
Project Description

Project Name: Freshwater County Park Seasonal Dam Installation
Applicant: Humboldt County Department of Public Works
Date: December 2022; Revised February 2023 (creek flow discussion)

BACKGROUND/HISTORY

Freshwater County Park has been owned and operated by the County of Humboldt since 1939. Freshwater Creek meanders through the park, and the park's main attraction during the summer is a swimming area created by a seasonal dam, which has been annually installed since the 1920s. The swimming area is created by installing a temporary dam across the creek. The dam facility includes permanent concrete wing walls, sill, and retaining walls, and removable I-beams, flashboards, and gate valve.

Freshwater Creek, which drains into Humboldt Bay via Eureka Slough, provides habitat for fishery resources including Chinook salmon, Coho salmon, and steelhead. Two significant fish habitat restoration projects have occurred in close proximity to the park through cooperative efforts between the California Department of Fish and Wildlife (CDFW) and the County. In 2000, rock weirs were installed along the first 50 feet of Cloney Gulch, which enters Freshwater Creek at the downstream end of the park, to aid fish passage into the tributary. In 2005, a new bottomless arch culvert was installed on Graham Gulch, which is located immediately upstream of the park, to allow unobstructed access for salmon and steelhead.

In 2001, efforts were initiated to create a means for fish to freely move up- or downstream within Freshwater Creek during the approximately three months when the park's seasonal dam is in place. The County worked with local fisheries professionals, State and Federal agencies, Humboldt State University, and local community groups to design, construct, operate, and monitor a temporary dam bypass structure (similar to a fish ladder) which was designed to allow juvenile fish to move upstream and downstream of the seasonal dam. The bypass structure met its objectives but was not intended as a permanent solution. In addition, after several years of operation, design features were identified that would improve performance.

In 2006, the County received grant funding through the California River Parkways Grant Program (using funds from Proposition 50, the California Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002) to implement environmental, recreational, and educational improvements at the park. A Negative Declaration and associated Initial Study for the improvements project were completed in June 2007. The document was adopted by the Humboldt County Board of Supervisors on August 28, 2007. The project began in the Summer of 2009 and was completed in the Fall of the same year.

Components of the improvements project are thoroughly described in the Initial Study – which can be obtained by contacting the Natural Resources Division of Humboldt County Department of Public Works. One of those components is for the construction of a permanent concrete fish ladder embedded in the stream bank and attached to the concrete wing wall of the current flash-board dam

structure. Permits required for the improvements project were separate from permits required for the annual seasonal dam installation. This document provides information for permits related to the annual installation and removal of the seasonal dam only. As part of the regulatory permits for installing the seasonal dam annually, juvenile salmonid presence and movement was conducted in 2010 and 2011. Additionally, flow monitoring within the fish ladder was completed in 2011 and 2019. Both juvenile fish monitoring reports as well as the flow measurement report can be found in Attachment 2.

LOCATION

The project is located in Freshwater County Park. The eight-acre park is located on the west side of Freshwater-Kneeland Road approximately 3.5 miles southeast of Myrtle Avenue (also known as Freshwater Corners or Three Corners). The park is shown on the Arcata South 7.5' USGS quadrangle map (T4N, R1E, Section 3). The dam/fish ladder site is in the southern portion of the park. See Attachment A for maps.

PROPOSED ACTIVITIES

Since the flash-board dam has been installed, the condition of Freshwater Creek immediately upstream of the dam has varied somewhat over those years. Depending on the previous winter and spring conditions, the creek channel location, amount of gravel accumulated, and the formation of gravel bars could differ from year to year. Varying creek conditions upstream of the dam leads to different approaches to the activities and procedures for installation of the dam.

Generally, there have been two main features related to the condition of the creek immediately upstream of the dam. Most years, the creek consists of one main channel that was concentrated toward the west side (left bank). Other years, the creek consists of two channels immediately upstream of the dam. The main channel was on the western bank and a small "side channel" was on the eastern bank. Both channels were separated by a gravel bar island in the middle of the stream channel. Heavy storm events in 2005-06 re-scoured the area upstream of the dam and the single channel along the left bank has been the predominant channel condition since those storms. Currently, some areas of the streambed consist of bedrock and cannot scour down any further. There is also bedrock formations along the left-bank upstream of the dam location. In order for the dual channel condition to occur, significant input of sediment needs to be deposited within this portion of the creek.

The basic activities related to the installation of the flash-board dam remain the same, regardless of the number of channels upstream of the dam. Typically, if there is a dual channel condition, the channel closest to the right-bank (north) is shallow and contains very little flow during the time of dam installation activities (June). If a dual channel condition exists at the time of installation activities, then the wetted channel will be isolated with silt-fencing and a qualified biologist will ensure that no fish are present. Once the shallow channel is confirmed to have no fish present, then the wetted channel will be covered with streambed material such that the crane can access the stream channel and position itself within a non-wetted portion of the channel.

Preliminary Activities:

- Prior to installation activities, a fish-exclusion fence will be placed approximately 50 feet upstream of the dam, or in a more favorable location where the channel is most

confined. This fence will prevent fish from entering the construction area from the upstream portion of the creek.

- Although most juvenile salmonid species have out-migrated by the dam installation date (June), it is possible that some fish will be present throughout the dam installation area. A qualified fish biologist will be assigned onsite during installation to relocate any fish that may be present. Initially, an attempt to relocate fish will be done with several passes of a seine. If relocating fish out of the work area via seining is unsuccessful (due to streambed substrate; shallow water; etc), then a second option will be using small nets and/or electrofishing. Captured fish (via nets/e-fishing) shall be placed in temporary holding buckets containing creek water and aeration. Captured salmonids shall be immediately returned to the creek roughly 800 feet downstream at the confluence with Cloney Gulch. This site provides the deepest pool within the park boundaries.

Site Work:

The following are a list of steps and activities that are conducted during the installation of the seasonal dam at Freshwater Park. In general, the activities and procedures remain the same year after year because the conditions of Freshwater Creek through the Park remain relatively constant. Bedrock is located both up- and downstream of the dam location that prohibits the creek from meandering in this area.

As previously stated, the main channel of the creek flows along the left bank (where the bedrock is located) from the southern portion of the Park, through the swimming pool and flash-board dam area and continuing for approximately 200 feet downstream. The following the General Activities section outlines and summarizes the specific activities related for installing the dam each summer. General Activities occurring in the dry channel and activities occurring in the wetted channel will be indicated below.

General Activities:

- **Step 1:** Grading is performed on the right bank just upstream of the dam to allow heavy equipment (especially the crane) to maneuver down to a location near the dam for installing the flashboards. This process varies each year depending on the amount of gravel that has accumulated. Past operations have showed that approximately 50-100 cubic yards of sediment is removed during the grading process. These grading activities occur within 100 linear feet of the creek channel upstream of the dam location. Some of the removed gravel is used on site by filling in voids/depressions that occur from winter-time scour around the concrete fish ladder. Any gravel relocated is done in areas where it is dry (see Step 5). Any “leftover” gravel will be disposed of at an upland site outside of the park and may be used for park and/or road maintenance. The surface area of temporary impact is approximately 2,000 square feet. This activity occurs in the dry, active channel.
 - If a dual channel condition is present, then gravels will be used to cover the wetted portion of the channel once all fish have been removed (if present) and silt fencing is installed immediately downstream of the proposed grading limits such that turbidity is isolated and controlled. This activity would occur in a shallow, wetted portion of the active channel.
- **Step 2:** Before installing the flashboards, the concrete foundation that houses the flashboards must be cleared of gravel that has accumulated during high winter flows. This

will be done by removing approximately one to two cubic yards of gravel using a hand shovel and wheelbarrow in dry to very shallow water (<3" deep) conditions. This material is reused on site or will be disposed of at an upland site within the park. The surface area of temporary impact is approximately 64 square feet (32 ft long x 2 ft wide). During some years, the concrete foundation is already exposed, and no work is needed to "clear" the foundation.

- **Step 3:** Accumulated sediment is removed from the fish ladder. The amount of sediment varies between 2 to 10 cubic yards, depending on winter flows. The sediment is removed with shovels and disposed of at an upland location outside of the park. This work does not occur in the active and/or wetted channel. Additionally, an access channel is hand dug from the fish ladder exit to the active creek channel near the outlet pipe/gate-valve. This allows the water flowing through the ladder from the pool to enter the downstream portion of the creek, allowing fish to migrate both upstream and downstream of the dam. The roughly 20 foot channel is hand dug with shovels, placing the excavated materials on each side of the channel, forming "berms".
- **Step 4** There is a 36-inch-long, 24-inch-diameter corrugated metal pipe built into the concrete dam foundation. When the dam is not in place, the pipe is covered by a steel cap. A backhoe is used to remove one to three cubic yards of sediment in front of and behind the pipe to clear the area for installation of the gate valve. The gate valve is used to control the flow of water through the dam as well as assist in filling up the pool (See Dam Installation below). The surface area of temporary impacts are approximately 50 square feet (25 sq. ft. each side). This activity occurs in the wetted channel of which the area has been cleared of fish (either "hazed" out of the area using a sein and/or brooms or via electrofishing (CDFW)). (Note: Humboldt County is currently working with CDFW about partnering efforts of the fish relocation efforts when needed. CDFW has been conducting population estimates on Freshwater Creek for decades. CDFW may agree to assist the County in the relocation efforts under their District Bio 4(d) permit (Scientific Collection Permit)).
- **Step 5:** In some instances, approximately 10 to 20 cubic yards of gravel (which was removed and stockpiled from Step 1 above) is placed along the east side foundation/wing-wall adjacent to the dam. This is to add support and cover any scoured areas that may have formed from strong winter flows. During winters with above-average rainfall, the right-bank near the eastern most wing-wall becomes scoured as high creek flows erode previously deposited sediment. If unattended, once the pool area is filled, water could seep through or flow around the wing-wall where the scour areas exist. Placing the gravel along the wing-wall helps stabilize the area and eliminate any water seepage from occurring. The surface area of temporary impact is approximately 100 square feet. This activity occurs in the dry, active channel.
- **Step 6:** Once the dam is installed and prior to filling of the pool, an upwelling unit (plywood box) is installed over the hole (entrance/exit) from the pool to the fish ladder. This 4-ft long vertical box allows juvenile fish to enter/exit the ladder with protection as well as cooler water being drawn up from the pool (deeper water = cooler water) before it flows down the fish ladder. This activity occurs in the dry, active channel.

- **Step 7:** At the end of the season, the gate-valve will be opened slowly to drain the pool (described in more detail below). Once the pool is completely drained, the flashboard panels will be removed via the crane in the same manner they were installed (Step 1). No additional grading will occur. Steel caps are re-installed into the slots within the concrete foundation to prevent the slots from filling in with sediment. Temporary baffles will be removed from the fish ladder and the site will remain inactive until the following season.

SUMMARY OF TEMPORARY IMPACTS TO WATERS OF THE US AND WATERS OF THE STATE

All impacts associated with the installation of the seasonal dam occur within the active channel and below the ordinary high water mark (OHWM). Temporary impacts are consistent with the previous permitted activities (see reference to permits below) with minimal changes in proposed activities and/or associated impacts. The main change to the project scope for the reissuance of regulatory permits is associated with the need for authorization to relocate fish prior to any work in the wetted channel and to establish threshold flows needed in order to install the dam each season. Below is a summary of temporary impacts as a result of grading and excavation activities in order for the flashboard dam to be installed and the filling of the recreational pool. These impacts are described in above under General Activities.

- Grading Activities: 2000 square feet; Up to 100cy of gravels excavated by equipment. Linear feet impact is roughly 100 feet upstream of dam.
- Preparation for flashboards: 64 square feet; 2cy of gravels excavated by hand. Linear feet impacts is 32 ft long/wide (along the concrete foundation).
- Cleaning of the fish ladder: 200 square feet; Up to 10cy of sediment removed. Hand dug access channel is roughly 15-20 feet in length and 3 feet wide. Temporary impacts and amount of material excavated is included in the above totals.
 - It is unknown if the sediment removal activities within the fish ladder are to be considered temporary impacts to waters of the US/State since the fish ladder is a man-made permanent concrete structure. For now, the County will include these amounts as temporary impacts.
- Clearing of the Gate-Valve/Culvert: 50 square feet; Up to 3cy of gravels excavated by backhoe. 5 linear feet of creek channel on each side of gate-valve (10 linear feet total).
- Wing-wall gravel placement: 100 square feet; Up to 20cy of gravels placed (these gravels will be the gravels removed from Step 1 – so no net increase of fill).
 - It is unknown if the placement of gravels that were previous excavated from Step 1 are to be considered temporary impacts to waters of the US/State since these gravels were already removed from the non-wetted portions of the creek. For now, the County will include these amounts as temporary impacts.
- No additional grading, fill, or excavation activities occur during removal of the dam.

Total Square Feet: ~2,400 sq. ft. or 0.055 acre

Total CY Excavation/Fill: 135 cy streambed materials/gravel

Total Linear Feet: 182 linear feet

CREEK FLOW THRESHOLDS FOR DAM INSTALLATION

In order to maintain adequate flows downstream of the dam and park during and post installation, existing creek flows entering the park need to be at a certain “threshold” level. Prior/historical flow data was analyzed to determine baseline flows during the months of June (installation) and

September (removal). Flow data was provided by CDFW staff that was referenced as “Salmon Forever Study and Report” that included flow and turbidity data on Freshwater Creek taken at a monitoring station (FTR; Freshwater-Terry-Roelofs) located roughly 400 yards upstream of Freshwater Park. Flow data that was analyzed was sporadic and variable but included the years between 2002-2011. Additionally, the County recorded pre- (June) and post-dam (September) creek flows during the summer of 2011 during the first year of the newly constructed concrete fish ladder (2010).

The County is proposing on installing the dam if flows in late May or early June are greater than two times that of average low flows during the low-flow period summer months of August and September. The idea is that the amount of flow being released from the dam through the culvert/outflow pipe when the pool is filling up in late June should be within the range of average low flows during the low-flow period. This will ensure that adequate flows are represented downstream of the dam during the short period (2-4 days) it takes to fill the dam and will briefly mimic common low flows that occur annually on Freshwater Creek at the project location. Typically, once the flash-board panels have been installed, the cap that covers the outflow culvert is removed and a gate valve is installed in front of the inflow (upstream) portion of the culvert. Flow through the culvert is controlled by the gate valve. After setting the I-beams and flash-boards in place, the gate valve will be closed between 25%-50% depending on current creek flows in cfs (cubic feet per second; i.e. >6 cfs = 50% closed; ~4-6 cfs = 25% closed) thus allowing at least 50% of continuous flow downstream of the dam. In years where there is above normal flows (i.e. >8 cfs) prior to installing the dam, then the gate valve may be closed up to 75% as long as the downstream threshold flows are reached. Basically, the amount of opening on the gate valve is evaluated each year and is dependent on the amount of estimated creek flow in cfs. The general plan is to estimate creek flows upstream of the dam between May 25th and June 10th using a County-owned “Global Water FP111 Flow Probe”.

Threshold Flow Data

The County analyzed the multi-year (2002-2011) flow data received from CDFW relating to the “Salmon Forever Study and Report”. In general, due to the configuration of the monitoring gage upstream of the Park and how volume of flow is calculated, negative flow readings during the summer months was common. Freshwater Creek is a perennial stream with sections of subsurface flow being uncommon. Therefore, it appears that it is somewhat common for flows to be less < 1cfs during the late summer and early fall low-flow periods. Flow range estimates during the months of May-November were analyzed and are summarized below and in further detail in Attachment 3. Electronic copies of Excel files of all the data received and reviewed are available upon request.

Note: Negative flows are recorded below as 0.5 cfs and should be considered <1 cfs for purposes of this project. Early fall rains (October) occur periodically and subsequently show increased flows during those periods. Conversely, late spring flows in May show increased flows leading into June/early summer months. Summer months showed the most consistent low flow ranges with July – September ranging between <1 cfs to 3.5 cfs with August flows not being greater than 1.5 cfs at any time.

- Average flows ranges in late May: ~ 8.0 – 20.0 cfs
- Average flows ranges in June: ~4.0 – 14.0 cfs
- Average flows ranges in July: ~2.0 – 4.0 cfs

- Average flows ranges in August: ~0.5 – 1.5 cfs
- Average flows ranges in September: ~0.5 – 2.0 cfs
- Average flows ranges in October: ~0.5 – 7.0 cfs
- Average flows ranges in early November: ~2.5 – 20.0 cfs

Based on the limited flow data received and analyzed, it appears that flows of Freshwater Creek reach the lowest flows during the month of August. Using a conservative approach, a threshold minimal flow needed to be flowing downstream during dam installation will be 1.5 cfs. This means that flows need to be at least 3.0 cfs prior to installation such that 50% of flows (at least 1.5 cfs) continue downstream during filling of the pool (roughly 2-4 days). After the dam is filled, whatever the flow is upstream of the dam should be the same amount of flow that is continuing downstream via the overspill section of the dam combined with what is flowing through the fish ladder and back into the creek.

Summary of Threshold Flows and Dam Installation Guidelines

- Estimated flows will be taken upstream of the dam within the Park boundary between May 25th – June 10th.
- If flows are > 3.0 cfs, then the County will move forward with installing the dam no sooner than June 15th of any given year.
- The gate-valve, once installed, will be closed 50% if flows are between 3.0 cfs and 6.0 cfs during the filling of the pool. If flows are > 6.0cfs, then the gate-valve can be closed up to 75% as long as 1.5 cfs or greater is flowing downstream.
- Flow measurements will be taken downstream once the dam is installed and gate-valve is opened 50%. Based on those real-time flow estimates, the gate-valve will be opened/closed to achieve a minimum downstream flow of 1.5 cfs.
- Filling of the pool behind the dam typically takes 2-4 days to completely fill. Once filled, excess water will discharge from the lower flashboard/slot on the dam as well as discharge exiting the fish ladder.
- Additional flow estimate(s) will be taken in August to see if adequate flows are being delivered downstream of the dam. If flows drop below 1.5 cfs, then the County will consult with CDFW and NMFS to see what the recommendations are available. One option is to open the gate-valve slightly to provide additional flow until the minimum flow requirement is achieved. However, opening the gate-valve will slowly drain the pool and thus diminish public enjoyment and recreation. Since past flow data does show that flows have reached levels below 1 cfs, a minimum threshold flow of 1 cfs being released downstream may be an option for those times in late summer when flows fall below the 1.5 cfs threshold.

One important aspect of the water flowing from the pool to the fish ladder is the use of a “upwelling unit”. This is a plywood structure that gets mounted to the side of the concrete wingwall of the dam. It protrudes ~ 4 feet down into the water column thus sending the deeper, cooler water in the pool up and into the fish ladder. The permanent fish bypass structure enables the flow of water through the upwelling unit and into the fish ladder. Excess pool water pours over the notched flashboard into a small plunge pool behind the gate valve.

After the concrete flash-board panels are installed for the dam, and all the work in and around the streambed has been completed, the fish exclusion fencing will be removed.

In the fall, when the dam is to be removed, the procedure is reversed. The valve is initially opened about 10% for 24 hours, and then increased to 25% to allow the pool to drain slowly and to prevent instantly releasing a large volume of water. After 48 hours, the gate valve is opened to 50% and eventually 100% once the pool is mostly drained. When the pool is completely drained, the gate valve, flash-boards and I-beams are removed by the truck mounted crane and then stored within the Park for winter storage. The dam is installed no earlier than June 15th and is completely removed no later than September 30th. The complete installation or removal process of the seasonal dam takes one to three days depending on staff/equipment availability as well as site conditions.

HISTORY OF PERMITS AND ENVIRONMENTAL DOCUMENTATION

Below is a summary of “recently issued” permits and environmental documents associated with the Freshwater Park seasonal dam installation/removal project.

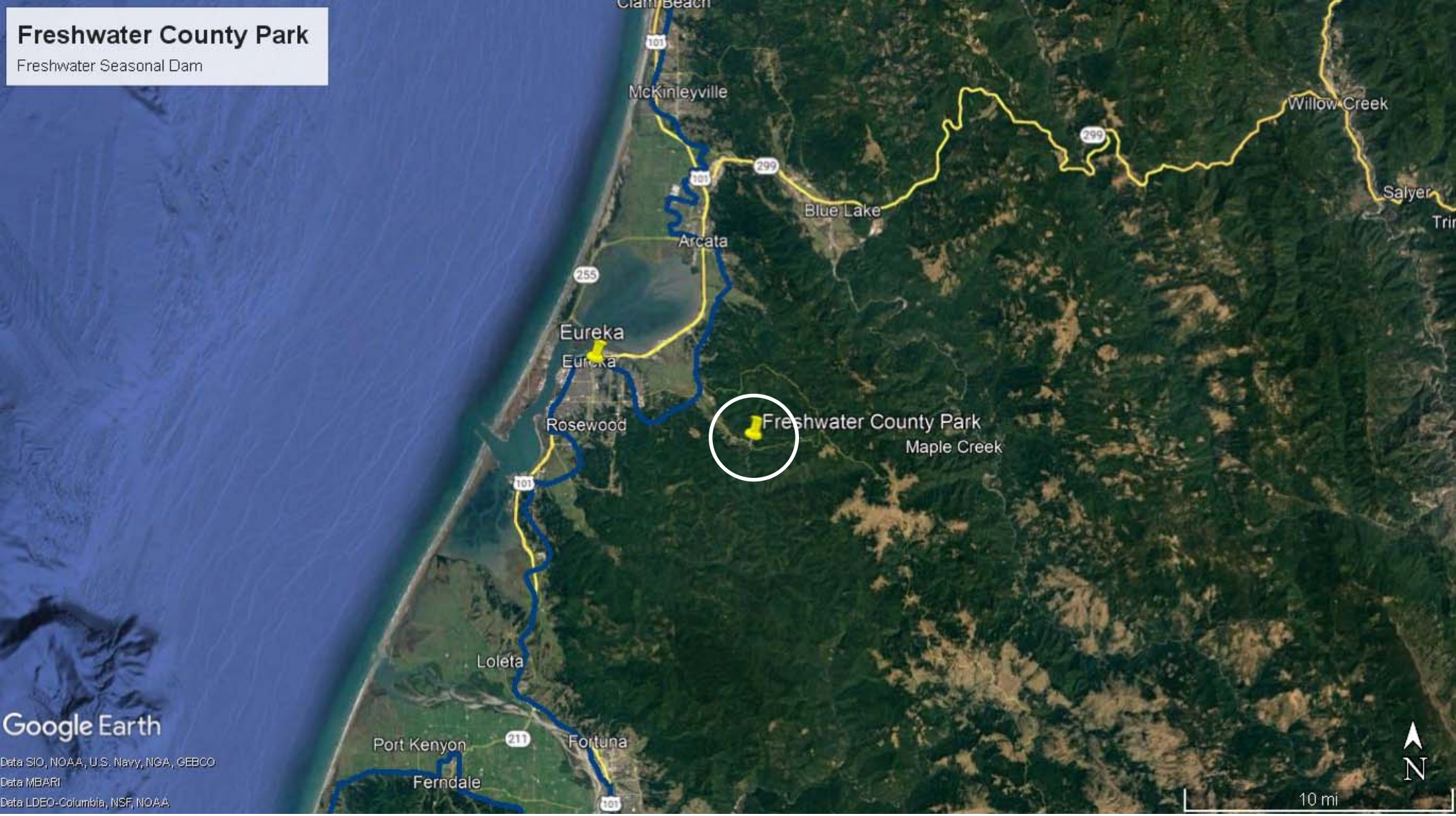
- California Department of Fish and Wildlife:
 - LSAA 1600-2007-0649-R1 was issued on April 7, 2008. A 5 year extension was granted in 2013 extending the LSAA through December 31, 2018.
- U.S. Army Corps of Engineers (Corps):
 - File No. 2007-00751N; 10-year permit
 - NMFS Letter of Concurrence (2008/03909)
- Regional Water Quality Control Board (RWQCB):
 - WDID No. 1B07179WNHU with 5-year extension issued in 2013.

ATTACHMENT 1

Location Maps

Freshwater County Park

Freshwater Seasonal Dam



Google Earth

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Data MBARI
Data LDEO-Columbia, NSF, NOAA



Freshwater County Park

Freshwater Seasonal Dam

Seasonal Dam Location

Juvenile fish ladder

Outline of seasonal pool formed when dam installed

Freshwater Creek

Google Earth

200 ft
N
Freshwater Rd