Environmental Assessment: County Road 675 Stream Crossing Project, Leelanau County, Michigan

OCTOBER 27, 2022

PREPARED FOR

Grand Traverse Engineering and Construction

ON BEHALF OF

Grand Traverse Band of Ottawa and Chippewa Indians Tribe

PREPARED BY

SWCA Environmental Consultants

ENVIRONMENTAL ASSESSMENT: COUNTY ROAD 675 STREAM CROSSING PROJECT, GRAND TRAVERSE BAND OF OTTAWA AND CHIPPEWA, LEELANAU COUNTY, MICHIGAN

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1 PURPOSE AND NEED FOR THE ACTION

In 2019, the Grand Traverse Band of Ottawa and Chippewa Indians (GTB) initiated a project to replace three undersized stream crossing structures on the Crystal River and the Tucker Lake Outlet culvert along Leelanau County Road (CR) 675 (also known as Dunns Farm Road and West Crystal View Road). The four crossings are located approximately 1 mile northeast of downtown Glen Arbor, Michigan, near the intersection of Michigan Highway 22 (M-22) and CR 675. The four stream crossing locations, numbered 1 through 4 (from west to east) are provided in Figure 1 and Figures A1 and A2 in Appendix A.

The project is being undertaken following a grant awarded to the GTB from the Bureau of Indian Affairs (BIA) to improve aquatic organism passage and natural stream functions at the four stream crossings along CR 675. In addition to the GTB and BIA, the Leelanau County Road Commission (LCRC) and the Natural Resources Conservation Service (NRCS) are both providing funding to assist with the project. A portion of the project area is owned by the National Park Service – Sleeping Bear Dunes National Lakeshore (SLBE). SLBE is therefore a cooperating agency as part of the environmental assessment (EA). This EA is required for compliance with the National Environmental Policy Act of 1969 (NEPA) and BIA 638 contract requirements.

The Crystal River crossings each have multiple culverts while the Tucker Lake outlet channel has a single culvert. The proposed project will replace the three river crossings (currently existing of culverts underneath the road) with a galvanized steel beam superstructure (Crossing #1) and multi-span timber bridge structures (Crossings 2 and 3) that will span the riverbank width. The Tucker Lake outlet channel will be replaced by a 16’6” x 6’-8” aluminum box culvert. These sections of the Crystal River see a high level of recreational paddler (typically kayakers) use in the summer due to its clear water, languid current, and relative shallowness. As a direct tributary to Lake Michigan, the Crystal River serves as spawning and rearing habitat for Great Lakes fishes as well as habitat for resident fish and other aquatic organisms. The town of Glen Arbor relies on tourist traffic during the summer months to support local businesses, and many people specifically visit Glen Arbor for paddling on the Crystal River.

While the original grant funds associated with the proposed project were focused on improving aquatic organism passage and improving natural stream functions along this section of the Crystal River, additional priorities and the need for the project have been identified by the GTB and the local community as the following:

- To decrease the artificially elevated stream grade/slope, water pooling and/or scouring caused by the culverts effect on stream flow so that priority fish species do not have restricted passage in the Crystal River at critical times in their life cycle.
- To decrease and minimize riverbank erosion at the road-stream crossings associated with high-volume water events that cannot be efficiently passed through undersized culverts. Continued overflow of water at these sections of CR 675 threatens the structural integrity of the road and therefore public safety.
- To decrease or stop salt (from winter road maintenance), petroleum, and other pollutant run off from CR 675 into the Crystal River.
- To decrease or stop the need for recreational users of the Crystal River (kayakers, etc.) to portage over CR 675 at these crossings, which will decrease the risk of pedestrian/vehicle accidents as well as reduce impacts from erosion.

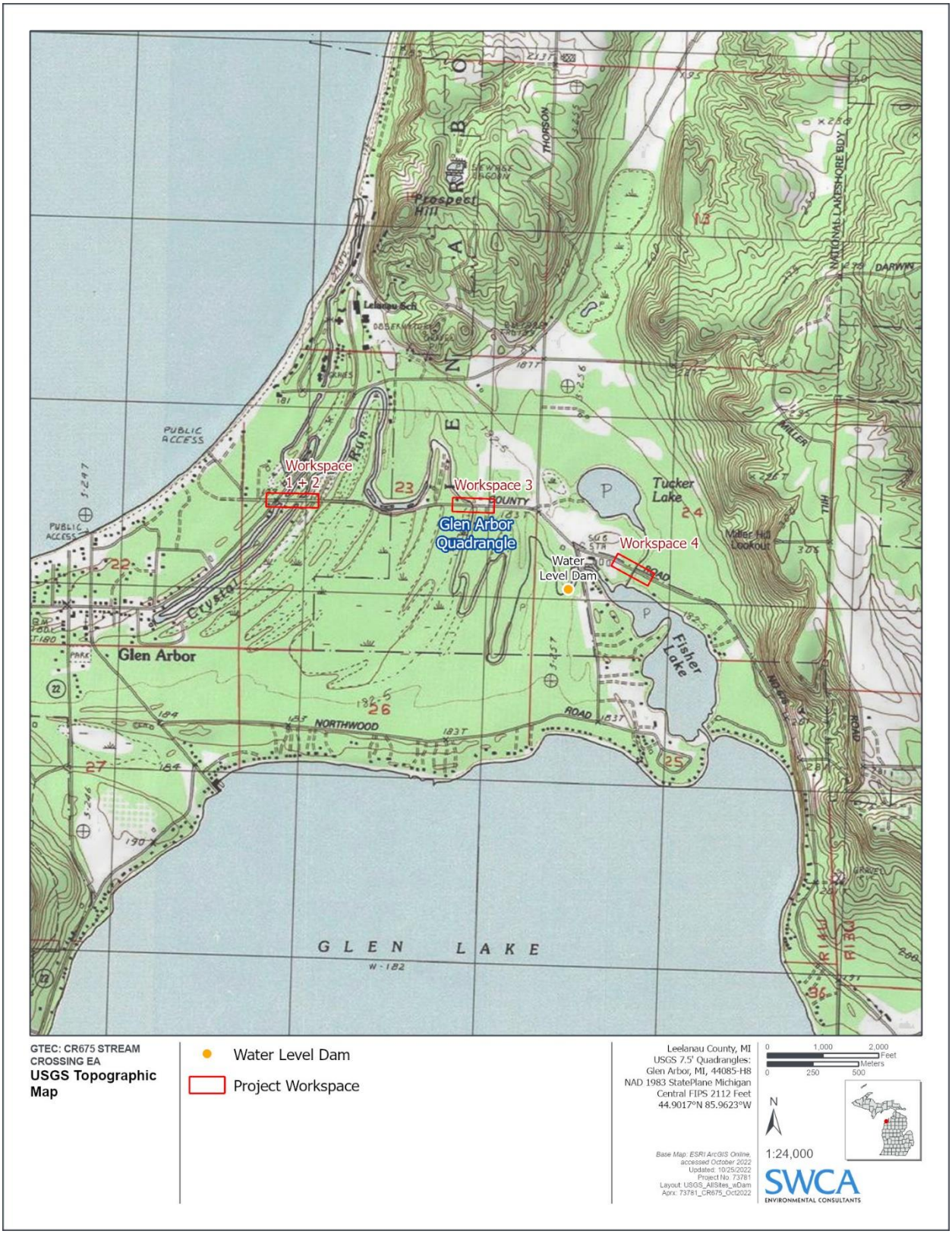

Figure 1. Project overview map, showing the Crystal River stream crossings, the Tucker Lake outlet, and the water level control dam near Fisher Road/Fisher Lake.

The project is considered a Federal Action as defined by NEPA since portions of the project will occur on federal land and the project will receive federal funds. The BIA Midwest Region is the lead federal agency. The BIA Midwest Region's Proposed Action is to respond to the GTB's request to expend highway trust funds through the Tribal Transportation Program (TTP) and grant approval for funds associated with the road improvements of CR675 at the river crossings. The need for the Proposed Action is established by the BIA Midwest Region's responsibilities under 23 United States Code (USC) 201 and 202. Under 23 USC 201, the need is recognized for all public federal and tribal transportation facilities to be treated under uniform policies, and the Secretary of Transportation is required to coordinate a uniform policy. The regulations under 23 USC 202 describe the appropriate use and distribution of funds, planning requirements, the bridge priority program, and funding and project selection for highway safety issues under the TTP. In addition, the need for the Proposed Action is established by the BIA Midwest Region's responsibilities under the TTP in Rights-Of-Way (ROW) over Indian Lands (25 Code of Federal Regulations [CFR] 169) and under the 1948 ROW Act (25 USC 323–328). The federal land parcels are owned by SLBE and include the parcels on the north and south sides of CR 675 at Crossing #3 and the north side of CR 675 at Crossings #1, #2, and #4 (Tucker Lake Outlet). Figures 2 through 4 illustrate the locations of SLBE property in the project area.

Construction activities are proposed that will have effects that can be meaningfully evaluated and therefore are subject to NEPA review. Based on available information and the nature of the Proposed Action, the project is expected to be a Class III Action requiring the preparation of this EA and appropriate subsequent documentation, either an Environmental Impact Statement or Finding of No Significant Impact (FONSI).

This EA has been prepared by SWCA Environmental Consultants (SWCA) on behalf of GTB and BIA Midwest Region. Information contained in this EA was also furnished by federal and state agencies and local units of government, including the SLBE. This EA has been prepared in accordance with NEPA and the BIA NEPA Guidebook (BIA 2012). The BIA, in conjunction with cooperating agencies (SLBE, NRCS) will use the EA to determine if the Proposed Action will result in significant effects to natural resources and the human environment. Department of Interior regulations require notifying the public of the availability of an EA and FONSI (43 CFR 46.305(c)). The Notice of Availability for the EA and FONSI will be published in a local newspaper and/or at public venues (the Glen Arbor Township Hall, for instance) at the same time as the decision to proceed. Additionally, a public meeting will be held in Glen Arbor, Michigan, as part of the public review process.

1.1 Project Description

The project area is located approximately 1 mile northeast of downtown Glen Arbor, Michigan, near the intersection of M-22 and CR 675, Leelanau County, Michigan. CR 675 generally consists of 11-foot lanes with an average of 4.5-foot paved shoulders for a total average paved width of 31 feet. Glen Lake is the source location for the Crystal River. Water from Glen Lake flows into Fisher Lake. Tucker Lake drains into Fisher Lake via a channel connecting the two lakes. The Tucker Lake Outlet contributes a small amount of flow, roughly 10% at base conditions, to the outflow of Fisher Lake into the Crystal River. A water level control dam is located at this location approximately .2 mile west of Fisher Road (Figure 1). This water level control dam and the channel is the beginning of the Crystal River. The Crystal River is a 6.3-mile-long (10.1 km) stream that flows from this location through sections of SLBE, private land, Glen Arbor and eventually into Lake Michigan near S. Homestead Road (The Homestead Resort area). The straight-line distance from where the Crystal River begins at the outlet of Fisher Lake to Lake Michigan is only 1.2 miles (1.9 km), however, the river meanders through and across CR 675 more than three times in that distance. The water level control dam at the channel of Fisher Lake is used to maintain Glen Lake's court ordered normal lake level of 596.75 feet above sea level and a minimum flow of 31

cubic feet per second for the Crystal River. The removal of the culverts at any of the four crossings will not change the flow of the Crystal River nor should it impact operation of this water level control structure since the lake level and river flow are based on the court approved Glen Lake level and Crystal River flow (not based on any downstream levels).

Numerous cottages are located along the lower reaches of the river from Glen Arbor to its mouth emptying into Lake Michigan. Groves of cedar, tamarack, and paper birch populate the riverine environment and provide good habitat for bald eagles, hawks, and various avian species. Areas of swamp/low-lying lands bordering the banks of the river provide habitat for frogs, turtles, beavers, muskrats, otters, and ducks.

The Crystal River meanders roughly north-northwest from Glen Lake/Fisher Lake and crosses CR 675 at four locations (including the Tucker Lake crossing) (see Figure 1). A channel from Tucker Lake to Fisher Lake crosses CR 675 approximately 0.4 mile to the southeast of the intersection of CR 675 and South Westman Road. This location is the Tucker Lake crossing (Crossing #4). The Crystal River continues from Fisher Lake on the south side of CR 675 until it crosses (Crossing #3, The Tubes) the road approximately 0.25 mile west of the intersection of CR 675 and South Westman Road. From this location, the Crystal River continues north and then tracks back south along CR 675 before turning north again toward M-22 and South Faculty Road. The Crystal River then shifts south again and crosses CR 675 at Crossing #2 approximately 0.25 mile east of the intersection of M-22 and CR 675. The river then continues south-southwest into the town of Glen Arbor where it oxbows near the popular boat house location associated with Crystal River Outfitters and then runs northeast and crosses (Crossing #1) CR 675 adjacent to M-22.

The Crystal River crossings each have multiple culverts while the Tucker Lake outlet channel has a single culvert (see Figures 5 through 8). The proposed project will replace the three river crossings (currently existing of culverts underneath the road) with multi-span timber bridge structures (at Crossings #2 and #3) and a steel bridge (at Crossing #1) that will span the riverbank width. The Tucker Lake outlet channel will be replaced by a 16’6” x 6’-8” aluminum box culvert.

The existing road cross section of CR 675 from the M-22 intersection east to the Tucker Lake crossing consists of 11-foot lanes with an average of 4.5-foot paved shoulders for a total average paved width of 31 feet. Replacement of the existing metal culverts at each location along CR 675 with the proposed bridge structures (timber bridges and steel bridge) and the box culvert at the Tucker Lake Outlet would result in 12-foot lanes with 5-foot paved shoulders (a total of 34-foot paved width versus the current 31-foot width). Additionally, 2 feet of gravel shoulder is proposed on either side of the CR 675 outside the limits of each bridge structure.

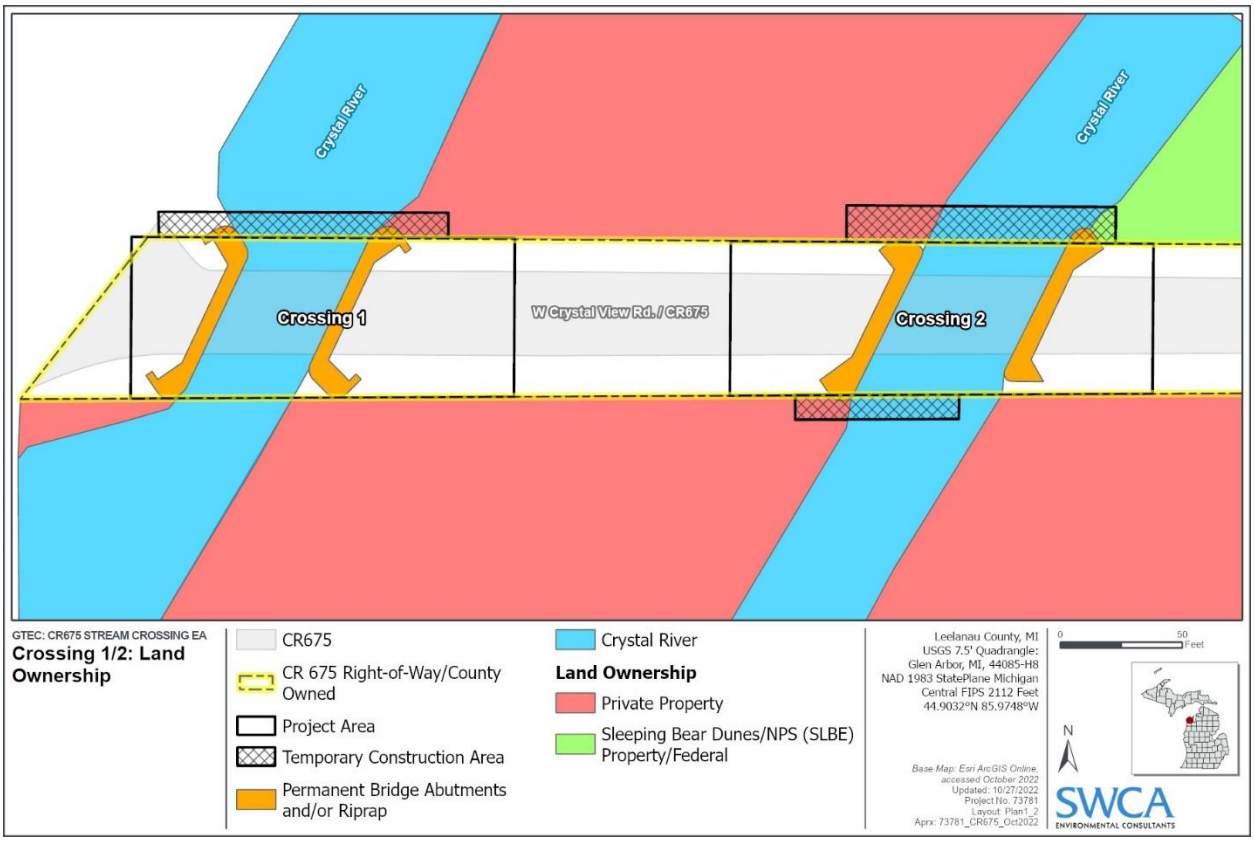

Figure 2. Land ownership status at Crossings #1 and #2.

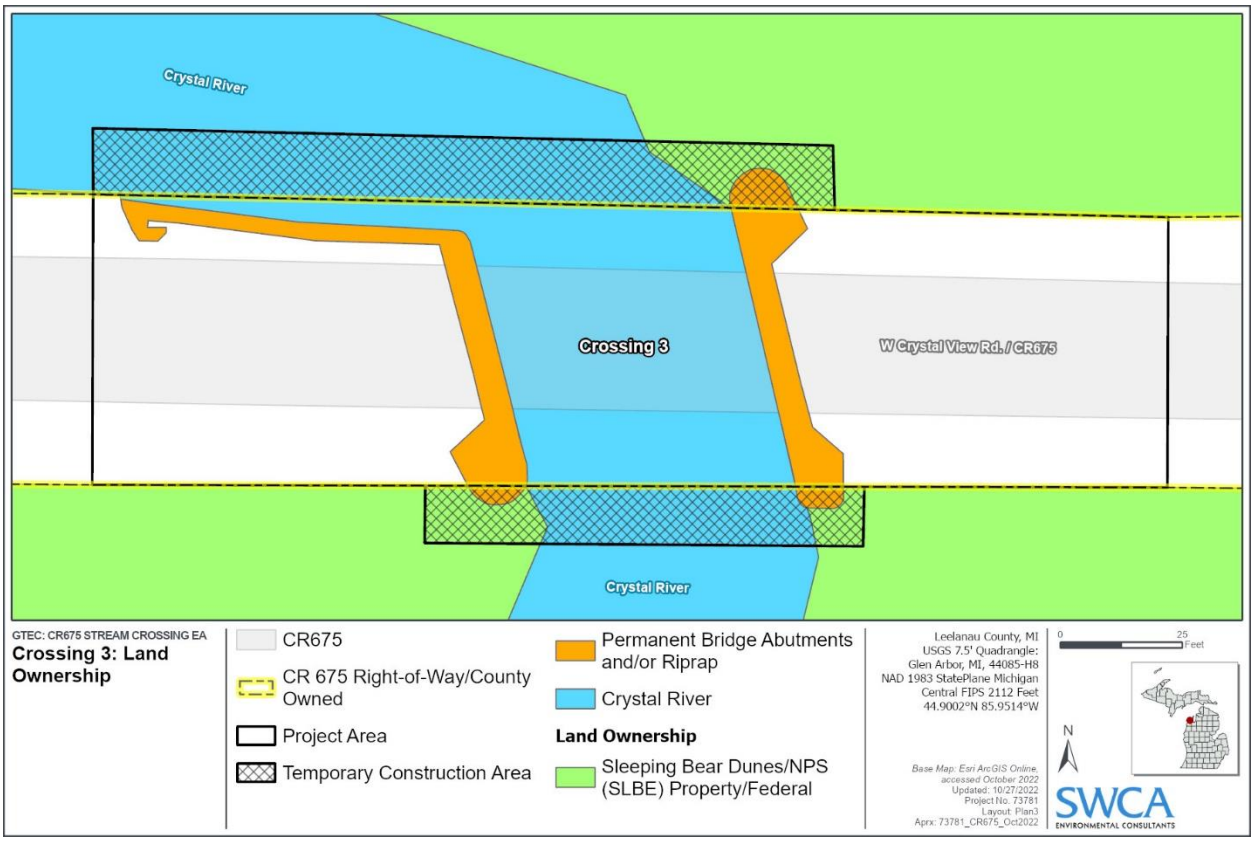

Figure 3. Land ownership status at Crossing #3.

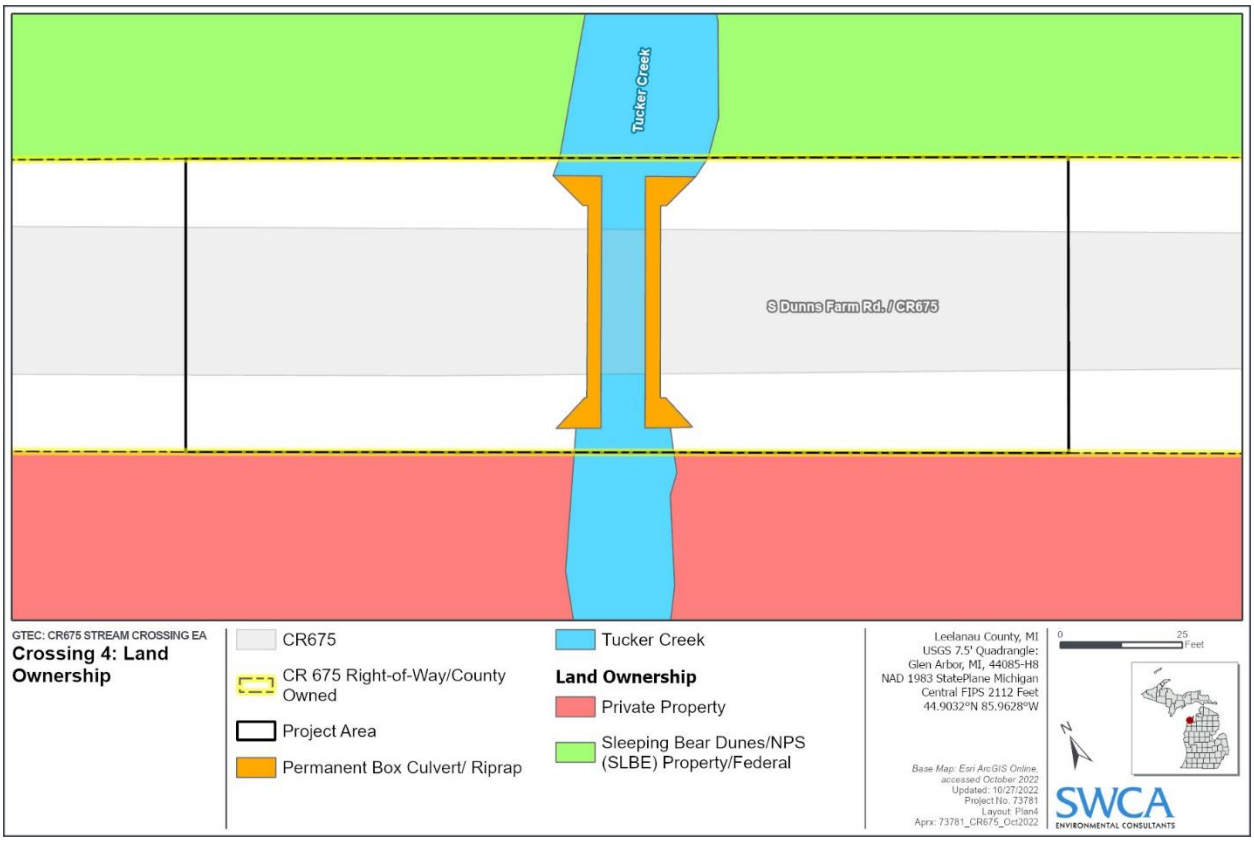

Figure 4. Land Ownership Status at Crossing #4.

Figure 5. Crossing #1, downstream/outlet section of the Crystal River, looking south-southeast at the intersection of M-22 (white car in background traveling north on M-22) and CR 675.

Figure 6. Crossing #2, upstream/inlet section of the Crystal River, looking north.

Figure 7. Crossing #3 (The Tubes), downstream/outlet section of the Crystal River, looking south.

Figure 8. Crossing #4 (Tucker Lake Outlet), downstream section, looking south-southeast with CR 675 in foreground.

The proposed project would remove the metal culverts underneath CR 675 and span the Crystal River with a galvanized steel beam superstructure (Crossing #1), timber bridge structures (Crossings #2 and #3), and an aluminum box culvert at the Tucker Lake Outlet. Criteria used for planning and design of the crossings, along with details of the design for each crossing are provided below.

The four stream crossing improvements were planned and designed according to the USDA-Natural Resources Conservation Service (NRCS) aquatic organism passage (396) conservation practice standard (attached for reference). Compliance with the NRCS aquatic organism passage conservation practice standard required that the design team evaluated the project according to the following applicable criteria and designed the project to the following applicable requirements:

General Criteria Used for Planning and Design

- Evaluate sites for variations in stage and discharge, tidal influence, hydraulics, geomorphic impacts, sediment transport and continuity, and organic debris movement.
- Design passage features to account for the known range of variation resulting from this evaluation.
- Mitigate undesirable channel plan or profile shifts resulting from the modification or removal of a passage barrier.
- Plan and locate passage for compatibility with local site conditions and stream geomorphology, to the extent possible.
- Avoid locating fishway entrances and exits in areas that will obstruct function, increase harassment or predation, or result in excessive operation and maintenance requirements.

Design Requirements

- Design passage to accommodate present and reasonably anticipated changes in watershed conditions.
- Design passage structures according to known swimming and leaping capabilities of target species or a similar species with comparable swimming abilities. Utilize hydraulic computations to document how designs satisfy the physiological requirements of target organisms.
- Design passage structures to mimic channel geometry and morphology referenced from an adjacent reach or analog stream when the swimming and leaping abilities of target species are unknown, or when a project will benefit multiple aquatic organisms.
- At a minimum, design and evaluate passage structures for hydraulic performance and structural integrity at the bankfull and 25-year peak flow events.
- Design passage features to minimize or avoid energy deficits, physical stress, and harm to migratory organisms.
- Design passage features to minimize or avoid excessive delays during migration periods.
- Provide adequate attraction flow into a passage facility across the full range of discharge during which target species will move.
- Use trashracks on culverts or fishways only if required or necessary. Ensure that trashracks are self-cleaning and/or easily maintained.
- Select construction materials that are non-toxic and resistant to degradation.

- Plan construction logistics, methods, and sequencing to minimize adverse effects to aquatic organisms, riparian areas, and instream habitat.

The Preliminary Engineering Report as well as the supplemental memos, as an attachment to the NRCS Inventory and Evaluation (I&E) document, demonstrate how the practices were designed in accordance with the aquatic organism passage standard. NRCS engineering staff and partner biologists and ecological staff evaluated the draft designs and design report, meeting with the engineer and road commission on several occasions to provide a functional review of the design report and designs. NRCS and partners concurred that the engineer of record, Gosling Czubak Engineering, planned and designed the four stream crossing projects according to NRCS aquatic organism passage standard.

NRCS maintains a process to ensure that the job approval for determining compliance with conservation practice standards and the technical requirements therein are delegated to competent NRCS staff with the demonstrated academic background and professional experience in the region where the project is planned to be implemented.

Crossing #1: The required structure length to cross the river is approximately 65 feet, and the vertical distance from the road surface to the stream bottom at the center of the new/proposed river channel is approximately 8.9 feet. Crossing #1 is geometrically constrained due to the adjacent proximity of M-22, therefore several alternatives were examined for replacement of the culverts (Gosling Czubak 2020; 2022). These included two 30-foot timber bridge spans, a three-sided precast concrete structure, and a clear span steel superstructure. Of the three alternatives, the preferred alternative is the clear span steel superstructure as it can span the entire length of the river within the constraints of M-22 by using conventional driven steel pile and concrete abutment foundations and wing walls to support the bridge. Additionally, the galvanized steel superstructure maximizes the channel flow area through the structure, the bridge includes a 35-year warranty for the galvanized steel system, and it does not require center piers to be placed directly in the Crystal River.

Crossing #2: The bankfull width measured just upstream of this crossing is approximately 65 feet, with a bankfull width of 73 feet at the cross section of the road (Gosling Czubak 2020). A three-span timber structure with an overall length of 80 feet is proposed at Crossing #2. The center span would extend 38 feet and each end span would be 21 feet, so the overall length of the bridge exceeds the bankfull width. The vertical distance from the road surface to the anticipated stream bottom at the center of the new channel is approximately 10 feet (Gosling Czubak 2020). Scour protection riprap will be used at each abutment just below the representative cross section of the stream bed elevation where the abutments intercept the stream. The riprap would slope down to the toe of the abutment from where the anticipated stream bottom will be. Riprap will conform with MDOT 2020 Standard Specifications for Construction "Section 813 - Slope Protection" and consist of natural stone with footprint dimensions from 8 to 16 inches and an in-place thickness of at least 16 inches. The contractor may use smaller stones to infill spaces for better slope protection. The proposed riprap extends partially out of the CR 675 Right-of-Way into SLBE property (Figure 9). Per the riprap specifications above, the riprap will consist of natural stone and will be decreasing in overall thickness on SLBE property as it is located at the terminus of the abutment so that impacts to SLBE property will be minimal. The use of the three-span timber structure will allow the Crystal River to flow freely and maximize channel flow.

Crossing #3: Crossing #3 is similar to Crossing #2, with nearly identical bankfull width measurements at the cross section of CR 675. A three-span timber structure with an overall length of 80 feet is proposed at Crossing #3. The center span would extend 38 feet and each end span would be 21 feet so the overall length of the bridge exceeds the bankfull width. Unlike Crossing #2, however, this crossing has a slope between the road and the river where the river parallels the road (on the north side of the crossing). A 61-foot-long retaining wall is required to support this slope (Gosling Czubak 2020). A timber pile wall is

proposed as part of the timber bridge at this crossing to ensure stability of this slope and to prevent erosion. Riprap similar to that discussed for Crossing #2 will be used at each abutment in the river. Riprap extends onto SLBE property at three locations of Crossing #3 (Figure 10). Per the riprap specifications, the riprap will consist of natural stone and will be decreasing in overall thickness on SLBE property as it is located at the terminus of the three abutments so that impacts to SLBE property will be minimal. The use of the three-span timber structure will allow the Crystal River to flow freely and maximize channel flow.

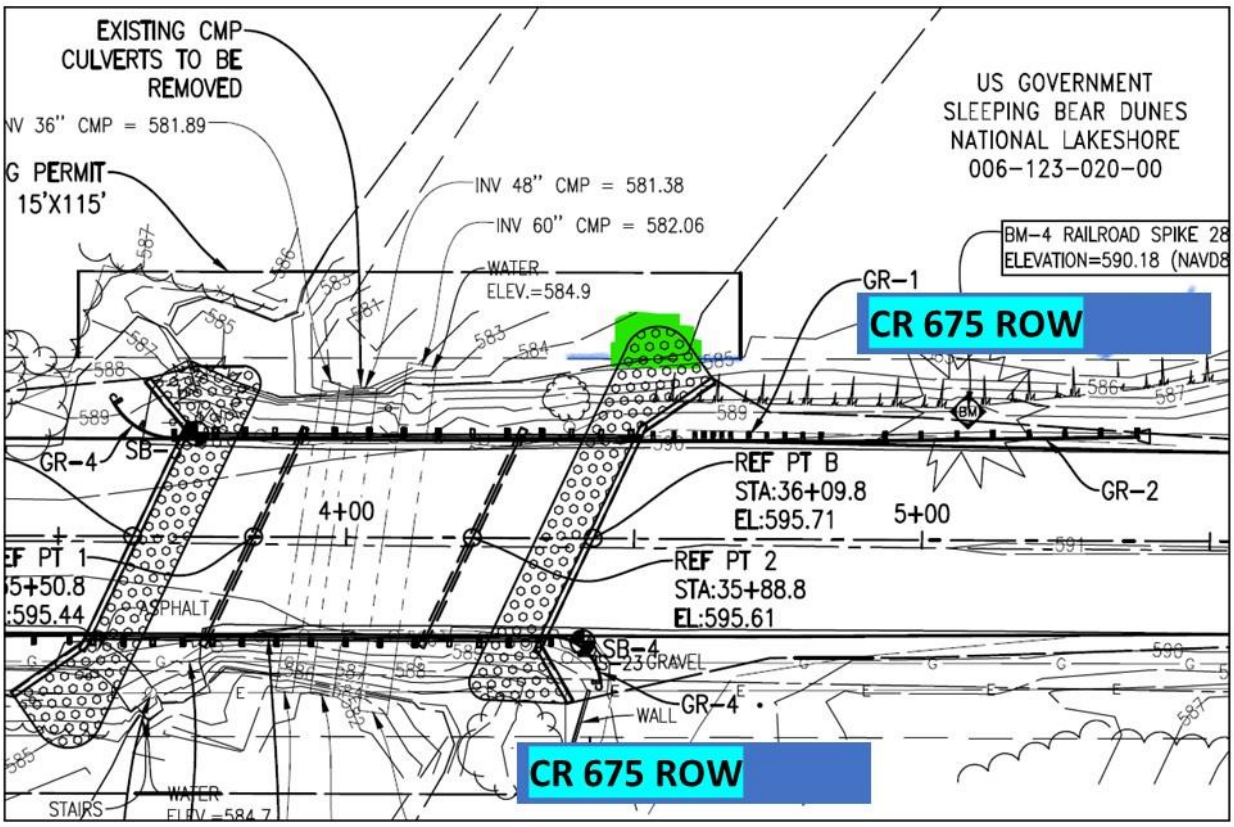

Figure 9. Design drawing showing proposed riprap (green highlighted areas) extending outside of the CR 675 Right-of-Way onto SLBE property.

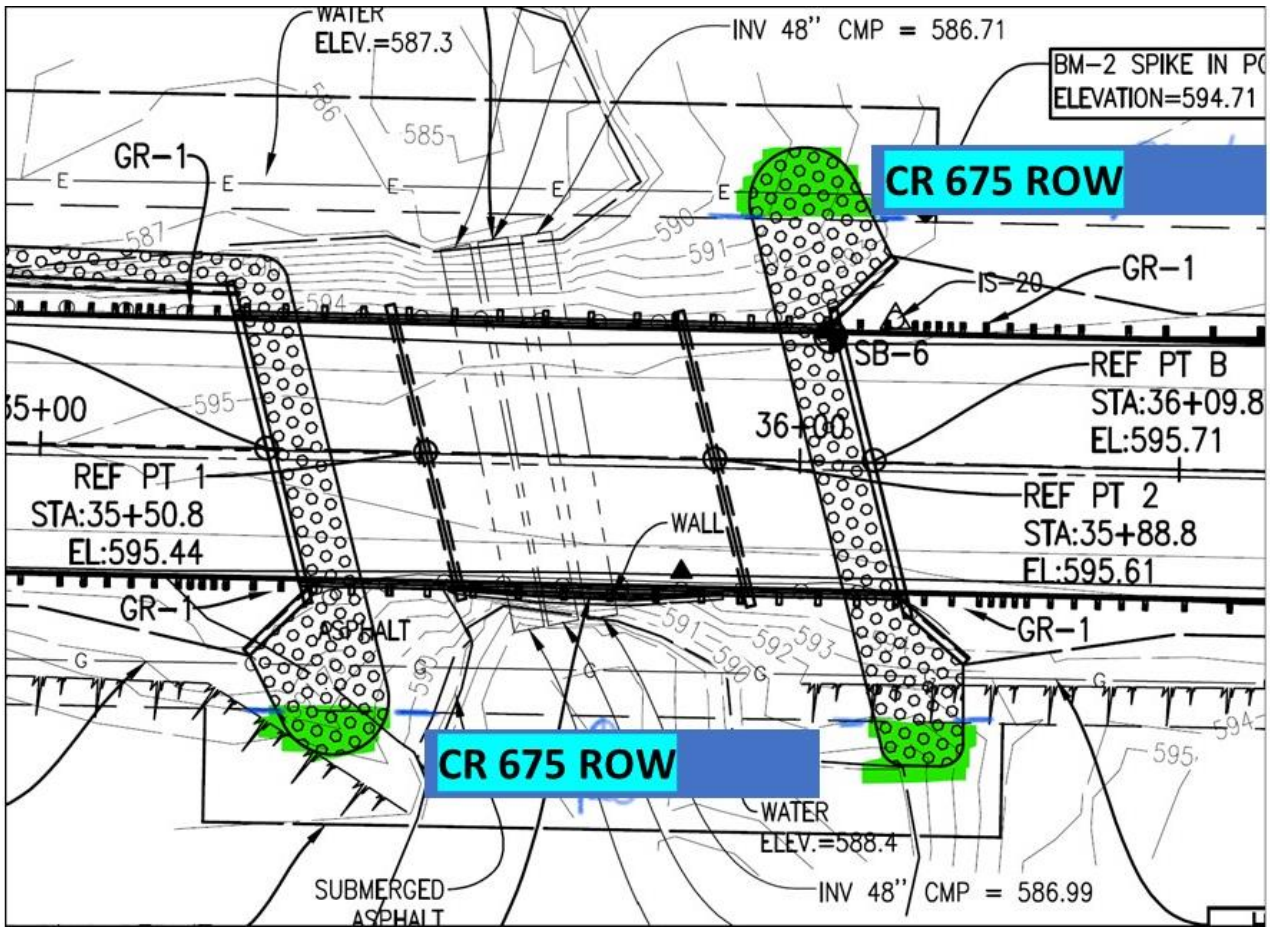

Figure 10. Design drawing showing a portion of the proposed riprap (green highlighted areas) extending outside of the CR 675 Right-of-Way onto SLBE property.

Crossing #4/Tucker Lake Outlet: Because this crossing is a relatively low-velocity location of the river, and due to a deep peat soil layer that is unsuitable for providing support, building a timber bridge structure was not suggested (Gosling Czubak 2020). Instead, an aluminum box culvert structure is proposed. The box culvert would be 16 feet, 6 inches by 6 feet, 8 inches, and construction of the culvert would require removing the peat and any other unsuitable material in the river channel, and replacing it with engineered fill to provide suitable weight bearing material for the crossing.

The Conservation Resource Alliance (DJ Shook) completed aquatic organism passage studies at each of the four Crystal River crossings in 2019 (Appendix B). Mr. Shook utilized the Great Lakes Road Stream Crossing Inventory Instructions (version 2011) for the aquatic organism passage ratings. A description of each crossing, along with an overview of the aquatic organism passage ratings are provided below.

Crossing #1: The crossing consists of two 60-inch diameter corrugated metal pipe culverts and was rated as a passibility score of 0.5. Some species and/or life stages cannot pass at most stream flows because the culverts are longer than 30 feet and do not have natural substrate lining throughout the culvert. No other barriers exist downstream from this crossing, so native Great Lakes fish are prevented from migrating upstream from Lake Michigan through this crossing during elevated stream flow periods. An over-widened scour pool exists downstream of Crossing #1, indicating past channel bed and streambank erosion was caused by elevated water velocities associated with high-water events being forced to flow through the undersized culverts.

Crossing #2: The crossing consists of three corrugated metal pipe culverts of various sizes (36-inch, 48-inch, and 60-inch diameters). Similar to the organism passage rate of Crossing #1, this crossing is rated as a passibility score of 0.5 because the culverts are longer than 30 feet and there is a lack of natural substrate within the culverts. Crossing #2 also has an over-widened scour pool downstream of the culverts from streambank and channel bed erosion from elevated water velocities created as high-rain events are forced to flow through the undersized culverts.

Crossing #3: The crossing consists of three 48-inch diameter corrugated metal pipe culverts. The organism passage rating at this crossing is 0.0, meaning that most species and life stages cannot pass at most stream flows because the water velocity within the culvert is greater than 3 feet per second at base flow. This crossing also has an over-widened scour pool downstream of the culvert associated with high-water events where water is forced to flow through the undersized culverts.

Crossing #4 (Tucker Lake Outlet): The crossing consists of a single 42-inch diameter corrugated metal pipe culvert. Water was not passing through the culvert at the time of the GTB study. This location often is blocked with debris and the lack of passing water prevents all fish species from passing through the culvert. A 2-foot water surface elevation differential from upstream to downstream was measured at this location. Water routinely overtops the road at this location during high-rain or runoff events and has caused erosion of the road shoulders into the waterway.

Hydraulic analysis and stream morphology of each crossing was conducted to examine the potential backwater effects of replacing the existing culverts at each location with new structures (Gosling Czubak Engineering Sciences, Inc. [Gosling Czubak] 2020, 2022). These studies utilized flood frequency data for discharges provided by the Michigan Department of Environment, Great Lakes, and Energy (EGLE). The HEC-River Analysis System 5.0.7 (HEC-RAS) developed by the U.S. Army Corps of Engineers (USACE) was utilized for modeling the natural river with the existing and proposed structures. Existing and proposed (post-culvert/bridge replacement) effects for 2-year and 100-year discharges, plus the base flow estimate, were analyzed for sections of the river (1,000 feet upstream and downstream of the crossings) to examine potential impacts to riparian property owners and wetlands and wildlife from possible river level changes. The overall analyses indicates that changes to water surface elevation would be minimal (between 0.00 foot [0 inch] to 1.19 foot [14.3 inches]) for 2-year flood flows and 100-year flood flows. The analysis of stream morphology and hydraulics associated with the proposed project are discussed further in Chapter 3 of this EA. These studies can be reviewed in full, along with the results and project recommendations, in Appendix B.

Construction of the project would require the temporary closing of traffic along sections of CR 675 while the culverts are removed, and the proposed structures are erected. Cofferdams will be used during construction to isolate the work area from the flowing water for construction and pollution reduction purposes. The cofferdams will be used in stages, generally used on one half of the existing culvert area so that the other half can remain in-use to allow for water flow. Cofferdams extend out of the CR 675 ROW at all four crossings. These cofferdams will only be used during construction and will be removed after construction so impacts to the river are temporary.

It is estimated that the typical three-span timber structure construction could be completed in 35 working days or 49 calendar days and the steel span bridge structure could be completed in 49 working days or 67 calendar days (Gosling Czubak 2020, Page 19). Construction will take place between June 15th and October 1st to avoid disrupting spawning season for fish species in the Crystal River. It should be noted that the local Michigan Department of Natural Resources Fisheries Management Biologist does not have a concern with starting the Tucker Lake Outlet culvert replacement earlier that June 15. Traffic detour plans can be found as part of the most recent engineering/design plans (see Appendix C).

The planned schedule for construction of the bridges and box culvert is as follows:

- Spring 2023 – Tucker Lake Outlet
- Spring-Summer 2023 or 2024 – Crossing #1 – Steel Bridge
- Late Summer – Early Fall 2023 – Crossing #2 – Timber Bridge
- Late Summer – Early Fall 2024 – Crossing #3 – Timber Bridge

2 PROJECT ALTERNATIVES

The alternatives considered for the EA consist of a No Action Alternative and the Proposed Action Alternative. The No Action Alternative is the baseline condition that is referenced through this document. For an EA where there are no unresolved conflicts with respect to alternative uses of available resources, only the Proposed Action and No Action Alternatives require consideration (BIA 2012). Other alternatives do not need to be analyzed. In this EA, no unresolved conflicts with respect to alternative uses have been identified, therefore, only the Proposed Action and No Action Alternatives are considered in detail.

2.1 No Action Alternative

Under the No Action Alternative, the size and structure of the culverts and CR 675 would remain in the same condition as they are currently at these sections of the Crystal River. As mentioned in Chapter 1 (Purpose and Need), the Crystal River is a direct tributary to Lake Michigan and serves as a spawning and rearing habitat for Great Lakes fishes as well as habitat for resident fish and other aquatic organisms. Brook and rainbow trout and other aquatic organism passage are currently limited due to the hydraulic flow and lack of substrate through the existing culverts. The limitations for the aquatic organisms, including watershed connectivity, in-stream habitat, stream function and geomorphology, and stream-to-floodplain connectivity in the Crystal River Watershed, are all related to the current size of the culverts. Additionally, debris is often trapped in front of or within these culverts, restricting water conveyance and negatively impacting the ability for fish and other aquatic organisms to spawn and/or pass freely through these sections of the Crystal River.

These sections of the Crystal River see a high level of recreational paddler (typically kayakers) use in the summer. The town of Glen Arbor relies on tourist traffic during the summer months to support local businesses, and the many people specifically visit Glen Arbor for paddling on the Crystal River. Although people are known to kayak through the culverts (in particular, at Crossing #3, The Tubes), travel directly through the culvert is dangerous. The safety hazard associated with this activity increases when the water level of the Crystal River is high (for instance, after a high-rain event or during spring run-off), or when debris is obstructing the culverts. Local residents have also raised concerns regarding kayakers, including young children, standing next to CR 675 while waiting for parents/adults to portage the boat across the road. In particular, at Crossing #2, there is very little safe space to wait between the road and the trail back down to the river.

Continued bank erosion along CR 675 at the crossing locations is expected due to high-water velocities moving through the culverts during high-rain events. Areas along CR 675 at each crossing location have evidence of erosion, including noticeable deterioration of the road itself along the edges of CR 675. Stormwater runoff, often containing petroleum or other pollutants from CR 675, are therefore entering the Crystal River without being treated and/or without an efficient path for natural absorption into the ground/substrate. The culverts themselves continue to degrade and rust, and eventually will fail structurally, thereby increasing the likelihood that the road itself will fail and/or wash-out. This would

pose a serious public risk to the local community that relies on CR 675, as well as to tourists utilizing the road to access the Crystal River during the summer months.

The ability to provide adequate aquatic organism passage and habitat, the prevention of road/bridge failures and streambank erosion, and the need to provide safer passage for recreational users of the Crystal River would not be met under the No Action Alternative.

2.2 Proposed Action

The Proposed Action consists of the elements described under Section 1.1 (Project Description) above. Timber bridges were chosen for Crossings #2 and #3 due to their more natural appearance and visual appeal versus a concrete or steel structure. Timber bridges match the rural character of northern Michigan. In addition, timber bridges are a relatively lower cost option than bridges of comparable span made of concrete or steel. The multiple spans of the timber bridges also offer more clear distance beneath the structure than a single span bridge of a comparable span. Site constraints restricted the use of a timber bridge at Crossing #1 without having a row of timber piles placed in the center of the river. This option was not chosen as the river under the culvert needed to be designed to mimic an analog channel from a reference section of the Crystal to meet the NRCS aquatic organism passage conservation practice standard. The aluminum box culvert for the Tucker Lake Outlet structure was chosen because it is the lowest cost alternative to address the resource concerns at the site.

The undersized culverts back-up water upstream of the culverts which causes sediment to drop out of suspension and accumulate upstream of the culverts. Removal of these undersized culverts and replacement with the steel beam superstructure and timber structure bridges, along with the box culvert at Crossing #4 would, over time, allow the flow of the river to determine the size (width, water depth, etc.) of the channel. As part of the construction plans, seeding and mulching along the stream banks at the bridge locations and the Tucker Lake Outlet would be required. Permanent road vegetative restoration measures will include topsoil, chemical fertilizer nutrient Class A (228 LB/Acre), general roadside seed mix TDS (220 LB/Acre), mulch, and biodegradable jute netting blanket. These measures will be selected from MDOT qualified products and installed per MDOT specifications. Planting/seeding and mulching in these areas would aid in establishing stable vegetation following construction and would further decrease soil erosion. The construction contractor and LCRC will coordinate with SLBE, EGLE and MDNR for guidance on approved planting/seeding and mulching materials prior to post-construction vegetation activities. Planting/seeding or mulching is not planned outside of the CR 675 Right-of-Way as land disturbance is limited to within the Right-of-Way.

Management practices will be implemented to minimize transport and increase attenuation of petroleum, salt, and other pollutants associated with the stormwater runoff of CR 675. Stormwater would be forced to flow through established vegetation on road embankments that are less steep than the current road grade and the road will be re-graded during bridge construction to eliminate concentrated flow of stormwater. Appropriate soil erosion and sedimentation control measures shall be in place prior to earth-disturbing activities. Turf establishment items will be placed as soon as possible on potential erodible slopes as directed by the engineer. Criticial ditch grades shall be protected with either sod or seed/mulch or a mulch blanket as directed by the engineer. Consultation with SLBE and LCRC will occur to utilize approved materials for the project area.

Fish and other aquatic organism passage would no longer be limited by the culverts at all four crossing of the Crystal River and Tucker Lake Outlet by replacing the culverts with the bridges/box culvert. The undersized culverts on the Crystal River and Tucker Lake Outlet are not identified as lowermost barriers to Sea Lamprey on the Sea Lamprey Control Map maintained by the Great Lakes Fishery Commission. The United States Fish and Wildlife Service will be consulted to ensure that there are no concerns with

Sea Lamprey advancement with the improvement of these stream crossing sites. Normal sediment transport regimes would be re-established and would uncover natural stream-bed habitat for fish/aquatic organisms. Expected aquatic organism passage passibility scores would increase above the current 0 to 0.5 score because the barriers (culverts) preventing fish species from migrating upstream from Lake Michigan through these crossings would be eliminated. Furthermore, natural riverbed substrates would be available for fish and other aquatic species within the stream crossings. The engineering and stream analyses indicates that water surface elevation change would be minimal (between a 0.00-foot [0-inch] to 1.19-foot [14.3-inch] decrease) 1,000 feet upstream and downstream of the CR 675 crossings during both 2-year flood flows and 100-year flood flows (Gosling Czubak; tables 12-13; pages 12–14). While changes to upstream and downstream morphology will occur initially after the culverts are removed, based on these data, the proposed culvert replacement will not significantly alter landowners river frontage along the river. Further discussion of expected changes to the river are provided below, and in Section 3.2.3 – Stream Morphology.

River Water Surface Below the Proposed Bridges

Sheets C1.1 and C3.1 of the engineering plans (Gosling Czubak 2020) illustrate the expected water surface elevations relative to the elevations of the bridge structures for the base flow, 2-year flood flow, and 100-year flood flow. Below, Tables 1 through 4 summarize the distance from the modeled water surface elevation to the bottom of the bridge structure for each of the modeled flow events (Note: distance is estimated from the center of the bridge to the water surface. With the planned slope of the bridge and the slope of the river, this distance will be slightly greater near the right bank of the river [facing downstream] and the downstream edge of the bridge relative to the left bank of the river and the upstream edge of the bridge.):

Table 1. Crossing #1 – Crystal River Water Surface to Bottom of Bridge

Flow Event	Clear Distance From Water Surface to Bottom of Bridge
Base Flow	2.5 Feet
2-Year	1.8 Feet
100-Year	0.5 Feet

Table 2. Crossing #2 - Crystal River Water Surface to Bottom of Bridge

Flow Event	Clear Distance From Water Surface to Bottom of Bridge
Base Flow	4.1 Feet
2-Year	3.2 Feet
100-Year	1.6 Feet

Table 3. Crossing #3 - Crystal River Water Surface to Bottom of Bridge

Flow Event	Clear Distance From Water Surface to Bottom of Bridge
Base Flow	5.8 Feet
2-Year	5 Feet
100-Year	3.5 Feet

Table 4. Crossing #4 – Tucker Lake Outlet/Culvert Water Surface to Top/Inside of Culvert

Flow Event	Clear Distance From Water Surface to Bottom of Bridge
Base Flow	2.2 Feet
2-Year	2.2 Feet
100-Year	1.6 Feet

Specifications from State of Michigan (DOT) Bridge Design Manual, Chapter 7, (2019) for stream/river crossing low chord (lowest part of a bridge above the water) elevation for navigation (9-24-2018) states "where practical, a minimum clearance of 2 feet from the low chord to the design high water elevation. Clearance should conform to Federal requirements based on normally expected flows during the navigation season. Navigation includes using canoes, small boats and wading by fishermen". For purposes of this analysis, 2 feet minimal height is used to determine potential impact for recreational boating under the bridges.

Kayakers and recreational users of the river will be able to move freely underneath CR 675 in between the timber bridge spans at Crossing #3 (5 feet or more clearance for base flow and 2-year events, and 3.5 feet for a 100-year event) without the need to portage the boat (and people, including children) over the road during base flow events. Recreational boaters would have acceptable space to cross under the bridge at Crossing #2 with clearance of just over 4 feet at base flow event, although less space (3.2 feet) is available at a 2-year flow event. Not enough space would be available to safely pass through Crossing #2 during a 100-year event (under 2 feet). If a 100-year event occurred, portage of Crossing #2 would be required (similar to a 100-year event with the existing culverts, passage through the culverts would not be possible). Signage for portage should be placed on the bridge and/or in the project area in the event that a 100-year event occurs.

Utilization of the Tucker Lake channel to access Tucker Lake is not currently an issue. The addition of the proposed culvert is wider and would potentially allow people to boat through the culvert into Tucker Lake. However, even at base flow, there is only 2.2 feet of distance from water elevation to the top of the culvert. While this is above the minimal 2 feet distance, landowners around Tucker Lake have indicated the preference to keep recreational traffic on Tucker Lake to a minimum. In order to dissuade kayakers/boaters from using this channel, it could be beneficial to have signage at the culvert that indicates entering the lake is discouraged.

Overall, the proposed bridge design would provide a much better public health and safety process for river users to enjoy their time on the Crystal River – in particular at Crossing #3. Lastly, the proposed designs indicate that CR 675 would not be subject to road failure during high-rain events and decrease the likelihood of human harm related to a road/culvert wash-out.

3 ENVIRONMENTAL IMPACTS

3.1 Land Resources

3.1.1 Topography

The topography of the project area is generally flat with lateral dune and swale ridges that run southwest to northeast. Elevations in the project area range from 580 to 607 feet. Grading and other construction-

related alteration of the existing topography are expected as part of the immediate site preparation, but significant changes to the land topography are not anticipated.

Photographs of the existing conditions in the project area are included in Appendix D.

3.1.2 Geology

The *Quaternary Geology of Southern Michigan*, published by the Michigan Natural Features Inventory (MNFI), indicates that the site is within a dune and swale complex, with sediment made of dune sand, lacustrine sand, and gravel between Sleeping Bear Bay and Glen Lake (MNFI 1982). Due to minimal depth of proposed ground disturbance, the proposed development will have no impacts on the geology of the area.

3.1.3 Soils

According to the NRCS Web Soil Survey, six soil map units are present within the project area, including surface water (Table 5, Figures A3–A5) (NRCS 2022).

Table 5. Soil Types in the Project Area

Soil Map Unit Name	Acres in Project Area	Percentage of Project Area
Lupton-Markey mucks (Lm)	5.5	39.5%
Eastport sand (EdB)	3.5	25.2%
Deer Park-Roscommon sands (DrB)	1.7	12.1%
Au Gres-Kalkaska sands (AuA)	1.3	9.0%
Water (W)	1.3	9.0%
Deer Park sand (DkD)	0.7	5.1%
Total	**14.0**	**100.0%**

Source: NRCS (2022).
Note: Totals may not match due to rounding.

Existing soils would be disturbed and fill material may be added as part of site grading and other construction activities expected during construction. Construction activities would result in short-term exposure of soils to wind and rain erosion. Soil erosion will be minimized via implementation of the typical engineered erosion and sediment control measures such as seeded cover of exposed soils in accordance with EGLE permit requirements.

3.2 Water Resources

3.2.1 Surface Water

There are two surface waterbodies within the project area: Crystal River and an unnamed perennial stream connecting Fisher Lake and Tucker Lake. The project is also less than 1 mile away from Lake Michigan and Glen Lake.

Because maintaining aesthetic value, water quality, and recreational opportunities of the natural features of the area is so central to the Glen Arbor Master Plan (Glen Arbor Planning and Zoning Commission [Glen Arbor Zoning] 2019) and SLBE Master Plan, measures will be implemented to protect the water

features that will be disrupted by project construction. Engineered erosion control measures will be implemented to protect on-site, in-stream, downstream, and off-site surface water from stormwater runoff during construction activities in accordance with EGLE permit requirements.

A National Flood Hazard Flood Insurance Rate Map prepared by the Federal Emergency Management Agency indicates that the project area is located in an area of minimal flood hazard (Zone X) (Federal Emergency Management Agency 2021). The area is located within a 500-year floodplain (Class II) according to NPS guidelines (2022) with a .2 percent chance of flooding within a one-year timeline and a 10 percent chance of flooding within a 50-year timeline. Water level modeling of the Crystal River was completed using 50-year and 100-year flood data and the results indicate the river water level would still remain under the bridge (at both 50-year and 100-year flood cfs) and would be confined to the area adjacent to the river crossings (see Section 2.2 and 3.2.3). The project will be constructed outside of the regulated floodplain; therefore, no impacts to floodplains are anticipated.

3.2.2 Groundwater

The presence of surface water and only small variations in elevation indicates a shallow water table is present throughout the project area. Appropriate stormwater practices as outlined by the Township and EGLE will be implemented during design and construction of the project.

The timber bridge wood will be treated with copper naphthenate in accordance with current Michigan/AASHTO specifications. As part of the treatment process, proper fabrication certification must be performed by a third-party inspection agency that is accredited by the American Lumber Standards Committee (ALS), as specified in the ALSC Treatment Wood Program. Copper naphthenate has been used for over 70 years in the United States in various wood treating applications (Alley and Associates 1999). Copper naphthenate is a copper carboxylate made with naphthenic acid, which occurs naturally in petroleum. Commercial copper naphthenate is normally supplied as a 6% or an 8% copper concentrate which is diluted with a petroleum hydrocarbon to provide a 1-2% copper treating solution.

Copper naphthenate is an EPA registered general use wood and fabric preservative that can be used with a high degree of safety. It is not considered a hazardous waste, it is non-corrosive, non-conductive, nonblooming, and it has low mammalian (e.g., human) toxicity. Copper naphthenate is essentially insoluble in water and its leachability from wood is very low (Alley and Associates 1999) and, based on these studies, will not present a groundwater toxin or other negative impact to humans or wildlife/aquatic organisms in the general project area.

3.2.3 Stream Morphology

Hydraulic analysis and stream morphology of each crossing was conducted to examine the potential backwater effects of replacing the existing culverts at each location with new structures (Gosling Czubak 2020; 2022). These studies utilized flood frequency data for discharges provided by the EGLE. The HEC-RAS developed by the USACE was utilized for modeling the natural river with the existing and proposed structures. Existing and proposed (post-culvert/bridge replacement) effects for 2-year and 100-year discharges, plus the base flow estimate, were analyzed for sections of the river (1,000 feet upstream and downstream of the crossings) to examine potential impacts to riparian property owners from possible river level changes. The overall analyses indicates that water surface elevation change would be minimal (between a 0.00-foot [0-inch] to 1.19-foot [14.3-inch] decrease) 1,000 feet upstream and downstream of the CR 675 crossings during both 2-year flood flows and 100-year flood flows (Gosling Czubak; tables 12-13; pages 12–14). Flow data of the Crystal River from the measurement devices at the Fisher Lake dam show flows generally in the 60 to 80 cubic feet per second (cfs) range, with peaks of 110 cfs and lows of 25 cfs (Gosling Czubak 2020: 3). As noted in the Gosling Czubak report (2020: 6–14), the court-

ordered minimum flow of 31 cfs for the Crystal River is adjusted by the Fisher Lake dam. The dam is used to maintain the Glen Lake level at 596.75 ft (Gosling Czubak 2022; 3). Therefore, the normal flow of the Crystal River is maintained, with some deviation in the summer when water is retained for higher lake levels and when water is released in the winter to lower lake levels.

Of most importance for the proposed culvert removal and replacement with the steel span bridge and timber bridges is potential changes to upstream or downstream river morphology. Over time, the form (alignment, cross-section/elevation, and flow) of the Crystal River (like all rivers) will adjust as a function of multiple variables. These include rain/snowfall amounts and frequency, vegetation growth (or lack thereof), sediment transport and or soil stabilization, and the use of the river by aquatic organisms. None of these variables include human impact. The culverts currently in place along the Crystal River have, over time, altered the natural form and function of the river channel by decreasing the amount of channel area and increasing the velocity of the water being released at the culvert outlet (underneath the downstream side of CR 675). Replacing the culverts with span bridges, even with multiple spans used for Crossing #2 and #3, will decrease the velocity of water at these single road crossing locations and create a more natural river flow both up-stream and downstream.

For this project, a Biologist from the CRA, River Restoration Ecologist form the GTBOC, and a Civil Engineer from NRCS (having the applicable job approval authority for the planned practices), worked with a surveyor to ensure the Crystal River survey incorporated relevant geomorphic features such as bankfull field indicators, tops of riffles, and max depth of pools. In addition, the team ensured that the stream profile survey extended upstream and downstream of the Crystal River crossings nearly 1,500 feet at each crossing (2.5 times greater than standard practice for stream crossing projects in Michigan). Following this extensive stream survey, the engineer plotted the profiles and included them in the Preliminary Engineering Report (Figures 11 through 13 in this document; Gosling Czubak 2020). The following plots were reviewed by GTB, NRCS, CRA, Road Commission and the design engineer during a meeting in January of 2022 to help evaluate the effects of removing the undersized culverts and replacing the bridges (larger format/full page images of these plots – Figures 11, 12, and 13 – can be found in Appendix E):

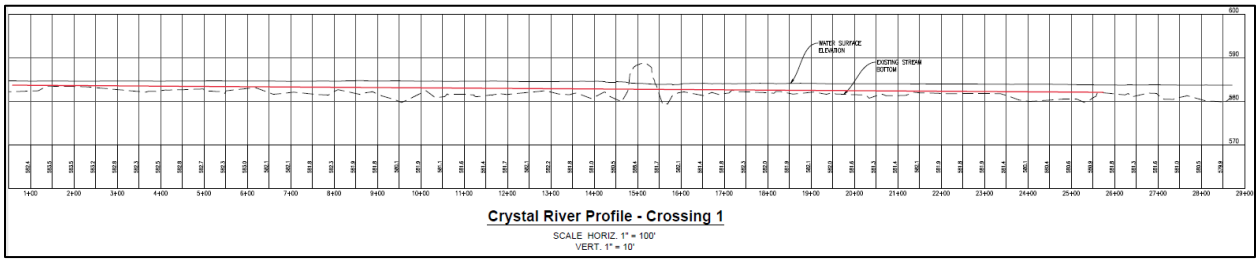

Figure 11. Crystal River Profile, Crossing #1. Dashed line shows existing stream bottom, single dark line shows water surface elevation and red line illustrates the continuity of streambed elevations from downstream to upstream of the crossing.

The straight red line inserted in the profile connecting the high points in the channel bed below the crossing with the high points in the channel bed above the crossing, is a visual guide that illustrates the continuity of streambed elevations from downstream to upstream of each crossing. The red line in Figure 11 (Crossing #1) demonstrates that the high spots in the channel just upstream of the crossing are at an elevation that is consistent with the rest of the river upstream and downstream of the crossing and no significant sediment wedge is present. Significant vertical shifts to the channel bed are not predicted as a result of the culvert replacements at Crossing #1.

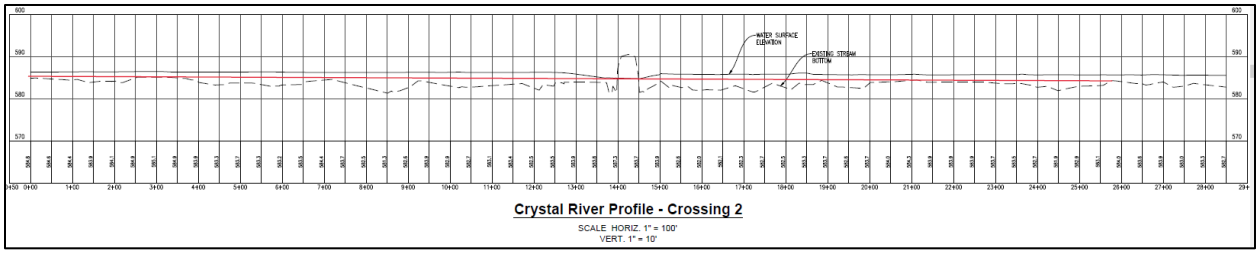

Figure 12. Crystal River Profile, Crossing #2. Dashed line shows existing stream bottom, single dark line shows water surface elevation and red line illustrates the continuity of streambed elevations from downstream to upstream of the crossing.

The red line in Figure 12 (Crossing #2) demonstrates that the high spots in the channel just upstream of the crossing are at an elevation that is consistent with the rest of the river upstream and downstream of the crossing and no significant sediment wedge is present. Significant vertical shifts to the channel bed are not predicted as a result of the culvert replacements at Crossing #2.

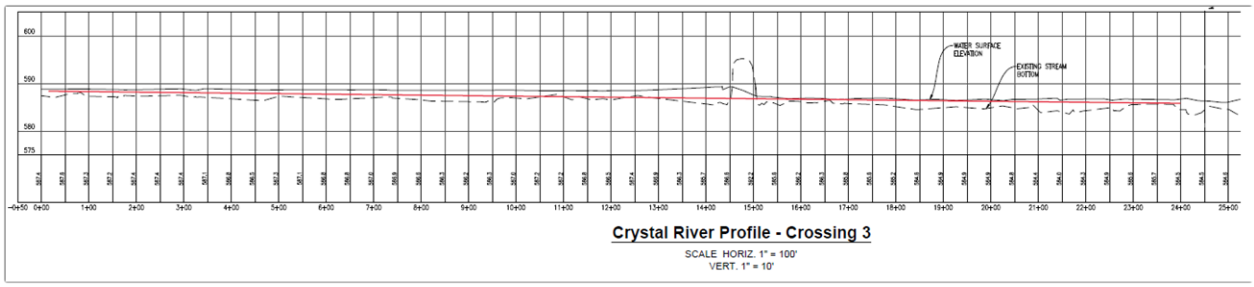

Figure 13. Crystal River Profile, Crossing #3. Dashed line shows existing stream bottom, single dark line shows water surface elevation and red line illustrates the continuity of streambed elevations from downstream to upstream of the crossing.

At Crossing #3, the project engineer, CRA, GTB, Road Commission, and NRCS reviewed the stream profile at a January 14, 2022, meeting. Using this evaluation, along with the knowledge that the sediment wedge material upstream of crossing 3 is sand, and the collective experience of the group evaluating the project plan, the group agreed that the sediment wedge present upstream of crossing 3 was minimal compared to the size of river.

Using the red line in Figure 13 as a guide, the maximum difference between riffle top downstream and the shallowest point in the river upstream of the crossing is .6 feet. Similarly, the maximum difference between the deepest points in the river upstream and downstream of Crossing #3 is 1.2 feet. These maximum differences are observed at stations 10+50 to stations 13+00 and gradually taper off to no noticeable difference at station 0+00.

The straight red line inserted in the profile at site #3 demonstrates that only a minimal sediment wedge is present and support the following Gosling Czubak (2020) statement in the Preliminary Engineering Report: “The velocities within the river at these crossings are generally low and with their reductions from replacing the constricting culverts with larger structures, are not expected to initiate streambed modification. There are many areas of pools and riffles that were surveyed along the river. It is possible that short term adjustments of the stream bed may occur at localized areas of the pools and riffles in response to the culvert replacements and or flood flows the river may experience.” The Preliminary Engineering Report further states, “It is generally expected that the natural channel will assume a geomorphological form in equilibrium with the discharges and sediment load it has historically experienced.” This statement indicates that the competence of the Crystal River and Tucker Lake Outlet

to move certain size sediment particles and the capacity of the river and the outlet channel to move a certain volume of sediment are in line with the size of and volume of sediment that are anticipated at each crossing.

Velocity at all crossings was modeled for the proposed culvert replacements. Crossings #1 and #2 would have a predicted velocity adjustment from between 1.0 (Crossing #2) to 1.1 (Crossing #1) feet per second to 0.5 foot per second at the downstream face of the stream crossing structures for a 2-year flow event and adjust from 1.7 (Crossing #2) to 2.0 (Crossing #1) feet per second to 0.8/0.9 foot per second for a 100-year flow (Gosling Czubak 2020; 7–8).

Crossing #3 is predicted to have a more noticeable effect on velocity. The overall predicted velocity change is from 2.8 feet per second to 1.3 feet per second at the downstream face of the structure for the 2-year flow and a change from 4.4 feet per second to 2.0 feet per second for the 100-year flow. Velocities in the new channel compared to the existing culverts at the flood discharges are shown to be slightly reduced and therefore any noticeable streambed modification is not anticipated (Gosling Czubak 2020; 12).

3.2.4 Wetlands

The U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) indicates that two palustrine scrub-shrub, four riverine, and four palustrine emergent wetlands are present in the project area (Figures A6–A11) (USFWS 2015). The EGLE Wetlands Map Viewer depicts the Part 303 final wetlands inventory for the state of Michigan. This dataset includes a combination of NWI data, Michigan Resources Inventory System data, and hydric soils. The EGLE Wetlands Map Viewer supports the NWI indication of wetlands within the project area (Figures A12–14) (EGLE 2022a).

There will be impacts to wetland areas that surround each of the stream crossings during project construction. Some impacts will be permanent to wetland areas during construction, these impacts will be kept as minimal as is practical for project construction. There will also be temporary impact to wetland areas during construction, these impacts will also be kept to the minimal amount practicable. Measures will be implemented to control erosion that could potentially affect other nearby wetlands and waters per the engineering design. Even with design controls, the proposed development will have an impact on wetland resources as the construction work is occurring adjacent to wetlands along the Crystal River. Impacts will be reviewed and permitted under an Individual permit through EGLE. The project will permanently fill portions of the wetlands surrounding each of the crossings due to the placement and orientation of the bridge piers. While impacts will be minimized as much as possible, each of the crossings is surrounded by wetland area and impacts to wetlands are unavoidable. These impacts will be reviewed and permitted under an Individual permit through EGLE. Mitigation may be required for the permanent fill of the wetland areas, EGLE will approve a mitigation bank, as needed. Following construction, wetlands in the surrounding area will benefit from stream flow which will provide a slight increase in water inundation throughout the year (upstream and downstream) of the crossings.

3.3 Air Quality

The Clean Air Act and the 1990 Clean Air Act Amendments allow for the establishment of primary and secondary National Ambient Air Quality Standards (NAAQS) for six criteria pollutants. Areas where the criteria pollutant levels do not exceed the annual average or short-term standards are considered in attainment of the NAAQS. Additional obligations occur for federal actions that are considered within non-attainment areas.

The project area is located within an attainment area for the NAAQS (U.S. Environmental Protection Agency [EPA] 2022a).

There would be short-term impacts to air quality due to short-term airborne dust and heavy equipment emissions during construction activities. The additional dust during construction could be controlled using water sprays and other mitigation actions as deemed necessary. Water spray/dust control is not expected to be needed during construction as most of the work will occur within or adjacent to the Crystal River and road materials will be removed so as not to fall/drop into the river. If any water spray is needed, the contractor will follow decontamination procedures for field equipment, vehicles, and water sourcing per State of Michigan and SLBE guidelines (www.michigan.gov/invasives). Water brought to the project area must be approved by SLBE prior to use. These short-term construction-related emissions would not interfere with Leelanau County's status as an attainment area for the six critical pollutants per the NAAQS. A conformity analysis is not required, as the project is in an attainment area. No long-term effects to air quality are expected.

3.4 Living Resources

The living resources evaluation considers protected wildlife, vegetation, ecosystems, and biological communities. The evaluation included review of publicly available information and coordination with public agencies. This effort includes, but is not limited to, consideration of threatened and endangered species and compliance with Section 7 of the Endangered Species Act.

3.4.1 Threatened and Endangered Species

3.4.1.1 FEDERALLY LISTED SPECIES

The USFWS was consulted via the Information for Planning and Consultation (IPaC) system to determine if federally listed or proposed species may occur in the project area or if designated critical habitat is present (Appendix F) (USFWS 2022a). If suitable habitat or critical habitat is not present in the project area, the IPaC screen fulfills the Section 7 obligation of the Endangered Species Act.

Federally listed species identified include endangered Indiana bat (*Myotis sodalist*), Michigan monkey-flower (*Mimulus michiganensis*), and piping plover (*Charadrius melodus*); threatened northern long-eared bat (*Myotis septentrionalis*), rufa red knot (*Calidris canutus rufa*), pitcher's thistle (*Cirsium pitcheri* and eastern massasauga rattlesnake (*Sistrurus catenatus*); and candidates monarch butterfly (*Danaus plexippus),* tricolor bat (*Perimyotis subflavus*), and wood turtle (*Glyptemys insculpta*).. USFWS also identified birds of conservation concern: bobolink (*Dolichonyx oryzivorus*), Canada warbler (*Cardellina canadensis*), cerulean warbler (*Dendroica cerulea*), common tern (*Sterna hirundo hirundo*), eastern whip-poor-will (*Antrostomus vociferus*), evening grosbeak (*Coccothraustes vespertinus*), golden-winged warbler (*Vermivora chrysoptera*), lesser yellowlegs (*Tringa flavipes*), olive-sided flycatcher (*Contopus cooperi*), wood thrush (*Hylocichla mustelina*), and bald eagle (*Haliaeetus leucocephalus*). These species are protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. In addition, the project area contains designated critical habitat for the piping plover.

The suitable habitat for each listed species has been reviewed to determine if species and/or suitable habitat is present within the project area. A narrative for each listed species is provided below.

Indiana bat, occurs over a range that extends from the east coast to midwestern United States, including Michigan (USFWS 2006). Indiana bats roost and form maternity colonies under loose bark or in hollows and cavities of mature trees in floodplain forests. Indiana bats utilize a variety of habitats to forage on flying insects found along rivers, lakes, open fields and uplands (USFWS 2006). Hibernacula, including

mines and caves, are not known within 1.5 miles of the project area (see Appendix F). Due to the presence of potentially suitable habitat in the project area. Trees will not be removed during the active roosting season, therefore the project is unlikely to impact the Indiana bat.

The **northern long-eared bat** occupies hibernacula during the winter months and uses forested areas for roosting and foraging (USFWS 2020). The northern long-eared bat has a wide-range and can be found in many midwestern states, including Michigan. A small, forested area is present in the project area. Hibernacula, including mines and caves, are not known within 1.5 miles of the project area (see Appendix F). Trees will not be removed during the active roosting season, therefore the project is unlikely to impact the northern long-eared bat.

The **tricolor bat** occupies hibernacula during the winter months and uses forested areas for roosting and foraging during the summer months (USFWS 2022d). Hibernacula, including mines and caves, are not known within 1.5 miles of the project area (see Appendix F). Tricolor bats utilized a variety of habitats for foraging and can be found roosting in dead leaf clusters of live or recently dead deciduous hardwood trees. Suitable habitat is present in the project area, but no trees will be cleared as part of this project. The project is unlikely to impact this species.

The **rufa red knot** is a shorebird that migrates between breeding grounds in the Canadian Arctic and wintering regions in the southeast United States, northwest Gulf of Mexico, northern Brazil, and Tierra del Fuego. The rufa red knot prefers to occupy shoreline and mudflat habitats (USFWS 2022b). No critical habitat or suitable habitat is present in the project area; therefore, the project is unlikely to impact this species.

The **piping plover** is a shorebird that occupies coastal areas or large wetland complexes. The project area is not located along the Lake Michigan shoreline where the piping plover is known to occur (USFWS 2022c). Critical habitat is located in the western portion of the project area but impacts to this specific area are not anticipated. The piping plover may pass through the project area but is unlikely to nest or linger in the area, the project is unlikely to impact this species.

The **eastern massasauga rattlesnake** is a rattlesnake that prefers wetlands with adjacent uplands (USFWS 2019). Several wetlands adjacent to upland areas were identified within the project area. Suitable habitat is present in the project area and the project may impact this species. USFWS guidelines for culvert and bridge projects will be followed to reduce potential impacts to the eastern massasauga rattlesnake during construction.

The **wood turtle** can be found in downed woody debris and utilizes streams for part of their lifecycle (MNFI 2022h). Wood turtles have been found in Port Oneida and could utilize the project area due to the presence of headwater streams. The project may impact this species if it is present in the project area at the time of construction. During construction the USFWS project construction guidance will be followed to reduce disturbance and impacts to this species.

The **monarch butterfly** can occur in a variety of habitats with flowering nectar resources and milkweed plants, their larval host plant (USFWS 2021). The project area is located in the known summer breeding range, and monarchs could pass through the project area, but are not likely to be impacted by the project.

Michigan monkey-flower is the only plant entirely endemic to Michigan. This monkey-flower is found in cold calcareous springs, seeps, and streams through northern white-cedar as well as at the base of bluffs near the Great Lakes shoreline (MNFI 2022a). Suitable habitat is present in the general area, but monkey-flower is not found along the Crystal River in SLBE and the project is not likely to impact this species.

Pitcher's thistle is a federally listed threatened thistle that grows on beaches and grassland dunes along the Great Lakes shoreline (MNFI 2022b). Dunes and other sandy areas are not present in the project area. Considering the lack of suitable habitat within the project area, the project is not likely to impact this species.

3.4.1.2 STATE-LISTED SPECIES

Project review requests for state-listed species are conducted by the MNFI, a program run by Michigan State University. A Rare Species Review was requested from the MNFI on June 1, 2022, to determine whether any state-listed threatened or endangered species, other protected species or habitats, or sensitive ecosystems or biological communities may occur within 1.5 miles of the project area (see Appendix F). MNFI identified state threatened Blanchard's cricket frog (*Acris blanchardi*), wavy rayed lampmussel (*Lampsilis fasciola*), red-shouldered hawk (*Buteo lineatus*), lake herring (*Coregonus artedi*), and pine-drops (*Pterospora andromedea*). MNFI also identified special concern species ellipse (*Venustaconcha ellipsiformis*), flutedshell (*Lasmigona costata*), pickerel frog (*Lithobates palustris*), and creek heelsplitter (*Lasmigona compressa*). These species are not protected under endangered species legislation, but MNFI recommends efforts to minimize any or all impacts to these species.

The **Blanchard's cricket frog** typically inhabits the open edges of permanent ponds, lakes, floodings, bogs, seeps and slow-moving streams and rivers. They prefer open or partially vegetated mud flats, muddy or sandy shorelines, and mats of emergent aquatic vegetation in shallow water. Blanchard's Cricket Frogs also can be found in farm ponds, drainage ditches and gravel ponds, although polluted water is poorly tolerated (MNFI 2022c). Since the crossing sites will impact streams and wetlands, the project may impact this species.

The **wavy rayed lampmussel** is a freshwater mussel that occurs in small-medium sized shallow streams, in and near riffles, with good current. It prefers sand or gravel substrate (MNFI 2022d). Suitable habitat is present in the project area, and MNFI reported an occurrence of wavy rayed lampmussel within 1.5 miles of the project area in 2003. The project may impact this species; however, none were found during the freshwater mussel survey (Appendix G).

The **red-shouldered hawk** will nest in a variety of habitats but seems to be closely associated with mature forests in or adjacent to wet meadows and swamps (MNFI 2022e). Suitable habitat is present in and adjacent to the project area. The MNFI review reported an occurrence within 1.5 miles of the project area in 2015. The red-shouldered hawk could pass through the project area but is unlikely to remain in the area if there is active construction occurring, therefore, the project is unlikely to impact this species.

The **lake herring** are found in deep inland lakes as well as the Great Lakes at depths ranging from 18 to 53 meters. They can be found in shallower depths (9–12 m) when spawning over rocky substrates (MNFI 2022f). Suitable habitat is not located in the project area. The project is unlikely to impact this species.

Pine-drops are a parasitic plant found in dry to moist woods dominated by pines or mixed conifers, usually with a well-developed needle duff. Along Great Lakes shorelines, it is found in boreal forest and on forested back dunes (MNFI 2022g). Suitable habitat is not present in the project area, this project is unlikely to impact this species.

3.4.1.3 FRESHWATER MUSSEL SURVEY

SWCA's mussel biologists conducted an initial freshwater survey at Crossing #3 to determine species diversity and distribution of mussels within this portion of the river, as well as brief reconnaissance surveys at Crossings #1 and #2 to determine if freshwater mussels are likely to be present at these locations as well.

SWCA surveyed Crossing #3 August 9–August 12, 2022. Water temperatures were in the low 70s degrees Fahrenheit, with visibility over 3 meters. Over 2 days, a total of three live mussels were observed in the downstream 100 meters of the survey area. All three individuals were *Eurynia dilatata*. In contrast, a total of 104 live mussels were found over 1 survey day in the upper 50 meters of the survey area. The majority of these were *E. dilatata* (100), but four were *Lampsilis siliquoidea*.

Substrate downstream of the crossing was comprised primarily of gravel, while that of the upstream section of the Survey Area was comprised primarily of fine sand, with fine silt and muck along the river edges.

During the Crossing #1 15-minute reconnaissance survey, eight live *E. dilatata* were observed, as well as a recently dead shell of *Sagittunio* (formerly *Ligumia*) *nasuta*, a state endangered species in Michigan. The 15-minute survey at Crossing #2 produced seven live *E. dilatata* and one *L. siliquoidea*.

Prior to project construction at each crossing location, the mussels will be relocated to avoid adverse effects, therefore, impacts to listed species or species of concern are unlikely. All relocation plans, protocol, and implementation of the plan will be reviewed and approved by the MDNR and the SBD.

The full report of the freshwater mussel survey is located in Appendix G.

3.4.1.4 MDNR COORDINATION

SWCA and the Conservation Resource Alliance coordinated with the Michigan Department of Natural Resources (MDNR) regarding the project and received guidance surrounding spawning seasons for fish species found in the Crystal River. Heather Hettinger, Fisheries Management Biologist, provided guidance on the following species: steelhead trout (*Oncorhynchus mykiss)*, smallmouth bass (*Micropterus dolomieu*), suckers (*Catostomidae* spp.), chinook (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch)*, yellow perch **(***Perca flavescens*), and brown trout (*Salmo trutta*). Ms. Hettinger advised that project construction should take place between June 15th and October 1st in order to avoid disrupting spawning seasons for these species. It should be noted that the local Michigan Department of Natural Resources Fisheries Management Biologist does not have a concern with starting the Tucker Lake Outlet culvert replacement earlier that June 15 as this outlet is not a major spawning location.

3.4.2 Ecosystems and Biological Communities

The MNFI review identified three natural features, a mesic northern forest, a bog, and a wooded dune and swale complex within 1.5 miles of the project area. Although the project centers on a road corridor, the surrounding area is not highly developed.

The Biological Rarity (Biorarity) Index model is based on the MNFI database of known sightings of threatened, endangered, or special concern species and high-quality natural communities. Crossings #1, #2, and #3 are located in an area with a Biorarity Index of 33.25 and Crossing #4 is located in an area with a Biorarity Index of 26.75, both high rankings (Paskus et al. 2007). Impacts to biological and natural communities may occur as a result of construction, these impacts will be kept to a minimum and following construction, the communities will be allowed to return in kind.

3.4.2.1 CRITICAL DUNES

Critical dune areas are present in Leelanau County, Michigan; however, these areas are primarily located along the Lake Michigan shoreline and are not present within the project area. The project will not have an impact on critical dune areas (EGLE 2022b).

3.5 Cultural Resources

SWCA conducted an archaeological reconnaissance survey, including a review of historic, cultural, and religious properties (Appendix H).

3.5.1 Historic and Archaeological Resources

SWCA conducted an archaeological field reconnaissance on June 13 and 14, 2022. The investigation included field survey and/or non-systematic shovel testing within each of the four crossing locations – on either side of CR 675 extending approximately 75 feet to the east and west of each location. Much of the area is heavily wooded and the soil was fairly wet (from the proximity to the Crystal River and the general low-lying elevation of the land in these locations). Furthermore, some of the land between Crossings #1 and #2 is occupied by houses/yards and landowners specifically requested no trespassing in some locations (cultural resources survey still occurred within the CR 675 ROW at these locations, and where possible, shovel tests were excavated). Most of the area adjacent to Crossing #1 consists of paved roadway and/or ROW associated with M-22 and CR 675. The single area that consisted of upland sandy soil was on the east side of the Crystal River at Crossing #3 along the north side of the road. A total of 8 shovel tests were placed in the four crossing locations, most of these are located within the existing Leelanau County Right-of-Way and/or on private land.

A 1-mile buffer from the center point of each crossing was used to define the project study area. According to the Michigan State Historic Preservation Office's (MiSHPO's) files, a total of four previous archaeological surveys have been conducted across the project area and the study area. Of these, one previous archaeological survey has been conducted in the study area and three of these surveys cross between the project area and the study area. The three previous surveys within the project area include one recreational bike path project and two research surveys (Brose 1974). The site file search identified one previously recorded archaeological site that is within 100 feet of the Crossing #4 area. The site is a precontact site that was recommended Eligible for the NRHP. However, the site was recorded in 1974 and, according to the site form on file with MiSHPO, was destroyed during construction of a "canoe livery". This canoe livery is likely what is currently known as the Glen Lake Marina at the southeast corner of CR 675 and South Fisher Road. No evidence of this site was found during field inventory or shovel testing.

A review of MiSHPO's database for architectural resources identified no previously recorded architectural resources within the project area associated with the four Crystal River crossings.

No archaeological or historical material was identified within any of the shovel test pits. Project clearance for cultural resources concerns is recommended. Tribal consultation and input from the tribes has been initiated by the BIA. Formal review of these findings by the BIA, SLBE, NRCS, and MiSHPO for compliance with Section 106 of the National Historic Preservation Act is ongoing.

3.5.1.1 CULTURAL, SACRED, AND TRADITIONAL CULTURAL PROPERTIES

Formal tribal consultation has been initiated by the BIA with the following tribes:

- The Grand Traverse Band of Ottawa and Chippewa
- The Bay Mills Chippewa Indian Community
- The Little River Band of Ottawa Indians
- The Little Traverse Bay Bands of Odawa Indians

- The Sault Ste. Marie Tribe of Chippewa Indians

Based on the results of the cultural resources online file searches at the MiSHPO, discussion with SLBE archaeologist (Dr. Ashley Barnett), and lack of any cultural resources found during the inventory conducted in June 2022, no cultural, sacred, and traditional cultural properties are present within the project area. However, this statement is pending any information provided by the tribes during the consultation process in the event the tribes have knowledge of areas or importance or concern.

Section 4(f) of the 1966 Department of Transportation Act stipulates that land cannot be used from publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites unless there is no feasible and prudent alternative, and the action includes all possible planning to minimize harm to the property resulting from use. The proposed project will not use land from Section 4(f) resources.

3.6 Socioeconomics

Socioeconomic conditions provided are based on the 2020 U.S. Census (U.S. Census Bureau 2020a), the 2020 American Community Survey 5-year estimates (U.S. Census Bureau 2020b), the Glen Arbor Township Master Plan (Glen Arbor Zoning 2019), and the Leelanau County General Plan (Appendix I) (Leelanau County Planning Commission 2019).

3.6.1 Employment and Income

Based on the 2020 American Community Survey, approximately 34% of the Grand Traverse Reservation and Off-Reservation Trust Land population has an income of less than $10,000 and 22% has income between $15,000 and $24,999. The median household income estimate for the Grand Traverse Reservation and Off-Reservation Trust Land population was $43,533, considerably less than the Leelanau County estimate of $67,330. An estimated 49.8% of the population is employed compared to an estimated 54.6% of the Grand Traverse County population (U.S. Census Bureau 2020b).

3.6.2 Demographic Trends

The 2020 population of the Grand Traverse Reservation and Off-Reservation Trust Land was 625 (U.S. Census Bureau 2020a) with a moderate population growth rate based on the proportion of middle-aged and older adults compared to children. The total 2020 population of Leelanau County was 22,301 (U.S. Census Bureau 2020a). The Glen Arbor Township Master Plan shows that while the county experienced moderate population growth since 2000, the township has grown by 10% (see Appendix I) (Glen Arbor Zoning 2019). However, the median age of the township in 2010 has also become increasingly older, from 50 to 61 years between 1990 and 2010 as opposed to 33 and 39 for Michigan state. Since Glen Arbor serves a tourist hub for SBD, the town swells in population size during the summer to accommodate visitors and seasonal workers, while permanent residents stay through the winter.

3.6.3 Lifestyle and Cultural Values

Glen Arbor Township is located along the Sleeping Bear Bay shoreline and between the east and west portions of SBD. The population in Glen Arbor Township has steadily increased from 1990 to 2020. The Glen Arbor Township Master Plan notes that future population growth will be limited by lack of public sewers made infeasible by lack of land to build a treatment plant, high cost to residents, and undesirable affects to the surrounding high quality water bodies. The residents of Glen Arbor Township desire to maintain the natural resources in the area which make the township enjoyable to live in and attract tourists

every summer. The Township Master Plan aims to limit growth by enforcing low density zoning in surrounding areas in cooperation with nearby townships and encouraging the high-density residential and commercial development in downtown Glen Arbor (see Appendix I) (Glen Arbor Zoning 2019). The proposed culvert replacements are consistent with the planned approach to maintain tourists' destinations and maintain natural resources.

3.6.4 Community Infrastructure

Energy in the area is supplied by Realgy Energy Services, Spartan Renewable Energy, Nordic Energy Services, Strategic Energy LLC, Consumers Energy, Freedom Energy, Eligo Energy, and Wolverine Power Cooperative. The proposed project will not need to construct new and relocate existing utility lines. No long-term impacts to community infrastructure are anticipated.

3.6.5 Environmental Justice

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations) mandates that federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations (EPA 2022b). Socioeconomic and demographic data for the project area were analyzed to determine if a disproportionate number of minority or low-income persons have the potential to be adversely affected by the project. The project would occur within the Grand Traverse and Off-Reservation Trust Land, which contains both minority and low-income populations.

The proposed project would not result in disproportionately adverse impacts to the human health or environment of minority or low-income populations in the area.

3.7 Resource Use Patterns

3.7.1 Hunting, Fishing, and Gathering

Hunting, fishing, and gathering in the project area is allowed per SLBE guidelines. The area consists of two streams, surrounding wetlands, and forested uplands. Although project activities may impede hunting, fishing, and gathering during construction, no long-term impacts to these activities are anticipated. Temporary impact to fishing would occur during construction for locals who fish at the road crossings. Construction should occur outside of typical salmon run, due to MDNR's mitigations to limit impacts to fishery. Once construction is completed, no negative impacts to the salmon fishery are anticipated. The removal of the culverts may provide a less restricted upstream run for salmon toward Fisher and Glen Lake. Salmon have been documented in Fisher and upstream Glen Lake.

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3.7.2 Timber Harvesting

Because the project area is partially within SBD, timber harvesting is prohibited in much of the surrounding area. Tribal member permits are an exception. The forested uplands within the project area that may supply timber will not be significantly impacted by project activities, so no impacts to timber harvesting are anticipated.

3.7.3 Agriculture

Based on the NRCS Web Soil Survey, the majority of the project area is considered prime farmland (Figures A16-A18) (NRCS 2022). The project area is not used for agricultural purposes, however; therefore, the project will have no impact on agriculture or farmland soils.

3.7.4 Minerals

The site geology consists of glacial drift and does not have economic value. No known minerals occur in the project area. Therefore, the project will have no impact on mining or mineral resources.

3.7.5 Recreation

Because the project area is partially within SLBE, recreation is a major land use concern of the Glen Arbor Master Plan (Glen Arbor Zoning 2019). The Crystal River is zoned as "Experience Nature" in SLBE General Management Plan (2009), and the corridor along CR 675 in the project area is zoned as "Recreation". Tourists canoe and kayak on Crystal River, bikers and hikers use the roads, and there is a scenic trail within 1 mile of the project area. Although recreation may temporarily be negatively impacted by construction activities, improved culverts are anticipated to enhance access to recreational activities in the surrounding area. Passage under the bridges – in particular at Crossing #3 - for recreational use of the river will improve the experience for boaters. At the 100-year flow event, water level of the river may inhibit passage under the bridges at Crossings #1 and 2 and boaters would need to revert to portage across the road and/or ending the boating experience at these locations. Areas for removal of boats will still be available on the southwest (upstream) side of Crossing #2 for boats to be removed if needed.

3.7.6 Transportation

The project area for Crossings #1, #2, #3, and #4 is accessed by Crystal View Road. During project construction Crystal View Road will be closed for short periods of time in order to conduct work. Road closure plans will be made public prior to the date when transportation along this road will be impacted. Road closure plans are provided in the design plans (Appendix C). Detours along M-22 to the north of the intersection of CR 675 and following south along South Westman Road would be utilized during construction. Additional detours may utilize Northwood Drive to the south of the project area and move traffic north on South Fisher Road. Although project activities may impact transportation during construction, no long-term impacts to transportation are anticipated.

3.7.7 Land Use Planning

The entirety of Crossing #3, and parts of Crossings #2, and #4, are within the SLBE area and are not slated for further development per SLBE General Management Plan (2009). The proposed project is an improvement of existing stream culverts which will increase flow capacities at each location and therefore is consistent with the Glen Arbor Master Plan (Glen Arbor Zoning 2019).

3.8 Other Values

3.8.1 Wilderness

The National Wilderness Preservation System coordinates activity on formally designated wilderness areas, defined in the 1964 Wilderness Act as "area[s] where the earth and community of life are

untrammeled by [humans], where [humans themselves are] visitor[s] who [do] not remain" and "area[s] of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions" with other specific requirements (U.S. Department of Justice 1964). The closest National Wilderness Preservation area is the Sleeping Bear Dunes Wilderness located on the Lake Michigan shoreline in northern Leelanau County (The Wilderness Society 2022). Due to the lack of wilderness areas within or near the project area, no impacts to wilderness resources are anticipated.

3.8.2 Noise and Light

Noise is any undesirable sound that causes disturbance. Noise can be described in terms of three variables: amplitude, frequency, and time. Noise is frequently expressed in units of decibels with the threshold of hearing ranging from 0 to 120 decibels. The project area is surrounded by undeveloped wetlands and forested uplands. Short-term impacts would include construction noise generated by trucks, excavation and erection equipment, generators, etc. No long-term noise impacts are anticipated.

Project construction may cause light disruption to the surrounding area if construction occurs after sundown, but long-term light impacts are not anticipated.

3.8.3 Visual

The project area spans the dune and swale complex of undulating dune ridges. Views of the ridges occur throughout the complex. The Glen Arbor Master Plan (Glen Arbor Zoning 2019) places preservation of scenic views as one of the main goals of development. Although construction may be unsightly, no destruction of trees or topography are anticipated, and no obstructing structures are part of the culvert replacement plan.

The use of appropriately sized timber bridges, steel bridge and box culvert, along with the associated stable embankments are more visually attractive than the undersized, failing culverts and associated eroding embankments. The use of the timber bridge will also provide an aesthetic wood color/format that blends well with the surrounding natural forest habitat along CR 675.

3.8.4 Public Health and Safety

The Glen Arbor Fire and Rescue Department, operates from two stations: the Public Safety Building in Glen Arbor and the fire station in Empire. Park rangers work closely with the Leelanau County Sheriff's Department and provide emergency assistance to county officers when requested. The Marine Safety Unit of the sheriff's office patrols the waterways within Glen Arbor Township and Leelanau County. The proposed project may warrant traffic controls during construction, but no other impacts to public health and safety are anticipated. Recreational kayakers/boaters using the Crystal River at Crossing #3 (and most of the time at Crossing #2) will be able to remain in boats and travel underneath CR 675 once the culverts are removed and replaced with bridges. This change will decrease the potential for traffic/pedestrian accidents as people will not have to portage over the road with their boats (or children).

A fire hydrant water intake location is currently located on the northwestern side of Crossing #1 in a plunge pool. The Leelanau Road Commission will coordinate with the Township to relocate the intake pipe for the fire hydrant during construction and place it higher in the water column after construction.

3.8.5 Climate Change (Greenhouse Gases)

The Council on Environmental Quality issued draft guidance to federal agencies in 2016 on when and how to consider the effects of greenhouse gas (GHG) emissions and climate change in their evaluation of proposed federal actions in accordance with NEPA. It is recommended that the projected GHG emissions be used as a proxy for assessing a proposed action's potential climate change impacts.

Increased GHG emissions would occur during construction of the project compared to the No Action Alternative due to the use of trucks, excavation and erection equipment, generators, etc. Projects with less than 25,000 metric tons of carbon dioxide emissions on an annual basis do not require a GHG emissions quantitative analysis (EPA 2022c). Construction activities for the project would be significantly below this threshold during construction; therefore, impacts related to GHG emissions would be negligible. Construction crews would limit unnecessary idling times for diesel-powered engines and implement dust-control measures, which would reduce emissions. No long-term impacts to GHG are anticipated as a result of construction activities.

3.8.6 Hazardous Materials

Known sources of contamination were evaluated through a review of federal and state online databases. The Michigan Department of Environmental Quality Environmental Mapper (Part 201, Part 211, Part 213), the Toxics Release Inventory, and the Superfund National Priorities List databases were reviewed (EPA 2022d, 2022e; Michigan Department of Environmental Quality 2021). No sites of environmental contamination, underground storage tanks, Toxics Release Inventory sites, or Superfund National Priority List sites were identified within the project area.

The wood beams used for the timber bridges will be treated with copper naphthenate. Copper naphthenate is an EPA registered general use wood and fabric preservative. It is not considered a hazardous waste, it is non-corrosive, non-conductive, nonblooming, and it has low mammalian (e.g. human) toxicity (Alley and Associates 1999).

No known sources of hazardous materials are expected to impact the project area.

3.9 Cumulative and Indirect Effects

Cumulative impacts may result from individually minor but collectively significant actions occurring over a period of time. Cumulative effects analyses should ensure that the full range of consequences of the Proposed Action and alternatives are considered.

The replacement of the culverts along the Crystal River with span bridges (steel and timber) is not expected to result in increased land development or increased traffic. The Glen Arbor Master Plan (Glen Arbor Zoning 2019) aims to maintain the township's small town character while maintaining current roads for local and tourist use. The project will not negatively impact further development, and in fact, upgrading these sections of CR 675 would ensure safe passage to Glen Arbor and to Lake Michigan/the Sleeping Bear Dunes for residents and tourists visiting the area.

The project would add cumulatively to the air pollutant emissions in the region during construction activities. Exhaust emissions from construction vehicles and equipment and particulate matter emissions from surface disturbance would occur. These emissions would be temporary and localized. Construction crews would limit unnecessary idling times for diesel-powered engines and implement dust-control measures, which would reduce emissions. Construction staging areas for equipment and personnel would

be established in a previously disturbed portion of the project area to reduce the impact on soils and living resources.

The living resource impacts for the project area have been reviewed and found to have no significant negative effects to protected species. The intent of the project, using grant funds from the GTB, was to provide a positive impact and improve aquatic organism passage and natural stream functions at the four stream crossings along CR 675.

Indirect effects are related to the decreased need for kayakers or other recreational users of the Crystal River to portage over CR 675. The configuration of these crossings with culverts currently requires most kayakers/canoers to leave the river and portage over CR 675. This is a known safety hazard, and the project would eliminate the need (at Crossing #3) and decrease the need (Crossing #1 and #2) for recreational users to cross the road.

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APPENDIX A

Figures

APPENDIX B

Three Crystal River Crossings and Tucker Lake Outlet Crossing of Leelanau CR 675 – I & Es

APPENDIX C

CR 675 Design and Traffic Detour Plans

APPENDIX D

Photographic Log

APPENDIX E

Crystal River Stream Profiles

APPENDIX F

U.S. Fish and Wildlife Service Information for Planning and Consultation Review and Michigan Natural Features Inventory Review

APPENDIX G

Freshwater Mussel Survey

APPENDIX H

Historical, Cultural, Religious, and Archaeological Consultation Information

APPENDIX I

Grand Traverse County and Glen Arbor Township Master Plans

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