Instructions for Completing the Streamlined Biological Assessment Form for Project-Level Consultation under the Streamlined Consultation Framework for the Big Creek Crayfish, St. Francis River, Crayfish, and the Species' Critical Habitat

Version 1.2 (November 2024)

This document was created to assist Federal agencies and designated non-federal representatives with completing the streamlined biological assessment (BA) form for project-level consultation under the streamlined consultation framework (SCF) for the Big Creek Crayfish (BCC), St. Francis River Crayfish (SFRC), and the species' designated critical habitat (DCH). For additional assistance, please contact the Missouri Ecological Services Field Office of the U.S. Fish and Wildlife Service (Service) at 573-234-2132.

Before beginning the form, generate an Official Species List through the Service's Information for Planning and Consultation (IPaC) website at https://ipac.ecosphere.fws.gov/.

I. Project Information

Provide the project name, action agency, point of contact (name, email address, and phone number), county(ies) in which the project is located, project location (either latitude/longitude or UTM coordinate), IPaC code, and a description of the project.

For the project description, identify all actions associated with the project (such as vegetation or tree removal required for other actions, streambank grading, etc.) and estimate the duration of each action. Provide sufficient information for the Service to confirm the project is within the scope of the SCF. Action agencies can contact the Service's Missouri Ecological Services Field Office if they are uncertain whether an action or activity is within the scope of the framework.

Note that for projects that may adversely affect one of the crayfishes or their DCH, a representative from the Federal agency must submit the request to initiate formal consultation.

II. Project Location Relative to the Stream Channel

Because many of the questions in the streamlined BA form pertain to projects likely to adversely affect one or both crayfishes or their DCH, it may be helpful to conduct a cursory assessment to determine if project activities will have no effect on the species or DCH.

Projects with potential to affect the crayfishes or the species' DCH are those that involve activities within the stream channel or that will affect stream conditions in areas occupied by the species or designated as critical habitat. Therefore, if a project will occur outside of the stream channel and will not affect stream conditions (such as turbidity or temperature), a "no effect" determination is appropriate and consultation with the Service is not required.

Examples of actions that may have no effect on the crayfishes and their DCH include (but are not limited to): timber management activities that do not result in sediment input into streams or increased stream temperature (from removal of canopy cover in riparian corridors); providing funds for conservation practices that do not affect stream quality; removal of trees when erosion and sedimentation is completely avoided; and application of pesticides when measures are implemented to prevent chemicals from reaching streams.

III. Conservation Measures

Indicate which conservation measures will be implemented to avoid or minimize adverse effects to one or both crayfish species and/or their DCH. If implementation of a conservation measure is not certain (e.g., it will only be implemented if possible), select "NO". If a conservation measure will be implemented but is not included in the list, you may add it in under "Other Conservation Measures".

Note that all applicable conservation measures listed under "Conservation Measures Required in All Areas" must be implemented to use the SCF. In addition, if instream impacts cannot be avoided March 15 to June 30 within High Priority Crayfish Areas, action agencies must coordinate with the Service's Missouri Ecological Services Field Office to either implement actions or provide funds to aid recovery of the crayfishes. A shapefile of the High Priority Crayfish Areas is available at https://www.fws.gov/office/missouri-ecological-services/library.

IV. Action Area

Describe the action area for each action associated with the project and describe any areas of overlap. The action area is defined at 50 CFR §402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (note that the action area includes the area in which any effect may occur and is not limited to only the area in which adverse effects may occur).

Start by providing a qualitative description of the action area, such as "The action area will include the area within the stream channel in which work will occur, the downstream area which will experience increased turbidity and sedimentation, and the area outside the stream channel in which trees will be removed." Then estimate the instream portion of the action area in square meters (m^2) by multiplying the longitudinal stream distance in which temporary or long-term effects may occur by the stream width in which effects may occur. To assist action agencies, we estimated the maximum longitudinal distances for each action in the SCF (**Table 1).** Note that the distances in **Table 1** represent the maximum distances given the range of stream orders within the crayfishes' ranges. Thus, the instream portion of the action area will likely be much less for projects on smaller streams. For example, the instream portion of the action area for a culvert replacement on a first order stream may be only 50 m.

To define the instream portion of the action area more specifically, consider both temporary and long-term impacts to stream conditions such as flow velocity, stream depth, water temperature, turbidity, sedimentation, and substrate composition. When estimating the distance of increased turbidity or sedimentation, consider stream width, depth, and flow velocity, which all influence sediment transport. Also consider the volume of sediment likely to be mobilized by project activities and substrate composition (or particle size) as smaller particle sizes are more easily mobilized and transported. The amount of substrate mobilized during project activities will also depend on the extent of disturbance to the substrate and if applicable, the amount of sediment accumulated behind structures (such as behind bridge piles or a culvert).

Table 1. Maximum longitudinal stream distance in which turbidity and sedimentation may increase from each action included in the SCF. Multiply the stream distance by width of the stream channel to define the instream portion of the action area.

Action	Stream Distance (m)
Bridge construction	400
Bridge maintenance	295
Bridge removal	400

Action	Stream Distance (m)
Culvert installation, maintenance, replacement, and removal	270
Pipeline construction, repair, replacement, and removal	165
Construction, maintenance, replacement, and removal of river accesses	165
Construction, maintenance, use, and removal of hardened stream crossings	270
Stream channel or streambed restoration	750
Streambank stabilization	480
Construction or modification of instream structures for streambank stabilization	555
Instream heavy metal remediation and reduction	345
Construction and removal of instream work pads	205
Construction, removal, and use of temporary stream crossings	195
Installation and removal of coffer dams and dewatering	205
Geotechnical investigations (borings)	55
Streambank grading	150
Vegetation or tree removal required for other actions	120
Other terrestrial actions	120

V. Presence of the Species and Critical Habitat

If the IPaC species list includes one of the crayfishes or their DCH, use the information below to determine if suitable habitat or DCH physical or biological features (PBFs) are present within the action area. If suitable habitat is absent within the entire action area, the species can be presumed absent. Similarly, if no PBFs are present within the action area, DCH can be considered absent.

If suitable habitat is present, action agencies may either: 1) conduct surveys to determine presence or absence of the crayfish(es) or 2) assume presence. Protocols for conducting surveys are outlined further below.

Assessing Habitat Suitability

Suitable habitat for the BCC and SFRC generally includes areas dominated by substrate with particle sizes over 16 mm (0.6 in) in diameter (pebble, cobble, and boulder). However, stream-dwelling crayfish also can occur in areas where silt, sand, fine gravel, or bedrock are the predominant substrate, albeit at lower densities (DiStefano et al. 2000). Though assessing the quality of habitat to determine absence of the species is difficult, we consider an area to be unsuitable and unlikely to be occupied by either species when substrate within the wetted portion of the stream channel is dominated by particle sizes less than 6 mm (0.2 in) in diameter and there is no habitat that could serve as refugia for the crayfish (such as bedrock crevices).

In addition to suitable substrate, the crayfishes generally require stream flow velocities below 1.1 feet per second (ft/s) (0.35 meters per second) (m/s), water temperatures between 34- and 84-degrees Fahrenheit (°F) (1.1 and 28.9 degrees Celsius (°C)), and available spaces under rocks or cavities in gravel to use as refugia.

Determining Presence of Critical Habitat within the Action Area

Review the PBFs in **Table 2** to determine if one or PBFs may be present within the action area. Critical habitat is considered present if any of the PBFs are present within the action area.

Table 2. Description of each physical or biological feature (PBF) constituting critical habitat for the Big Creek Crayfish and St. Francis River Crayfish[1].

PBF	Description of Feature
1. Stream flow velocity	Stream flow velocity generally between 0 and 1.1 feet per second (ft/s) (0 and 0.35 m/s).
2. Stream depth	Stream depths generally between 0.2 and 1.7 ft (0.06 and 0.52 m).
3. Water temperature	Water temperatures between 34- and 84-degrees Fahrenheit (°F) (1.1 and 28.9 degrees °C).
4. Low embeddedness	Low stream embeddedness so that spaces under rocks and cavities in gravel remain.
5. Prey base	Available prey base consisting of invertebrates, periphyton, and plant detritus.
6. Connectivity	Connectivity among occupied stream reaches (both within and among occupied subwatersheds).

Conducting Surveys to Determine Presence or Assume Absence

Before conducting surveys, action agencies should coordinate with the Service's Missouri Ecological Services Field Office to discuss sampling plans and ensure a level of search effort sufficient for assuming absence.

Surveys for the BCC or SFRC should follow protocols for quadrat sampling outlined in pages 11-12 of DiStefano (2000)[2]. Quadrat sampling involves placing a quadrat within the stream, sealing it into the substrate to prevent crayfish escape, and then thoroughly disturbing the substrate within the sampler to a depth of at least 15 centimeters (cm). Sampling should be conducted during the day when crayfish are seeking shelter in the substrate and would not avoid the quadrat sampler.

Surveys should be conducted June through September[3]. Peak breeding of the crayfishes occurs in October and November and individuals are sensitive to disturbance during this time. Winter is not suitable for surveying because crayfish tend to be less active. Sampling in March through May also is discouraged because crayfish are the most sensitive to disturbance during this time due to hatching and development of young (Westhoff 2022, pers. comm.).

Sampling should first be conducted in primary habitat, which is stream areas dominated by substrate with particle sizes over 16 mm (0.6 in) in diameter (pebble, cobble, and boulder). If no Big Creek Crayfish or St. Francis River Crayfish individuals are captured in primary habitat, then sampling should also be conducted in secondary habitat (silt, sand, fine gravel, or bedrock) where crayfish occur at lower densities (DiStefano 2000).

[1] Only PBFs that may be affected by actions in the SCF are identified.
[2] DiStefano, R.J. 2000. Development of a Quantitative Sampling Method to Assess Crayfish Communities and Macrohabitat Associations in Missouri Ozarks Streams. Missouri Department of Conservation, Federal Aid in Sport Fish Restoration, Project F-1-R-42, Final Report, Columbia.
[3] Contact the Service's Missouri Ecological Services Field Office for approval to survey outside this window.

VI. Effects to the Species and Critical Habitat

In the Standing Analysis (SA) supporting the SCF, the Service considered the ways in which the crayfishes and their DCH may be affected, estimated thresholds at which adverse effects may occur, and described potential effects from each action in the SCF. This information is summarized below. However, we recommend reviewing pages 21–25 of the SA to fully understand how effects were evaluated.

Note that actions increasing the likelihood of a Woodland Crayfish introduction or facilitating the species spread, such as construction of new public river accesses, are outside the scope of the SCF. Actions that result in a long-term reduction in connectivity, such as construction of a dam, are also outside the scope of the SCF (with long-term defined as more than 10 years).

Evaluating Effects to the Species

The ways in which the crayfishes may be adversely affected include: 1) injury or mortality from crushing, 2) temporarily reduced habitat suitability, 3) long-term habitat loss or degradation, and 4) temporarily reduced connectivity.

Use the adverse effect thresholds in **Table 3** and description of effects in **Table 4** to select the appropriate effects determination for each species. If an action may result in any of the types of adverse effects, the appropriate effects determination for the BCC or SFRC is "may affect, and likely to adversely affect". If effects may occur but are unlikely to exceed the adverse effects thresholds, a "may affect, but not likely to adversely affect" determination is appropriate. A "No Effect" determination is appropriate for species not identified on the IPaC species list or which are absent within the action area.

Note that the descriptions represent the maximum extent of effects, and that adverse effects may be avoided in some instances (such as pipeline installation using horizontal directional boring or bridge maintenance not affecting stream conditions or involving heavy equipment use within the stream channel). Thus, consider specific details of the proposed project to evaluate effects.

Evaluating Effects to Critical Habitat

Critical habitat may be adversely affected when one or more of the following functions are impacted: 1) supporting occupancy and reproduction within an area, or 2) supporting movement among occupied areas.

Use the adverse effect thresholds in **Table 5** and description of effects in **Table 6** to select the appropriate effects determination for each species' DCH. If an action is anticipated to result in adverse effects to one or more DCH PBFs, then the appropriate effects determination for the critical habitat is "may affect, and likely to adversely affect". If effects may occur but are unlikely to exceed the adverse effects thresholds, a "may affect, but not likely to adversely affect" determination is appropriate. A "No Effect" determination is appropriate for DCH not identified on the IPaC species list or which are absent within the action area.

Note that the descriptions represent the maximum extent of effects, and that adverse effects may be avoided in some instances (such as pipeline installation using horizontal directional boring or bridge maintenance not affecting stream conditions or involving heavy equipment use within the stream channel). Thus, consider specific details of the proposed project to describe effects.

VII. Additional Information Required for Formal Consultation

For activities that may adversely affect one or both crayfishes or their DCH, additional information is required for the Service to develop the streamlined biological opinion (BO). Outlined below are instructions for providing this information.

A. Other Activities Caused by the Action

Within a BO, all consequences to species or critical habitat caused by the proposed Federal action are evaluated, including the consequences of other activities caused by the proposed action, that are reasonably certain to occur (see definition of "effects of the action" at 50 CFR §402.02). Additional regulations at 50 CFR §402.17(a) identify factors to consider when determining whether activities caused by the proposed action (but not part of the proposed action) are reasonably certain to occur. These factors include, but are not limited to:

1) past experiences with activities that have resulted from actions that are similar in scope, nature, and magnitude to the proposed action;
2) existing plans for the activity; and
3) any remaining economic, administrative, and legal requirements necessary for the activity to go forward.

The Service is not aware of any additional activities likely to be caused by the actions and activities included in the SCF that are not already included in the description of the actions. However, for each project, please determine if there may be other activities caused by the actions that were not considered in this Standing Analysis. Should other activities be anticipated, please describe them.

B. Environmental Baseline within the Action Area

Using maps located at https://www.fws.gov/office/missouri-ecological-services/library, indicate if: 1) the action area overlaps with one or more High Priority Crayfish Areas, 2) there is evidence of the Woodland Crayfish within or near the action area, and 3) the majority (at least half) of the action area is within areas of heavy metal contamination. Then based on instream habitat conditions within the action area, indicate if at least half of the action area is affected by sedimentation.

For questions on whether an area is affected by sedimentation, action agencies may contact the Service's Missouri Ecological Services Field Office.

C. Extent of Effects of the Action

Within the Incidental Take Statement (ITS) of a BO, the Service describes the amount or extent of incidental take expected to result from the proposed Federal action and monitoring requirements to determine when the take has been exceeded. Because the crayfishes' small body size makes it difficult to quantify and detect the actual amount of incidental take, we use the extent of suitable habitat affected as a surrogate to monitor the level of take.

For each action associated with the project, use information in **Tables 4 and 6** and consider specific details of the project to estimate the longitudinal stream distance in which each type of adverse effect may occur. For projects involving multiple actions, consider the order in which actions will be completed and the spatial extent of overlap of adverse effects. If multiple actions will cause the same type of adverse effect within an area, only estimate the stream distance of adverse effects for the first action and explain why. For example, streambank grading may cause increased turbidity and sedimentation that exceeds adverse effect thresholds, thereby temporarily reducing habitat suitability. But it is not necessary to provide the distance of adverse effects from the streambank grading if habitat suitability within the same area was already reduced by a previous action associated with the project (such as construction of a temporary stream crossing). However, if an action causes adverse effects in a greater stream distance than a prior action associated with the project, the additional distance of adverse effects should be provided.

Other instructions for estimating the stream distance of adverse effects:

- For projects temporarily reducing connectivity - estimate the spatial footprint of the area through which their movement is impeded. For example, the distance of adverse effects from a temporary stream crossing reducing connectivity would be estimated as the stream longitudinal stream distance encompassed by the crossing.
- If connectivity will be temporarily reduced because of tree removal that results in increased water temperature – estimate the spatial footprint of the area through which their movement is impeded for the connectivity PBF (instead of the water temperature PBF).
- For adverse effects to critical habitat - indicate whether effects will be temporary or long-term (the only long-term adverse effect to critical habitat covered by the SCF is vegetation removal that increases water temperature enough to reduce the ability of the critical habitat to support occupancy and reproduction).
- If adverse effects will occur in a High Priority Crayfish Area within the period of March 15 to June 30 - describe mitigation efforts

Examples are provided below to aid in estimating and explaining the distance of adverse effects. Also note that actions are outside the scope of the SCF if the estimated distance of adverse effects exceeds the amounts identified in **Tables 4 and 6**.

Example 1. A proposed project involving construction, removal, and use of a temporary stream crossing, followed by streambank grading. The stream distance in which streambank grading temporarily reduces habitat suitability (from increased turbidity or sedimentation) is fully encompassed within the stream distance in which habitat suitability was already reduced by construction of a temporary stream crossing.

Action	Type of Adverse Effect to the Species	Distance of Adverse Effects (m)
Construction, removal, and use of temporary stream crossing	Injury or mortality	30
	Temporarily reduced habitat suitability	130
	Long-term habitat loss or degradation	NA (there will be no net increase in the size of depositional areas)
	Temporarily reduced connectivity	10 (represents the stream distance encompassed by the crossing)
Streambank grading	Injury or mortality	NA
	Temporarily reduced habitat suitability	NA (no additional adverse effects beyond those from construction of the temporary stream crossing)
	Long-term habitat loss or degradation	NA
	Temporarily reduced connectivity	NA (connectivity already temporarily reduced from presence of temporary stream crossing)

Action	PBF Adversely Affected	Critical Habitat Function Affected	Distance of Adverse Effects (m)	Duration of Adverse Effect
Construction, removal, and use of temporary stream crossing	Water temperature	Supporting occupancy and reproduction	NA (the extent of tree removal is unlikely to increase stream temperature beyond the adverse effect threshold)	Temporary
	Stream embeddedness/ Prey base	Supporting occupancy and reproduction	130	Temporary
	Connectivity	Supporting movement among occupied areas	10 (represents the stream distance encompassed by the crossing)	Temporary
Streambank grading	Water temperature	Supporting occupancy and reproduction	NA (the extent of tree removal is unlikely to increase stream temperature beyond the adverse effect threshold)	Temporary
	Stream embeddedness/ Prey base	Supporting occupancy and reproduction	NA (no additional adverse effects beyond those from construction of the temporary stream crossing)	Temporary
	Connectivity	Supporting movement among occupied areas	NA (connectivity already temporarily reduced from presence of temporary stream crossing)	Temporary

Example 2. A proposed project involving construction, removal, and use of a temporary stream crossing, followed by streambank grading. The stream distance in which streambank grading temporarily reduces habitat suitability (from increased turbidity or sedimentation) extends beyond the stream distance in which habitat suitability was already reduced by construction of a temporary stream crossing.

Action	Type of Adverse Effect to the Species	Distance of Adverse Effects (m)
Construction, removal, and use of temporary stream crossing	Injury or mortality	30
	Temporarily reduced habitat suitability	130
	Long-term habitat loss or degradation	NA (there will be no net increase in the size of depositional areas)
	Temporarily reduced connectivity	10 (represents the stream distance encompassed by the crossing)
Streambank grading	Injury or mortality	NA
	Temporarily reduced habitat suitability	15 (the stream distance of increased turbidity or sedimentation may extend beyond that impacted by construction of the temporary stream crossing)
	Long-term habitat loss or degradation	NA
	Temporarily reduced connectivity	NA (connectivity will already be temporarily reduced from presence of temporary stream crossing)

Action	PBF Adversely Affected	Critical Habitat Function Affected	Distance of Adverse Effects (m)	Duration of Adverse Effect
Construction, removal, and use of temporary stream crossing	Water temperature	Supporting occupancy and reproduction	NA (the extent of tree removal is unlikely to increase stream temperature beyond the adverse effect threshold)	Temporary
	Stream embeddedness/ Prey base	Supporting occupancy and reproduction	130	Temporary
	Connectivity	Supporting movement among occupied areas	10 (represents the stream distance encompassed by the crossing)	Temporary
Streambank grading	Water temperature	Supporting occupancy and reproduction	NA (the extent of tree removal is unlikely to increase stream temperature beyond the adverse effect threshold)	Temporary
	Stream embeddedness/ Prey base	Supporting occupancy and reproduction	15 (the stream distance of increased turbidity or sedimentation may extend beyond that impacted by construction of the temporary stream crossing)	Temporary
	Connectivity	Supporting movement among occupied areas	NA (connectivity will already be temporarily reduced from presence of temporary stream crossing)	Temporary

D. Cumulative Effects

Cumulative effects are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR §402.02). Additional regulations at 50 CFR §402.17(a) identify factors to consider when determining whether activities are reasonably certain to occur. These factors include but are not limited to: existing plans for the activity; and any remaining economic, administrative, and legal requirements necessary for the activity to go forward. If no cumulative effects are anticipated, note "none".

Describe any anticipated cumulative effects within the action area. If none are anticipated, note "none".

VIII. Form Submission

Review the responses to confirm: the accuracy of information, that project activities are within the scope of the Service's 2024 Standing Analysis supporting the SCF, and that anticipated effects are consistent with the those in the Standing Analysis. Then sign and date the form (a digital signature is acceptable).

For questions, contact the Service's Missouri Ecological Services Field Office at 573-234-2132.

Table 3. Estimated thresholds at which adverse effects to the Big Creek Crayfish and St. Francis River Crayfish may occur. Actions reducing connectivity continuously for more than one year or intermittently for more than 10 years are outside the scope of the SCF.

Type of Impact	Estimated Threshold for Adverse Effects
Injury or mortality	Whenever heavy equipment is used or heavy materials placed within occupied areas of the stream channel.
Temporarily reduced habitat suitability	For more than 24 hours and in an area greater than 25 m^2 (29.9 yd2) during July through March or in an area greater than 4 m^2 (4.8 yd^2) during April through June: • Turbidity exceeds 500 NTUs, • Short-term sediment deposition exceeds 0.5 cm (0.2 in), • Stream flow velocity exceeds 0.6 m/s (2 ft/s), • Stream depth in pools exceeds 1.8 m (6 ft), • Water temperature exceeds 32.2 °C (90 °F) or is less than -1.1 °C (30 °F), OR • Substrate is compacted such that spaces within gravel or under rocks cannot accommodate all life stages of crayfish.
Long-term habitat loss or degradation	For more than 10 years and in an area greater than 25 m^2 (29.9 yd^2): • Spaces within gravel or under rocks accommodating all life stages of crayfish are no longer available, OR • Adverse effect thresholds for temporarily reduced habitat suitability (see above) are exceeded.
Temporarily reduced connectivity	For more than 30 days (but not continuously for more than 1 year or intermittently for more than 10 years) and across more than 75% of the stream width: • A physical or biological impediment to movement is present for any longitudinal stream length, • Stream flow velocities exceed 1.8 m/s (4 ft/s) for any longitudinal stream length, • Stream depth exceeds 3.7 m (12 ft) for a longitudinal stream length greater than 10 m (33 ft), • Water temperature is less than -6.7 °C (20 °F) for a longitudinal stream length greater than 10 m (33 ft), OR • Water temperature is greater than 35.0 °C (95 °F) for a longitudinal stream length greater than 10 m (33 ft).

Table 4. Anticipated effects to the crayfishes from actions included in the in the SCF given the adverse effect thresholds outlined in Table 1. The maximum longitudinal stream distance in which adverse effects may occur are in bold.

Action	Anticipated Effects to the Crayfishes
Bridge construction	Injury or mortality from crushing: Injury and mortality will likely occur within instream areas traversed by heavy equipment or in which substrate is disturbed, which may include the area underneath the bridge, the area in which bridge supports are installed (encompassed by the area underneath the bridge), and areas immediately upstream and downstream of the bridge. The area underneath the bridge may be up to 25 m in length and span the entire stream width; whereas the areas upstream and downstream of the bridge may each extend up to 20 m in length and also span the entire stream width. **Distance of Adverse Effects = 65 m** Temporarily reduced habitat suitability: Heavy equipment use and substrate disturbance from installation of bridge supports will likely result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 65 m) and up to 200 m downstream with effects spanning the entire stream width. **Distance of Adverse Effects = 265 m** Long-term habitat loss or degradation: Changes in hydrology may result in long-term depositional areas upstream of bridge supports and further downstream. In addition, stream flow velocity and stream depth may exceed adverse effect thresholds immediately downstream of bridge supports. The depositional area in front of each bridge support may be up to 2 m in width and 2 m in length, the area downstream of each bridge support experiencing increased flow velocity and depth may also be 2 m in length and 2 m in width, and the depositional area further downstream may be up to 10 m in length and 4 m in width. **Distance of Adverse Effects = 14 m** Temporarily reduced connectivity: The area in which stream flow velocity and stream depth may increase beyond adverse effect thresholds is unlikely to span more than 75% of the stream width. However, crayfish movement may be temporarily impeded due to disturbance if instream work extends across more than 75% of the stream channel and exceeds 30 days. Long-term effects will likely be beneficial if connectivity improves due to improvement of stream conditions. **Distance of Adverse Effects (Temporary) = Indeterminable**
Bridge maintenance	Injury or mortality from crushing: Injury and mortality may occur in instream areas traversed by heavy equipment or in which substrate is disturbed, which may include the area underneath the bridge, areas immediately upstream and downstream of bridge, and areas further upstream and downstream requiring sand or gravel removal as part of maintenance. The area underneath the bridge may be up to 25 m in length and span the entire stream width, the areas immediately upstream and downstream of the bridge may each extend up to 20 m in length and span the entire stream width, and the areas further upstream and downstream with sand or gravel accumulation may extend up to 20 m upstream of the bridge and 100 m downstream of the bridge and span the entire stream width (encompassing the areas immediately upstream and downstream of the crossing). **Distance of Adverse Effects = 145 m** Temporarily reduced habitat suitability: Heavy equipment use, substrate disturbance around bridge supports, and substrate disturbance in areas requiring removal of sand and gravel for maintenance may result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 145 m) and up to 50 m downstream with effects spanning the entire stream width. **Distance of Adverse Effects = 195 m** Long-term habitat loss or degradation: Because no new structures will be installed within the stream channel, stream hydrology will not be affected and no new depositional areas will form. Temporarily reduced connectivity: Crayfish movement may be temporarily impeded across the stream width due to disturbance. However, instream work is unlikely to exceed 30 days.

Action	Anticipated Effects to the Crayfishes
Bridge removal	Injury or mortality from crushing: Injury and mortality will likely occur within instream areas traversed by heavy equipment or in which substrate is disturbed, which may include the area underneath the bridge, areas in which bridge supports are installed (encompassed by the area underneath the bridge), the areas immediately upstream and downstream of the bridge, and areas in which bridge debris is removed (encompassed by the area immediately upstream and downstream of the bridge). The area underneath the bridge may be up to 25 m in length and span the entire stream width, whereas the areas upstream and downstream of the bridge may each extend up to 20 m in length and also span the entire stream width. **Distance of Adverse Effects = 65 m** Temporarily reduced habitat suitability: Heavy equipment use and removal of bridge supports and bridge debris will likely result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 65 m) and up to 200 m downstream, with effects spanning the entire stream width. **Distance of Adverse Effects = 265 m** Long-term habitat loss or degradation: Removal of bridge supports may change hydrology around the area of the removed bridge, creating new depositional areas and displacing old ones. If there is a net decrease in suitable habitat, it is unlikely to exceed 25 m^2. Temporarily reduced connectivity: Crayfish movement may be impeded across the stream width due to disturbance. However, instream work is unlikely to exceed 30 days. Long-term effects may be beneficial if aquatic organism passage improves due to bridge removal. Beneficial effects: Though removal of bridge supports may change hydrology around the area of the removed bridge, there will likely be an overall increase in suitability of stream flow velocity and stream depth immediately downstream of the removed bridge supports. In addition, flood events may displace depositional areas immediately upstream of bridge supports and further downstream, increasing availability of spaces within gravel or under rocks.
Culvert installation, maintenance, replacement, and removal	Injury or mortality from crushing: Injury and mortality will likely occur within instream areas traversed by heavy equipment or in which substrate is disturbed, which may include the footprint of culverts, areas immediately upstream and downstream of culverts, and areas further upstream and downstream requiring sand or gravel removal as part of maintenance. The area underneath culverts may be up to 10 m in length and span the entire stream width, the areas immediately upstream and downstream of culverts may each extend up to 10 m in length and span the entire stream width, and the areas further upstream and downstream with sand or gravel accumulation may extend up to 20 m upstream of culverts and 50 m downstream of the culvert and span the entire stream width (encompassing the areas immediately upstream and downstream of culverts). **Distance of Adverse Effects = 80 m** Temporarily reduced habitat suitability: Heavy equipment use, substrate disturbance around culverts, and substrate disturbance in areas requiring removal of sand and gravel for maintenance will likely result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 80 m) and up to 100 m downstream with effects spanning the entire stream width. **Distance of Adverse Effects = 180 m** Long-term habitat loss or degradation: Unless an open bottom culvert is used, habitat within the footprint of new or larger culverts will be lost, and stream flow velocity immediately downstream of culverts may exceed the adverse effect threshold[1], even when culverts of sufficient size are used. In addition, after multiple flood events, changes in hydrology may result in long-term depositional areas immediately upstream of culverts and further downstream. The footprint of culverts may be up to 10 m in length and span the entire stream width, the upstream depositional area may extend up to 2 m in length and span the entire stream width, the area immediately downstream of culverts experiencing increased stream flow

[1] If stream flow velocity or other stream conditions are expected to exceed the connectivity adverse effect thresholds for more than 1 year (**Table 1**), the action is outside the scope of the SCF and requires separate consultation.

Action	Anticipated Effects to the Crayfishes
	velocity may be up to 2 m in length and span the entire stream width, and the depositional area further downstream may be up to 3 m in length and 2 m in width. **Distance of Adverse Effects = 17 m** Temporarily reduced connectivity: The area in which stream flow velocity and stream depth may increase is unlikely to span more than 75% of the stream width. Though crayfish movement may be impeded across the stream width due to disturbance, instream work is unlikely to exceed 30 days. Beneficial effects: Culvert removal or replacement of undersized culverts with those of adequate size may improve suitability of stream flow velocity and stream depth immediately downstream of culverts and result in displacement of depositional areas immediately upstream of the culverts and further downstream, increasing availability of spaces within gravel or under rocks. Culvert removal or replacement of undersized culverts with those of adequate size may also improve aquatic organism passage.
Pipeline construction, repair, replacement, and removal	Injury and mortality from crushing: Unless horizontal directional drilling is used, injury and mortality will likely occur within instream areas traversed by heavy equipment or in which substrate is disturbed, which may include the footprint of the pipeline and areas immediately upstream and downstream of the pipeline. The footprint of the pipeline may be up to 2 m in length and span the entire stream width, whereas the areas immediately upstream and downstream of the pipeline may each extend up to 4 m in length and span the entire stream width. **Distance of Adverse Effects = 10 m** Temporarily reduced habitat suitability: Unless horizontal directional drilling is used, heavy equipment use and substrate disturbance will likely result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 10 m) and up to 100 m downstream, with effects spanning the entire stream width. **Distance of Adverse Effects = 110 m** Long-term habitat loss or degradation: Because new pipelines will be installed below the substrate, stream hydrology will not change and no new depositional areas will form. Temporarily reduced connectivity: Though instream activities may span the entire stream width, they are unlikely to exceed 30 days. Beneficial effects: If an exposed pipeline is removed or replaced, connectivity may improve if the exposed pipeline created a physical barrier to crayfish movement or if high stream flow velocity along the downstream side of the exposed pipeline impeded crayfish movement. Removal or replacement of an exposed pipeline may also result in displacement of depositional areas immediately upstream of the pipeline and further downstream, increasing availability of spaces within gravel or under rocks.
Construction, maintenance, replacement, and removal of river accesses	Injury or mortality from crushing: Injury and mortality will likely occur within instream areas traversed by heavy equipment or in which substrate is disturbed, which may include the footprint of the access ramp and areas immediately upstream and downstream of the ramp. The footprint of the access ramp and the areas immediately upstream and downstream of the ramp may be up to 10 m in length and 10 m in width. **Distance of Adverse Effects = 10 m** Temporarily reduced habitat suitability: Heavy equipment use and substrate disturbance in and around the pipeline may result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 10 m) and up to 100 m downstream with effects spanning up to 10 m in width. **Distance of Adverse Effects = 110 m**

Action	Anticipated Effects to the Crayfishes
	Long-term habitat loss or degradation: Installation of a new or larger access ramp will result in long-term habitat loss due to a loss of spaces within gravel or under rocks within the footprint of the ramp. Changes in hydrology may result in increased stream flow velocity and stream depth immediately downstream of the ramp in an area up to 2 m in width and 2 m in length. Changes in hydrology may also result in long-term depositional areas immediately upstream of the ramp and further downstream, with the upstream depositional area up to 3 m in width and 3 m in length and the downstream depositional areas also up to 3 m in length and 3 m in width. **Distance of Adverse Effects = 8 m** Temporarily reduced connectivity: The area in which stream flow velocity and stream depth may increase is unlikely to span more than 75% of the stream width. Beneficial effects: The removal of an access ramp may improve suitability of stream flow velocity and stream depth immediately downstream of the ramp and result in displacement of depositional areas immediately upstream of the culverts and further downstream, increasing the availability of spaces within gravel or under rocks.
Construction, maintenance, use, and removal of hardened stream crossings	Injury or mortality from crushing: Injury and mortality will likely occur within instream areas traversed by heavy equipment or in which substrate is disturbed, which may include the footprint of the crossing, areas immediately upstream and downstream of the crossing, and areas further upstream and downstream requiring sand or gravel removal as part of maintenance. The footprint of the crossing may be up to 10 m in length and span the entire stream width, the areas immediately upstream and downstream of the culvert may each extend up to 10 m in length and span the entire stream width, and the areas further upstream and downstream with sand or gravel accumulation may extend up to 20 m upstream of the culvert and 50 m downstream of the culvert and span the entire stream width (encompassing the areas immediately upstream and downstream of the crossing). Because habitat will likely be unsuitable within the footprint of the crossing, injury or mortality is not anticipated when vehicles use the crossing to traverse the stream. **Distance of Adverse Effects = 80 m** Temporarily reduced habitat suitability: Heavy equipment use, substrate disturbance in and around the crossing, and substrate disturbance in areas requiring removal of sand and gravel for maintenance will likely result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 80 m) and up to 100 m downstream with effects spanning the entire stream width. When vehicles use the crossing to traverse the stream, turbidity and sedimentation may temporarily increase. However, they are unlikely to exceed the adverse effect threshold. **Distance of Adverse Effects = 180 m** Long-term habitat loss or degradation: Within the footprint of the stream crossing, habitat will likely be lost due to substrate compaction or from covering spaces within gravel or under rocks with crossing material. The footprint of the crossing may be up to 5 m in length and span the entire stream width. Immediately downstream of the crossing, stream flow velocity may increase, and the increased stream flow velocity may result in scour, increasing the stream depth. However, the increases are unlikely to exceed adverse effect thresholds. Changes in hydrology may result in long-term depositional areas immediately upstream of the crossing and further downstream of the crossing, with the upstream depositional area extending up to 2 m in length and spanning the entire stream width and area further downstream extending up to 5 m in length and 4 m in width. **Distance of Adverse Effects = 12 m** Temporarily reduced connectivity: Although stream flow velocity and stream depth may increase immediately downstream of the crossing, conditions unlikely to exceed either adverse effect threshold. Though crayfish movement may be impeded across the stream width due to disturbance from instream activities, instream work is unlikely to exceed 30 days. Beneficial effects: Installation of a hardened stream crossing may reduce the amount of turbidity and sedimentation within and downstream of the crossing footprint when vehicles cross. When a hardened stream crossing is removed, habitat suitability within the footprint of crossing will likely improve as the availability of spaces within gravel or under rocks increases, and stream flow velocity may improve immediately downstream of the

Action	Anticipated Effects to the Crayfishes
	crossing. Stream depth may also improve immediately downstream of the crossing due to scoured areas filling with gravel containing interstitial spaces, and connectivity may improve if an existing hardened stream crossing that impedes crayfish movement is removed or replaced with a new crossing with improved aquatic organism passage. When hardened stream crossings are removed, the availability of spaces within gravel or under rocks immediately upstream of the crossing and further downstream may increase if depositional areas are displaced during flood events.
Stream channel or streambed restoration	Injury or mortality from crushing: Injury and mortality will likely occur within instream areas traversed by heavy equipment or in which substrate is disturbed, which will likely include the entire footprint of the stream channel reconfigurations. The area in which heavy equipment is used or substrate disturbed may be up to 300 m in length and span the entire width of the stream. **Distance of Adverse Effects = 300 m** Temporarily reduced habitat suitability: Heavy equipment use and other substrate disturbance will likely result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the length of the project area (up to 300 m) and up to 200 m downstream with effects spanning the entire stream width. **Distance of Adverse Effects = 500 m** Long-term habitat loss or degradation: Modifying contours of the stream channel or stream bed may increase stream flow velocity and stream depth in some areas while decreasing it other areas. However, there will likely be a net increase in the area containing suitable stream flow velocity and stream depth. If there is a reduction in the overall area containing suitable stream flow velocity and stream depth, it is unlikely to exceed 25 m^2. Temporarily reduced connectivity: The area in which stream flow velocity and stream depth may increase is unlikely to span more than 75% of the stream width. However, crayfish movement may be temporarily impeded due to disturbance if instream work extends across more than 75% of the stream channel and exceeds 30 days. **Distance of Adverse Effects (Temporary) = Indeterminable** Beneficial effects: Stabilizing the stream channel will likely result in an overall improvement of stream conditions, including reduced turbidity and sedimentation within and downstream of the project footprint and increased availability of interstitial spaces. The improvement in stream conditions may also improve connectivity if previously unsuitable conditions extended across most of the stream width.
Streambank stabilization	Injury or mortality from crushing: Injury and mortality will likely occur within instream areas traversed by heavy equipment or in which substrate is disturbed, which may include the entire streambank being stabilized and areas immediately upstream and downstream of the streambank being stabilized. The streambank may be up to 200 m in length and span the entire stream width in small streams. The areas immediately upstream and downstream of the culvert may each extend up to 10 m in length and span the entire stream width. **Distance of Adverse Effects = 220 m** Temporarily reduced habitat suitability: Heavy equipment use and other substrate disturbance will likely result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the project (220 m) area and up to 100 m downstream with effects spanning the entire stream width. **Distance of Adverse Effects = 320 m** Long-term habitat loss or degradation: Long-term habitat loss and degradation are unlikely since there will likely be an overall increase in the amount of suitable habitat by reducing sedimentation and increasing availability of spaces within gravel or under rocks. Because stabilizing the streambank will likely result in an overall reduction in turbidity and sedimentation within the footprint and downstream of the footprint, availability of spaces within gravel or under rocks will increase. Temporarily reduced connectivity: Instream work may extend across more than 75% of the stream channel but is unlikely to exceed 30 days. Beneficial effects: Stabilizing the streambank and reducing erosion will likely in an overall reduction in turbidity and sedimentation within and downstream of the project footprint, increased the availability of spaces within gravel or under rocks.

Action	Anticipated Effects to the Crayfishes
Construction or modification of instream structures for streambank stabilization	Injury or mortality from crushing: Injury and mortality will likely occur within instream areas traversed by heavy equipment or in which substrate is disturbed, which may include the footprint of the structures and areas immediately upstream and downstream of the structures. The area encompassing the structures may be up to 150 m in length and span half of the stream width, and the areas immediately upstream and downstream of the structures may each extend up to 10 m in length and span up to half of the stream width. **Distance of Adverse Effects = 170 m** Temporarily reduced habitat suitability: Heavy equipment use and other substrate disturbance will likely result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 170 m) and up to 200 m downstream with effects spanning the entire stream width. **Distance of Adverse Effects = 370 m** Long-term habitat loss or degradation: Modifying the hydrology along a streambank may result in increased stream flow velocity and stream depth in some areas while decreasing stream flow velocity and stream depth in other areas. However, any reduction in the overall size of areas containing suitable stream flow velocity and stream depth is unlikely to exceed 25 m^2. Because stabilizing the streambank will likely result in an overall reduction in turbidity and sedimentation within the footprint and downstream of the footprint, availability of spaces within gravel or under rocks will increase. Temporarily reduced connectivity: If instream work extends across more than 75% of the stream channel and exceeds 30 days, crayfish movement may be temporarily reduced due to the disturbance and exceed the adverse effect threshold. **Distance of Adverse Effects (Temporary) = Indeterminable** Beneficial effects: Stabilizing the streambank will likely result in an overall reduction in turbidity and sedimentation within the footprint and downstream of the footprint, increased the availability of spaces within gravel or under rocks.
Instream heavy metal remediation and reduction	Injury or mortality from crushing: Injury and mortality will likely occur within instream areas traversed by heavy equipment or in which substrate is disturbed, which may include the footprint of the excavations, areas immediately upstream and downstream of excavations, and areas used to access excavation locations. The area of each excavation may be up to 100 m in length and span the entire stream width, the areas immediately upstream and downstream of each excavation may each extend up to 10 m in length and span the entire stream width, and the area used to access each excavation location may be up to 10 m in length and span the entire stream width. **Distance of Adverse Effects = 130 m** Temporarily reduced habitat suitability: Heavy equipment use and other substrate disturbance will likely result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 130 m), extending up to 100 m downstream of excavation locations with effects spanning the entire stream width. **Distance of Adverse Effects = 230 m** Long-term habitat loss or degradation: There will be an overall improvement in stream conditions due to removal of contaminated sediment. Any increases in stream depth from excavation is unlikely to exceed either adverse effect threshold. Temporarily reduced connectivity: Crayfish movement may be temporarily impeded due to disturbance if instream work extends across more than 75% of the stream channel. However, instream work is unlikely to exceed 30 days. Beneficial effects: The removal of contaminated sediment will likely result in an overall improvement in crayfish health as well as abundance of their prey.

Action	Anticipated Effects to the Crayfishes
Construction and removal of instream work pads	Injury or mortality from crushing: Injury and mortality will likely occur within instream areas traversed by heavy equipment or in which substrate is disturbed, which may include the footprint of the work pad and areas immediately upstream and downstream of the work pad. The footprint of the work pad may be up to 15 m in length and span up to 75% of the stream width in larger streams or the entire stream width in smaller streams, and the areas immediately upstream and downstream of the work pad may each extend up to 10 m in length and span the entire stream width. **Distance of Adverse Effects = 35 m** Temporarily reduced habitat suitability: Heavy equipment use and substrate disturbance in and around the work pad will likely result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 35 m) and up to 100 m downstream with effects spanning the entire stream width. If culverts are installed within the work pad, stream flow velocity may increase beyond adverse effect thresholds within and immediately downstream of culverts, even when culverts of appropriate size are used. The increased stream flow velocity may result in scour, increasing stream depth immediately downstream of the culverts. The area with increased stream flow velocity may include the length of the culverts (up to 15 m in length) and up to 2 m downstream of culverts, extending across the width of each culvert (up to 1 m each), and the area with increased stream depth may include up to 2 m downstream of culverts, extending across the width of each culvert (up to 1 m each). If culverts are not installed, stream flow velocity may still increase beyond adverse effect thresholds due to the reduced width in which water can flow. The area in which steam flow velocity may be increased includes the length of the work pad (up to 15 m) and extending across the width of the flowing portion of the stream. Under either scenario, the area in which stream flow velocity and stream depth may exceed adverse effect thresholds is encompassed by the area affected by turbidity and sedimentation. If changes in hydrology result in temporary depositional areas, sediment deposition may also temporarily exceed the adverse effect threshold immediately upstream of the work pad and further downstream. Both areas will likely be within the area affected by turbidity and sedimentation from heavy equipment use and substrate disturbance. **Distance of Adverse Effects = 135 m** Long-term habitat loss or degradation: No long-term habitat loss or degradation is anticipated since there will be no long-term to hydrology. Temporarily reduced connectivity: Even when culverts of appropriate size are used, crayfish movement may be impeded due to the combined effects of instream disturbance, presence of work pad material that physically impedes movement, and increased stream flow velocity within the culverts and portion of the stream outside the work pad. If crayfish movement is impeded for more than 30 days, the adverse effect threshold for temporarily reduced connectivity will be exceeded. If culverts are not installed, the adverse effect threshold may still be exceeded if crayfish movement is impeded for more than 30 days due to the combined effects of instream disturbance, presence of work pad material that physically impedes movement, and increased stream flow velocity within the portion of the stream outside the work pad. **Distance of Adverse Effects = Indeterminable**
Construction, removal, and use of temporary stream crossings	Injury or mortality from crushing: Injury and mortality will likely occur within instream areas traversed by heavy equipment or in which substrate is disturbed, which may include the footprint of the stream crossing and areas immediately upstream and downstream of the crossing. The footprint of the crossing may be up to 10 m in length and span the entire stream width, and the areas immediately upstream and downstream of the crossing may each extend up to 10 m in length and span the entire stream width. **Total Stream distance = 30 m** Temporarily reduced habitat suitability: Heavy equipment use and substrate disturbance in and around the crossing will likely result in turbidity and sedimentation temporarily exceeding the adverse effect threshold throughout the project area (up to 30 m) and up to 100 m downstream with effects spanning the entire stream width. If culverts are installed within the crossing (as opposed to a crossing spanning the stream channel), stream flow velocity may increase beyond adverse effect thresholds within and immediately downstream of culverts, even when culverts of appropriate size are used. The increased stream flow velocity may result in scour, increasing stream depth immediately downstream of the culverts. The area with increased stream flow velocity may include the length of the culverts (up to 10 m in length) and up to 2 m downstream of culverts, extending across the width of each culvert (up to 1 m each), and the area with increased stream depth may include up to 2 m downstream of culverts, extending

Action	Anticipated Effects to the Crayfishes
	across the width of each culvert (up to 1 m each). The area in which stream flow velocity and stream depth may exceed adverse effect thresholds is encompassed by the area affected by turbidity and sedimentation. If changes in hydrology result in temporary depositional areas, sediment deposition may temporarily exceed the adverse effect threshold immediately upstream of the crossing and further downstream. Both areas will likely be within the area affected by turbidity and sedimentation from heavy equipment use and substrate disturbance. When existing fords are used as temporary crossings, sedimentation may occur downstream of the crossing. However, turbidity and sedimentation are not expected to exceed the adverse effect threshold. **Distance of Adverse Effects = 130 m** Long-term habitat loss or degradation: No long-term habitat loss or degradation is anticipated since there will be no long-term to hydrology. Temporarily reduced connectivity: Even when culverts of appropriate size are used, crayfish movement may be impeded due to the combined effects of instream disturbance, presence of work pad material that physically impedes movement, and increased stream flow velocity within the culverts and portion of the stream outside the work pad. If crayfish movement is impeded for more than 30 days, the adverse effect threshold will be exceeded. If the crossing consists of a bridge spanning the entire stream channel, no effects are anticipated. **Distance of Adverse Effects = Indeterminable**
Installation and removal of coffer dams and dewatering	Injury or mortality from crushing: Injury and mortality will likely occur within instream areas traversed by heavy equipment or in which substrate is disturbed, which may include the footprint of the coffer dam and areas immediately adjacent to the coffer dam. Though heavy equipment may not be used within the entire footprint of the coffer dam, any crayfish located within the dam will likely also be injured or killed if they emerge. The footprint of the coffer dam may be up to 15 m in length and span up to half of the stream width and the areas adjacent to the coffer dam may each extend up to 10 m in length and span the entire stream width. **Distance of Adverse Effects = 35 m** Temporarily reduced habitat suitability: Heavy equipment use and substrate disturbance in and around the coffer dam will likely result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 25 m) and up to 100 m downstream with effects spanning the entire stream width. Stream flow velocity may increase beyond adverse effect thresholds due to the reduced width in which water can flow. The area in which steam flow velocity may be increased includes the length of the coffer dam (up to 15 m), extending across the flowing portion of the stream and is encompassed by the area affected by turbidity and sedimentation. If changes in hydrology result in temporary depositional areas, sediment deposition may temporarily exceed the adverse effect threshold immediately upstream of the coffer dam and further downstream. Both areas will likely be within the area affected by turbidity and sedimentation from heavy equipment use and substrate disturbance. **Distance of Adverse Effects = 135 m** Long-term habitat loss or degradation: No long-term habitat loss or degradation is anticipated since there will be no long-term to hydrology. Temporarily reduced connectivity: Crayfish movement may be impeded due to the combined effects of instream disturbance, presence of work the coffer dam that physically impedes movement, and increased stream flow velocity within the portion of the stream outside the coffer dam. If crayfish movement is impeded for more than 30 days, the adverse effect threshold will be exceeded. **Distance of Adverse Effects = Indeterminable**
Geotechnical investigations (borings)	Injury or mortality from crushing: Injury and mortality will likely occur within instream areas traversed by heavy equipment or in which substrate is disturbed, which may include the footprint of the borings, areas immediately upstream and downstream of the borings, and the path taken to access boring locations. The footprint of the borings themselves may be up to 2 m in length and 2 m in width, the areas immediately upstream and downstream of the borings may each be 7 m in length and 7 m in width, and the path taken to access the borings may be 5 m in length and span most of the stream width. **Distance of Adverse Effects = 16 m**

Action	Anticipated Effects to the Crayfishes
	Temporarily reduced habitat suitability: Heavy equipment use and other substrate disturbance may result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 16 m) and up to 20 m downstream with effects spanning the entire stream width. **Distance of Adverse Effects = 36 m** Long-term habitat loss or degradation: No long-term habitat loss or degradation is anticipated since there will be no long-term to hydrology. Temporarily reduced connectivity: No impact to connectivity is expected since instream activities are unlikely to extend across more than 75% of the stream channel or exceed 30 days.
Streambank grading	Injury or mortality: No injury or mortality is expected since heavy equipment will not be used within the stream channel. Temporarily reduced habitat suitability: Though heavy equipment will likely not be used within the stream channel, soil may be released into the stream and result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 50 m) and up to 50 m downstream with effects spanning the entire stream width. **Distance of Adverse Effects = 100 m** Long-term habitat loss or degradation: No long-term habitat loss or degradation is anticipated since there will be no long-term to hydrology. Temporarily reduced connectivity: No impact to connectivity is expected since there will be no instream activities, and turbidity and sedimentation are unlikely to extend across more than 75% of the stream channel or exceed 30 days. Beneficial effects: When the purpose of the grading is to reduce erosion, there will likely be an overall reduction in sedimentation, which will increase habitat suitability in previous depositional areas.
Vegetation or tree removal required for other actions	Injury or mortality: No injury or mortality is expected since heavy equipment will not be used within the stream channel. Temporarily reduced habitat suitability: If vegetation removal is extensive, or if heavy rains occur before the streambank is revegetated, turbidity and sedimentation may temporarily exceed adverse effect thresholds throughout the project area (up to 30 m) and up to 50 m downstream with effects spanning the entire stream width. In addition, if tree canopy over the stream is reduced, water temperature may increase and exceed the adverse effect threshold until new trees are tall enough to provide canopy cover. The impacted area may be up to 20 m in length and span the entire stream width. Actions are outside the scope of the SCF if they will increase water temperature beyond the adverse effect threshold for temporarily reduced connectivity, either continuously for more than a year or intermittently for more than 10 years. **Distance of Adverse Effects = 80 m** Long-term habitat loss or degradation: If tree canopy over the stream is reduced and it takes more than 10 years for trees are to grow tall enough to provide canopy cover, water temperature may increase and exceed the adverse effect threshold. The impacted area may be up to 20 m in length and span the entire stream width. Note that actions are outside the scope of the SCF if they will increase water temperature beyond the adverse effect threshold for temporarily reduced connectivity, either continuously for more than a year or intermittently for more than 10 years. **Distance of Adverse Effects = 20 m** Temporarily reduced connectivity: If tree canopy over the stream is reduced, water temperature may increase and exceed the adverse effect threshold in up to 20 m in length and span the entire stream width. Actions are outside the scope of the SCF if they will increase water temperature beyond the adverse effect threshold for temporarily reduced connectivity, either continuously for more than a year or intermittently for more than 10 years. **Distance of Adverse Effects = Indeterminable**

Action	Anticipated Effects to the Crayfishes
Other terrestrial actions	Adverse effects not anticipated if turbidity and temperature do not exceed adverse effect thresholds and if stream conditions are not otherwise impacted.
Activities not explicitly described	Injury or mortality from crushing: If heavy equipment is used within the stream channel, injury and mortality will likely occur within instream areas traversed by the equipment or in which substrate is disturbed. The area in which injury or mortality may occur may include up to 150 m in length and span the entire stream width. **Distance of Adverse Effects = 150 m** Temporarily reduced habitat suitability: If heavy equipment is used within the stream channel or the substrate is disturbed from other activities, turbidity and sedimentation temporarily may temporarily exceed adverse effect thresholds throughout the project area and downstream with effects spanning the entire stream width. **Distance of Adverse Effects = 250 m** Long-term habitat loss or degradation: If a structure is constructed or placed within the stream channel, habitat within the footprint of the structure may be lost as long as the structure is in place. In addition, changes in hydrology may result in long-term depositional areas immediately upstream of the structure and further downstream of the structure. **Distance of Adverse Effects = 10 m** Temporarily reduced connectivity: If instream work extends across more than 75% of the stream width and exceeds 30 days, connectivity may be temporarily reduced due to the disturbance and exceed the adverse effect threshold. **Distance of Adverse Effects = Indeterminable** Beneficial effects: There may be an overall improvement in habitat suitability within and downstream of the project footprint.

Table 5. The number, abbreviated name, and function of each critical habitat PBF and the estimated threshold at which adverse effects may occur. Actions reducing connectivity continuously for more than one year or intermittently for more than 10 years are outside the scope of the SCF.

PBF #	PBF Abbreviated Name	Function(s) Provided by PBF	Estimated Threshold for Adverse Effects
1	Stream flow velocity	Supports occupancy and reproduction	Stream flow velocity exceeds 0.6 m/s (2 ft/s) more than 50% of a set of stream features for more than 24 hours.
1	Stream flow velocity	Supports movement among areas	Stream flow velocity exceeds 1.8 m/s (4 ft/s) across more than 75% of the stream width for more than 30 days (but not more than 1 year).
2	Stream depth	Supports occupancy and reproduction	Stream depth in pools exceeds 1.8 m (6 ft) in more than 50% of a set of stream features for more than 24 hours.
2	Stream depth	Supports movement among areas	Stream depth in pools exceeds 3.7 m (12 ft) across more than 75% of the stream width for more than 30 days (but not more than 1 year) for a longitudinal stream distance more than 10 m (33 ft).
3	Water temperature	Supports occupancy and reproduction	Water temperatures is less than -1.1 °C (30 °F) or greater than 32.2 °C (90 °F) in more than 50% of a set of stream features for more than 24 hours.
3	Water temperature	Supports movement among areas	Water temperatures is less than -6.7 °C (20 °F) or greater than 35.0 °C (95 °F) across more than 75% of the stream width for more than 30 days (but not more than 1 year) for a longitudinal stream distance more than 10 m (33 ft).
4	Stream embeddedness	Supports occupancy and reproduction	In more than 50% of a set of stream features and for more than 24 hours, turbidity exceeds 500 NTUs, sediment deposition exceeds 0.5 cm (0.2 in), or the substrate is compacted such that spaces within gravel or under rocks cannot accommodate all life stages of crayfish.
5	Prey base	Supports occupancy and reproduction	In more than 50% of a set of stream features, turbidity exceeds 500 NTUs or sediment deposition exceeds 0.5 cm (0.2 in) for more than 24 hours.
6	Connectivity	Supports movement among areas	For more than 30 days (but not continuously for more than 1 year or intermittently for more than 10 years) and across more than 75% of the stream width: • A physical or biological impediment to movement is present for any longitudinal stream length, • Stream flow velocities exceed 1.8 m/s (4 ft/s) for any longitudinal stream length, • Stream depth exceeds 3.7 m (12 ft) for a longitudinal stream length greater than 10 m (33 ft), • Water temperature is less than -6.7 °C (20 °F) for a longitudinal stream length greater than 10 m (33 ft), OR • Water temperature is greater than 35.0 °C (95 °F) for a longitudinal stream length greater than 10 m (33 ft).

Table 6. Anticipated effects to each critical habitat PBF from actions included in the SCF given the adverse effect thresholds outlined in Table 2. The maximum longitudinal stream distance in which adverse effects may occur are in bold. Because adverse effect thresholds for stream embeddedness and prey base are the same, effects to these PBFs are not discussed separately. Temporary increases in stream flow velocity immediately downstream of heavy equipment are not anticipated to exceed adverse effect thresholds beyond 24 hours and thus, are not discussed.

Action	Anticipated Effects to Critical Habitat
Bridge construction	Stream flow velocity: Bridges that span the entire stream channel are unlikely to affect stream flow velocity since stream hydrology is unlikely to change. For larger streams in which bridge supports are used to support the bridge, stream flow velocity immediately downstream of bridge supports will likely increase, However, size of the area impacted is unlikely to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width. Stream depth: For bridges with bridge supports, increased stream flow velocity immediately below bridge supports will likely result in scour, increasing stream depth. However, size of the area impacted is unlikely to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width. Water temperature: No effects anticipated. Stream embeddedness/Prey base: Heavy equipment use and substrate disturbance from installation of bridge supports will likely result in sedimentation temporarily exceeding the adverse effect threshold throughout the project area (up to 65 m) and up to 200 m downstream with effects spanning the entire stream width. After multiple flood events, changes in hydrology may result in long-term depositional areas immediately upstream of bridge supports and further downstream of the bridge. However, size of the depositional areas is unlikely to encompass more than 50% of a set of stream features. **Distance of Adverse Effects = 265 m (Temporary)** Connectivity: The area in which stream flow velocity and stream depth may increase is unlikely to span more than 75% of the stream width. However, crayfish movement may be temporarily impeded due to disturbance if instream work extends across more than 75% of the stream channel and exceeds 30 days, thereby exceeding the adverse effect threshold. **Distance of Adverse Effects = Indeterminable (Temporary)**
Bridge maintenance	Stream flow velocity: Because no new structures will be installed or constructed within the stream channel, stream flow velocity will not increase within any areas. Thus, no effects are anticipated. Stream depth: Because no new structures will be installed or constructed within the stream channel, stream depth will not increase within any areas due to scouring from increased stream flow velocity. Thus, no effects are anticipated. Water temperature: No effects anticipated. Stream embeddedness/Prey base: If heavy equipment is not used within the stream channel, the size of areas experiencing sedimentation from substrate disturbance in and around bridge supports is unlikely to encompass more than 50% of a set of stream features. However, if heavy equipment is used within the stream channel, sedimentation downstream of substrate disturbance is expected to temporarily exceed the adverse effect threshold throughout the project area (up to 45 m) and up to 100 m downstream, with effects spanning the entire stream width. Because no new structures will be installed within the stream channel, stream hydrology will not be affected and no new depositional areas will form. **Distance of Adverse Effects = 145 m (Temporary)** Connectivity: Crayfish movement may be temporarily impeded across the stream width due to disturbance. However, instream work is unlikely to exceed 30 days.

Action	Anticipated Effects to Critical Habitat
Bridge removal	Stream flow velocity: Because no new structures will be installed or constructed within the stream channel, stream flow velocity will not increase within any areas. Effects may be beneficial if removal of bridge supports improves stream flow velocity immediately downstream. Stream depth: Because no new structures will be installed or constructed within the stream channel, stream depth will not increase within any areas due to scouring from increased stream flow velocity. Effects may be beneficial if removal of bridge supports improves stream depth immediately downstream due to scoured areas filling with gravel containing interstitial spaces. Water temperature: No effects anticipated. Stream embeddedness/Prey base: Heavy equipment use and removal of bridge supports and bridge debris will likely result in sedimentation temporarily exceeding the adverse effect threshold for occupancy and reproduction throughout the project area (up to 65 m) and up to 200 m downstream with effects spanning the entire stream width. However, long-term effects may be beneficial if flood events displace depositional areas immediately upstream of bridge supports and further downstream, increasing availability of spaces within gravel or under rocks and thus, improving stream embeddedness and the prey base. **Distance of Adverse Effects (Temporary) = 265 m (Temporary)** Connectivity: Crayfish movement may be impeded across the stream width due to disturbance. However, instream work is unlikely to exceed 30 days and thus, not exceed the adverse effect threshold. Long-term effects may be beneficial if aquatic organism passage improves due to removal of the bridge.
Culvert installation, maintenance, replacement, and removal	Stream flow velocity: Within culverts and the areas immediately downstream, stream flow velocity may increase, but size of the area impacted is unlikely to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width. Effects may be beneficial if removal of culverts or replacement of undersized culverts with those of adequate size improves stream flow velocity immediately downstream. Stream depth: Within areas immediately downstream of culverts, increased stream flow velocity may result in scour, increasing stream depth. However, size of the area impacted is unlikely to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width. Long-term effects may be beneficial if removal of culverts or replacement of undersized culverts with those of adequate size improves stream depth immediately downstream due to scoured areas filling with gravel containing interstitial spaces. Water temperature: No effects anticipated. Stream embeddedness/Prey base: Heavy equipment use, substrate disturbance in and around culverts, and substrate disturbance in areas requiring removal of sand and gravel for maintenance will likely result in sedimentation temporarily exceeding the adverse effect threshold throughout the project area (up to 80 m) and up to 100 m downstream with effects spanning the entire stream width. Unless an open bottom culvert is used, installation of new or larger culverts will also reduce spaces within gravel or under rocks within the footprint of culverts long-term, thereby reducing stream embeddedness and the prey base. In addition, after multiple flood events, changes in hydrology may result in long-term depositional areas immediately upstream of culverts and further downstream. However, the combined size of the area encompassed by culverts and depositional areas is unlikely to exceed 50% of a set of stream features. Long-term effects may be beneficial if removal of culverts or replacement of undersized culverts with those of adequate size results in displacement of depositional areas immediately upstream of culverts and further downstream, increasing availability of spaces within gravel or under rocks and thus, improving stream embeddedness and the prey base. **Distance of Adverse Effects = 180 m (Temporary)**

Action	Anticipated Effects to Critical Habitat
	Connectivity: The area in which stream flow velocity and stream depth may increase is unlikely to span more than 75% of the stream width. Though crayfish movement may be impeded across the stream width due to disturbance, instream work is unlikely to exceed 30 days. Long-term effects may be beneficial if aquatic organism passage improves due to culvert removal or replacement of undersized culverts with those of adequate size.
Pipeline construction, repair, replacement, and removal	Stream flow velocity: Because all new pipelines will be buried under the substrate, stream flow velocity will not increase within any areas. Effects may be beneficial if removal or replacement of an exposed pipeline improves stream flow velocity immediately downstream. Stream depth: Because all new pipelines will be buried under the substrate, stream flow velocity will not increase within any areas. Effects may be beneficial if removal or replacement of an exposed pipeline improves stream depth immediately downstream due to scoured areas filling with gravel containing interstitial spaces. Water temperature: No effects anticipated. Stream embeddedness/Prey base: Unless horizontal directional drilling is used, heavy equipment use and substrate disturbance will likely result in sedimentation temporarily exceeding the adverse effect threshold throughout the project area (up to 10 m) and up to 100 m downstream with effects spanning the entire stream width. Long-term effects may be beneficial if removal or replacement of an exposed pipeline results in displacement of depositional areas immediately upstream of the pipeline and further downstream, increasing availability of spaces within gravel or under rocks and thus, improving stream embeddedness and the prey base. **Distance of Adverse Effects = 110 m (Temporary)** Connectivity: Though instream activities may span the entire stream width, they are unlikely to exceed 30 days. Removal or replacement of an exposed pipeline may be beneficial if the exposed pipeline created a physical barrier to crayfish movement or if high stream flow velocity along the downstream side of the exposed pipeline impeded crayfish movement.
Construction, maintenance, replacement, and removal of river accesses	Stream flow velocity: Stream flow velocity may increase immediately downstream of new access ramps, but size of the area impacted is unlikely to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width. Effects may be beneficial if removal or replacement of an existing access ramp improves stream flow velocity immediately downstream. Stream depth: Suitability of stream depth may decrease immediately downstream of new access ramps due to scour from increased stream flow velocity, but size of the area impacted is unlikely to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width. Effects may be beneficial if removal or replacement of an existing ramp improves stream depth immediately downstream due to the scoured area filling with gravel containing interstitial spaces. Water temperature: No effects anticipated. Stream embeddedness/Prey base: If heavy equipment is not used within the stream channel, the size of areas experiencing sedimentation from substrate disturbance in and around the access ramp is unlikely to encompass more than 50% of a set of stream features. However, if heavy equipment is used within the stream channel, sedimentation downstream of substrate disturbance is expected to temporarily exceed the adverse effect threshold throughout the project area (up to 10 m) and up to 100 m downstream, with effects spanning the entire stream width. Installation of a new or larger access ramp will also reduce spaces within gravel or under rocks within the footprint of the ramp long-term, thereby reducing stream embeddedness and the prey base. After multiple flood events, changes in hydrology may result in long-term depositional areas immediately upstream of the ramp and further downstream. However, the combined size of the area encompassed by the access ramp and depositional areas is unlikely to exceed 50% of a set of stream features (initial sedimentation will no longer be present after multiple flood events). **Distance of Adverse Effects = 110 m (Temporary)**

Action	Anticipated Effects to Critical Habitat
	Connectivity: The area in which stream flow velocity and stream depth may increase is unlikely to span more than 75% of the stream width.
Construction, maintenance, use, and removal of hardened stream crossings	Stream flow velocity: Immediately downstream of the crossing, stream flow velocity may increase, but the velocity is unlikely to exceed either adverse effect threshold. Long-term effects may be beneficial if removal or replacement of a hardened stream crossing improves stream flow velocity immediately downstream. Stream depth: Within the area immediately downstream of the crossing, increased stream flow velocity may result in scour, increasing stream depth. However, stream depth is not anticipated to exceed either adverse effect threshold. Long-term effects may be beneficial if removal or replacement of a hardened stream crossing improves stream depth immediately downstream due to scoured areas filling with gravel containing interstitial spaces. Water temperature: No effects anticipated. Stream embeddedness/Prey base: Heavy equipment use, substrate disturbance in and around the crossing, and substrate disturbance in areas requiring removal of sand and gravel for maintenance will likely result in sedimentation temporarily exceeding the adverse effect threshold throughout the project area (up to 80 m) and up to 100 m downstream with effects spanning the entire stream width. Installation of a new hardened stream crossing will likely also reduce spaces within gravel or under rocks within the footprint of crossing long-term, thereby reducing stream embeddedness and the prey base. After multiple flood events, changes in hydrology may result in long-term depositional areas immediately upstream of the crossing and further downstream. However, the combined size of the area encompassed by the crossing and depositional areas is unlikely to exceed 50% of a set of stream features (initial sedimentation will no longer be present after multiple flood events). When vehicles use the crossing to traverse the stream, turbidity and sedimentation may temporarily increase. However, they are unlikely to exceed the adverse effect threshold. Long-term effects may be beneficial if removal or replacement of a hardened stream crossing results in displacement of depositional areas immediately upstream of the crossing and further downstream, increasing availability of spaces within gravel or under rocks and thus, improving stream embeddedness and the prey base. **Distance of Adverse Effects = 180 m (Temporary)** Connectivity: Stream flow velocity and stream depth may increase immediately downstream of the crossing. However, conditions are not anticipated to exceed either adverse effect threshold. Crayfish movement may be impeded across the stream width due to disturbance from instream activities, but instream work is unlikely to exceed 30 days. Long-term effects may be beneficial if an existing hardened stream crossing that impedes crayfish movement is removed or replaced with a new crossing with improved aquatic organism passage.
Stream channel or streambed restoration	Stream flow velocity: Modifying contours of the stream channel or stream bed may increase stream flow velocity in some areas while decreasing it other areas. However, long-term effects of stabilizing the stream channel will likely be beneficial and result in an overall improvement in stream conditions for the crayfishes, including stream flow velocity. If there is a reduction in the overall area containing suitable stream flow velocity, unsuitable areas are unlikely to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width. Stream depth: Modifying contours of the stream channel or stream bed may increase stream depth in some areas while decreasing it other areas. However, effects of stabilizing the stream channel will likely be beneficial and result in an overall improvement in stream conditions for the crayfishes, including stream depth in scoured areas. If there is a reduction in the overall area containing suitable stream depth, unsuitable areas are unlikely to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width. Water temperature: No effects anticipated.

Action	Anticipated Effects to Critical Habitat
	Stream embeddedness/Prey base: Heavy equipment use and substrate disturbance will likely result in sedimentation temporarily exceeding the adverse effect threshold throughout the project area (up to 300 m) and up to 200 m downstream with effects spanning the entire stream width. However, long-term effects will likely be beneficial since stabilizing the stream channel will likely result in an overall reduction in sedimentation within and downstream of the project footprint, increasing availability of spaces within gravel or under rocks and thus, improving stream embeddedness and the prey base. **Distance of Adverse Effects (Temporary) = 500 m (Temporary)** Connectivity: The area in which stream flow velocity and stream depth may increase is unlikely to span more than 75% of the stream width. However, crayfish movement may be temporarily impeded due to disturbance if instream work extends across more than 75% of the stream width and exceeds 30 days. Long-term effects will likely be beneficial if connectivity improves due to improvement of stream conditions. **Distance of Adverse Effects (Temporary) = Indeterminable (Temporary)**
Streambank stabilization	Stream flow velocity: No effects anticipated. Stream depth: No effects anticipated. Water temperature: No effects anticipated. Stream embeddedness/Prey base: Heavy equipment use and substrate disturbance will likely result in sedimentation temporarily exceeding the adverse effect threshold throughout the project area (up to 220 m) and up to 100 m downstream with effects spanning the entire stream width. However, long-term effects will likely be beneficial since stabilizing the streambank will likely result in an overall reduction in sedimentation within and downstream of the project footprint, increasing availability of spaces within gravel or under rocks and thus, improving stream embeddedness and the prey base. **Distance of Adverse Effects (Temporary) = 320 m (Temporary)** Connectivity: Instream work may extend across more than 75% of the stream channel but is unlikely to exceed 30 days.
Construction or modification of instream structures for streambank stabilization	Stream flow velocity: Modifying the hydrology along a streambank may result in increased stream flow velocity in some areas while decreasing stream flow velocity in other areas. However, any reduction in the overall size of areas containing suitable stream flow velocity is not anticipated to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width. Stream depth: Modifying the hydrology along a streambank may increase stream depth in some areas while decreasing it other areas. However, any reduction in the overall size of areas containing suitable stream depth is not anticipated to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width. Water temperature: No effects anticipated. Stream embeddedness/Prey base: Heavy equipment use and substrate disturbance will likely result in sedimentation temporarily exceeding the adverse effect threshold throughout the project area (up to 170 m) and up to 200 m downstream with effects spanning the entire stream width. However, long-term effects will likely be beneficial since stabilizing the streambank will likely result in an overall reduction in sedimentation within and downstream of the project footprint, increasing availability of spaces within gravel or under rocks and thus, improving stream embeddedness and the prey base. **Distance of Adverse Effects (Temporary) = 370 m (Temporary)** Connectivity: If instream work extends across more than 75% of the stream width and exceeds 30 days, crayfish movement may be temporarily reduced due to the disturbance and exceed the adverse effect threshold. **Distance of Adverse Effects = Indeterminable (Temporary)**

Action	Anticipated Effects to Critical Habitat
Instream heavy metal remediation and reduction	Stream flow velocity: No effects anticipated. Stream depth: Excavating portions of the streambed will likely increase stream depth in excavated areas. However, increased stream depth is unlikely to exceed either adverse effect threshold. Water temperature: No effects anticipated. Stream embeddedness/Prey base: Heavy equipment use and substrate disturbance will likely result in sedimentation temporarily exceeding the adverse effect threshold throughout each project area (up to 130 m) and up to 100 m downstream with effects spanning the entire stream width. **Distance of Adverse Effects (Temporary) = 230 m (Temporary)** Connectivity: Crayfish movement may be temporarily impeded due to disturbance if instream work extends across more than 75% of the stream width. However, instream work is unlikely to exceed 30 days.
Construction and removal of instream work pads	Stream flow velocity: If culverts are installed within the work pad, stream flow velocity may increase immediately downstream of and within culverts, even when culverts of appropriate size are used. However, size of the area impacted is unlikely to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width. If culverts are not installed, stream flow velocity will likely also increase due to the reduced width in which water can flow. However, size of the area impacted is unlikely to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width, and stream flow velocity will return to baseline after removal of the work pad. Stream depth: Within areas immediately downstream of culverts, increased stream flow velocity may result in scour, increasing stream depth. However, size of the area impacted is unlikely to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width, and stream depth will return to baseline after removal of the work pad. Water temperature: No effects anticipated. Stream embeddedness/Prey base: Heavy equipment use and substrate disturbance in and around the work pad will likely result in sedimentation temporarily exceeding the adverse effect threshold throughout the project area (up to 35 m) and up to 100 m downstream, with effects spanning the entire stream width. If changes in hydrology result in temporary depositional areas, sediment deposition may temporarily exceed the adverse effect threshold immediately upstream of the work pad and further downstream. Both areas will likely be within the area affected by sedimentation from heavy equipment use and substrate disturbance. **Distance of Adverse Effects = 135 m (Temporary)** Connectivity: Even when culverts of appropriate size are used, crayfish movement may be impeded due to the combined effects of instream disturbance, presence of work pad material that physically impedes movement, and increased stream flow velocity within the culverts and portion of the stream outside the work pad. If crayfish movement is impeded for more than 30 days, the adverse effect threshold will be exceeded. If culverts are not installed, the adverse effect threshold may still be exceeded if crayfish movement is impeded for more than 30 days due to the combined effects of instream disturbance, presence of work pad material that physically impedes movement, and increased stream flow velocity within the portion of the stream outside the work pad. **Distance of Adverse Effects = Indeterminable (Temporary)**
Construction, removal, and use of temporary stream crossings	Stream flow velocity: If the crossing consists of a bridge spanning the entire stream channel, no effects are anticipated. If culverts are installed within the stream crossing, stream flow velocity may increase immediately downstream of and within culverts even when culverts of appropriate size are used. However, size of the area impacted is unlikely to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width, and stream flow velocity will return to baseline after removal of the crossing.

Action	Anticipated Effects to Critical Habitat
	Stream depth: If culverts are installed within the stream crossing, increased stream flow velocity immediately downstream of culverts may result in scour, increasing stream depth. However, size of the area impacted is unlikely to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width, and stream depth will return to baseline after removal of the crossing Water temperature: No effects anticipated. Stream embeddedness/Prey base: Heavy equipment use and substrate disturbance in and around the crossing will likely result in sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 30 m) and up to 100 m downstream with effects spanning the entire stream width. If changes in hydrology result in temporary depositional areas, sediment deposition may temporarily exceed the adverse effect threshold immediately upstream of the crossing and further downstream. Both areas will likely be within the area affected by sedimentation from heavy equipment use and substrate disturbance. When existing fords are used as temporary crossings, sedimentation may occur downstream of the crossing. However, sedimentation is not expected to exceed the adverse effect threshold. **Distance of Adverse Effects = 130 m (Temporary)** Connectivity: Even when culverts of appropriate size are used, crayfish movement may be impeded due to the combined effects of instream disturbance, presence of crossing material that physically impedes movement, and increased stream flow velocity within the culverts. If crayfish movement is impeded for more than 30 days, the adverse effect threshold will be exceeded. If the crossing consists of a bridge spanning the entire stream channel, no effects are anticipated. **Distance of Adverse Effects = Indeterminable (Temporary)**
Installation and removal of coffer dams and dewatering	Stream flow velocity: Stream flow velocity will likely increase due to the reduced width in which water can flow. However, size of the area impacted is unlikely to encompass more than 50% of a set of stream features or extend across more than 75% of the stream width, and stream flow velocity will return to baseline after removal of the work pad. Stream depth: No effects anticipated. Water temperature: No effects anticipated. Stream embeddedness/Prey base: Heavy equipment use and substrate disturbance in and around the coffer dam will likely result in sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 25 m) and up to 100 m downstream with effects spanning the entire stream width. If changes in hydrology result in temporary depositional areas, sediment deposition may temporarily exceed the adverse effect threshold immediately upstream of the coffer dam and further downstream. Both areas will likely be within the area affected by sedimentation from heavy equipment use and substrate disturbance. **Distance of Adverse Effects = 135 m (Temporary)** Connectivity: Crayfish movement may be impeded due to the combined effects of instream disturbance, presence of work the coffer dam that physically impedes movement, and increased stream flow velocity within the portion of the stream outside the coffer dam. If crayfish movement is impeded for more than 30 days, the adverse effect threshold will be exceeded. **Distance of Adverse Effects = Indeterminable (Temporary)**
Geotechnical investigations (borings)	Stream flow velocity: No effects anticipated. Stream depth: No effects anticipated. Water temperature: No effects anticipated.

Action	Anticipated Effects to Critical Habitat
	Stream embeddedness/Prey base: Heavy equipment use and other substrate disturbance may result in sedimentation temporarily exceeding adverse effect thresholds throughout the project area (up to 16 m) and up to 20 m downstream with effects spanning the entire stream width. **Distance of Adverse Effects = 36 m (Temporary)** Connectivity: No effects anticipated.
Streambank grading	Stream flow velocity: No effects anticipated. Stream depth: No effects anticipated. Water temperature: No effects anticipated. Stream embeddedness/Prey base: Though heavy equipment will likely not be used within the stream channel, soil may be released into the stream and result in turbidity and sedimentation temporarily exceeding adverse effect thresholds throughout the work area (up to 50 m) and up to 50 m downstream, with effects spanning the entire stream width. When the purpose of the grading is to reduce erosion, there will likely be an overall reduction in sedimentation, which will increase habitat suitability in previous depositional areas. **Distance of Adverse Effects = 100 m (Temporary)** Connectivity: No effect to connectivity is expected since there will be no instream activities, and turbidity and sedimentation are unlikely to extend across more than 75% of the stream width or exceed 30 days.
Vegetation or tree removal required for other actions	Stream flow velocity: No effects anticipated. Stream depth: No effects anticipated. Water temperature: If tree canopy over the stream is reduced, water temperature may increase and exceed adverse effect thresholds for both critical habitat functions until new trees are tall enough to provide canopy cover. The impacted area may be up to 20 m in length and span the entire stream width either temporarily or long-term, depending on the length of time for trees to grow tall enough to provide canopy cover. Note that actions are outside the scope of the SCF if they will increase water temperature beyond the adverse effect threshold for temporarily reduced connectivity, either continuously for more than a year or intermittently for more than 10 years. **Distance of Adverse Effects = 20 m (Long-term)** Stream embeddedness/Prey base: If vegetation removal is extensive, or if heavy rains occur before the streambank is revegetated, sedimentation may temporarily exceed adverse effect thresholds throughout the work area (up to 30 m) and up to 50 m downstream, with effects spanning the entire stream width. **Distance of Adverse Effects = 80 m (Temporary)** Connectivity: If tree canopy over the stream is reduced, water temperature may increase and exceed the adverse effect threshold during summer months in up to 20 m and span the entire stream width. Actions are outside the scope of the SCF if they will increase water temperature beyond the adverse effect threshold for temporarily reduced connectivity, either continuously for more than a year or intermittently for more than 10 years. **Distance of Adverse Effects = Indeterminable (Temporary)**
Other terrestrial actions	Stream flow velocity: No adverse effects anticipated. Stream depth: No adverse effects anticipated. Water temperature: No adverse effects anticipated, provided effects to temperature do not exceed the adverse effect threshold.

Action	Anticipated Effects to Critical Habitat
	Stream embeddedness/Prey base: No adverse effects anticipated if turbidity and temperature do not exceed adverse effect thresholds and if stream conditions are not otherwise impacted Connectivity: No adverse effects anticipated.
Activities not explicitly described	Stream flow velocity: No adverse effects anticipated. Stream depth: No adverse effects anticipated. Water temperature: If tree canopy over the stream is reduced, water temperature may increase and exceed adverse effect threshold for both critical habitat functions until new trees are tall enough to provide canopy cover. The impacted area may be up to 10 m in length and span the entire stream width either temporarily or long-term, depending on the length of time for trees to grow tall enough to provide canopy cover. Actions are outside the scope of the SCF if they will increase water temperature beyond the adverse effect threshold for temporarily reduced connectivity, either continuously for more than a year or intermittently for more than 10 years. **Distance of Adverse Effects = 10 m (Long-term)** Stream embeddedness/Prey base: If heavy equipment is used within the stream channel or the substrate is disturbed from other activities, turbidity and sedimentation temporarily may temporarily exceed the adverse effect threshold throughout the project area and downstream with effects spanning the entire stream width. If a structure is constructed or placed within the stream channel, habitat within the footprint of the structure may be lost as long as the structure is in place. In addition, changes in hydrology may result in long-term depositional areas immediately upstream of the structure and further downstream of the structure. However, the combined size of the area encompassed by the structure and depositional areas is unlikely to exceed 50% of a set of stream features. **Distance of Adverse Effects = 250 m (Temporary)** Connectivity: If instream work extends across more than 75% of the stream width and exceeds 30 days, connectivity may be temporarily reduced due to the disturbance and exceed the adverse effect threshold. **Distance of Adverse Effects = Indeterminable (Temporary)**