled.

10. Cattle exclusion, if planned, must be included in design drawings.

11. Maintenance plan which includes preventative and corrective measures (such as trash racks, if used), assignment of personnel for maintenance during storms, inspection and reporting requirements, maintenance logs, etc.

12. Post construction evaluation and monitoring plan with allocated money in the construction budget.

Hydraulic Design Culverts (retrofit): *See Parts IX, and XII, California Salmonid Habitat Restoration Manual, 4rd edition, California Department of Fish and Game.*

1. Completed Design Form from Part XII.

2. Target species, life stages and migration timing at project site.

3. Documentation that other fish passage methods are not feasible at site.

4. Calculation of lower and upper fish passage stream flows.

5. Calculation of current passage conditions.

6. Calculation of average water velocities and depths at lower and upper fish passage flows for each target species and life stage with modified conditions.

7. Demonstration that inlet and outlet conditions are not forming a velocity or height barrier over the range of fish flows.

8. Geotechnical information may be necessary to ensure project design is structurally appropriate.

9. Design drawings showing site topography, control points, structural dimensions in plan, elevation, and cross-sectional views, and important component details. Channel and culvert slope as well as channel width outside the influence of the culvert must be shown. If profile control is being used, these elements (and appropriate items from other checklists, must be included.

10. If crossing has multiple bores, all bores must be shown. If one is being designated or designed for fish passage, that bore must be so labeled. If a splitter wall is being used, it must also be shown.
11. Cattle exclusion, if planned, must be included in design drawings.
12. Maintenance plan which includes preventative and corrective measures (such as trash racks, if used), assignment of personnel for maintenance during storms, inspection and reporting requirements, maintenance logs, etc.
13. Post construction evaluation and monitoring plan with allocated money in the construction budget.

Baffles (only allowed on retrofits): *See Part XII, especially Appendix C, California Salmonid Habitat Restoration Manual, 4rd edition, California Department of Fish and Game.*

1. Completed Design Form from Part XII.
2. Target species, life stages and migration timing at project site.
3. Documentation that other fish passage methods are not feasible at site.
4. Calculation of lower and upper fish passage stream flows.
5. Design drawings showing site topography, control points, structural dimensions in plan, elevation, and cross-sectional views (including length and slope of existing culvert), and important component details. Channel and culvert slope as well as channel width outside the influence of the culvert must be shown. If profile control is being used, these elements (and appropriate items from other checklists must be included).
6. Calculation of current passage conditions (depth and average velocities).
7. Spacing and geometry (shape and height), material and attachment method for baffles.
8. Calculation of post-baffle passage conditions (depth and average velocities), EDF, plunging and streaming flow regimes, new hydraulic capacity at 100 yr storm.
9. Demonstration that inlet and outlet conditions are not forming a velocity or height barrier over the range of fish flows.
10. If crossing has multiple bores, all bores must be shown. If one is being designated or designed for fish passage, that bore must be so labeled. If a splitter wall is being used, it also must be shown.
11. Cattle exclusion, if planned, must be included in design drawings.
12. Maintenance plan which includes preventative and corrective measures including baffles and if used), assignment of personnel for maintenance during storms, inspection and reporting requirements, maintenance logs, etc.
13. Post construction evaluation and monitoring plan with allocated money in the construction budget.

Bridge and Bottomless Culverts *(Review pertains to impacts to stream and aquatic environment, but not structural integrity or bridge loading)*

1. Identify and apply applicable fish passage technique: stream simulation, hydraulic design, not applicable, etc.
2. Calculation of 100-year flow and any other design flow

3. Water surface profiles and average channel velocities for the design flows and the 100-year flow.
4. Description of geomorphic setting of bridge and why bridge design is appropriate for the setting
5. Potential for debris loads or jams at bridge site
6. Scour analysis
7. Justification for increases in water surface elevation or velocities near the bridge (if any) and the use of any scour protection.
8. Geotechnical assessment may be necessary to ensure project design is structurally appropriate.
9. Design drawings showing site topography, control points, dimensions of bridge/culvert structure in plan, elevation, longitudinal profile, and cross-sectional views, and important component details.
10. HEC-RAS model files including boundary conditions and other model parameters.