McKinleyville Wastewater Management Facility Freshwater Mussel Study Work Plan

WDR Order No. R1-2018-0032
NPDES Permit No. CA0024490
WDID No. 1B82084OHUM

Prepared for:

McKinleyville Community Services District
1656 Sutter Road
McKinleyville, CA 95519

Prepared by:

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September 28, 2020

Mr. Justin McSmith
California Regional Water Quality Control Board
North Coast Region
5550 Skylane Blvd., Suite A
Santa Rosa, CA 95403

Subject: McKinleyville Wastewater Management Facility, Freshwater Mussel Study Work Plan; WDR Order No. R1-2018-0032; NPDES Permit No. CA0024490; WDID No. 1B82084OHUM

Dear Mr. McSmith:

Please find enclosed the Freshwater Mussel Study Work Plan for the McKinleyville Wastewater Management Facility. This work plan has been prepared by Moonstone Associates, Inc. on behalf of the McKinleyville Community Services District (MCSD).

In accordance with the current National Pollutant Discharge Elimination System (NPDES) permit requirements, under Waste Discharge Requirements (WDR) Order No. R1-2018-0032, MCSD is required to submit a work plan for conducting a freshwater mussel study to the Regional Water Board by October 1, 2020. The enclosed work plan is being submitted for Regional Water Board review and approval in accordance with the special study requirements outlined in Order No. R1-2018-0032, Special Provision VI.C.2.a.

If you have any questions regarding this submittal, please call me at 707-845-1431.

Sincerely,

Lisa K. Stromme, P.E.
Senior Water Resources Engineer

Enclosure: Freshwater Mussel Study Work Plan
c. w/encl: Patrick Kaspari, MCSD
James Henry, MCSD

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McKinleyville Wastewater Management Facility
Freshwater Mussel Study Work Plan

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September 2020

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Abbreviations and Acronyms

cfs	cubic feet per second
ft	ft
sf	square feet
ADI	Area of direct impact
BIOS	Biogeographic Information and Observation System
CDFW	California Department of Fish and Wildlife
CNDDB	California Natural Diversity Database
DB	Downstream buffer
EFF-#	Effluent monitoring location-number
INF-#	Influent monitoring location-number
LB	Lateral buffer
LND-#	Land application monitoring location-number
MCSD	McKinleyville Community Services District
MZ	Mixing zone
NPDES	National Pollutant Discharge Elimination System
REC-#	Recycled water monitoring location-number
ROWD	Report of Waste Discharge
RSW-#	Receiving water monitoring location-number
RWQCB	California Regional Water Quality Control Board, North Coast Region
SWRCB	State Water Resources Control Board
TSD	Technical Support Document
UB	Upstream buffer
USEPA	United States Environmental Protection Agency
WDR	Waste Discharge Requirements
WWMF	Wastewater Management Facility

1.0 Introduction

Moonstone Associates, Inc., on behalf of the McKinleyville Community Services District (MCSD), has prepared this Freshwater Mussel Study Work Plan for the McKinleyville Wastewater Management Facility (WWMF, facility). A site location map for the facility is presented as Figure 1 and an aerial overview of the lower Mad River, showing the discharge locations for the facility, is presented as Figure 2.

This freshwater mussel study work plan has been prepared in accordance with the special study requirements set forth in Special Provision VI.C.2.a of Waste Discharge Requirements (WDR) Order No. R1-2018-0032; National Pollutant Discharge Elimination System (NPDES) Permit No. CA0024490, for the McKinleyville WWMF (Waste Discharge ID No. 1B82084OHUM). The NPDES permit and WDR order became effective for the designated facility on November 1, 2018.

Under the current NPDES permit requirements, MCSD is required to submit a work plan for conducting a freshwater mussel study to the Regional Water Quality Control Board (RWQCB, Regional Water Board) by October 1, 2020. The permit also requires that the study shall be initiated within 3 years of the permit effective date (by November 1, 2021) and a final report summarizing the results of the study is due for submittal in conjunction with the Report of Waste Discharge (ROWD) for the facility by November 1, 2022.

This work plan is intended to define a framework for complying with the special study requirements in the current NPDES permit and was prepared in accordance with the United States Environmental Protection Agency (USEPA) *Technical Support Document for Conducting and Reviewing Freshwater Mussel Occurrence Surveys for the Development of Site-Specific Water Quality Criteria for Ammonia* (USEPA 2013).

Section 1 of this document provides an introduction to the mussel study work plan.

Section 2 summarizes the wastewater facility discharge points and monitoring locations.

Section 3 presents an overview of the approach to mussel presence/absence determinations.

Section 4 describes the site delineation process and presence/absence definitions.

Section 5 summarizes the results of the mussel survey records review.

Section 6 presents the recommended mussel survey protocol for the project site.

Section 7 outlines the implementation and reporting schedule for the project.

Section 8 provides the references for the work plan.

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FRESHWATER MUSSEL STUDY WORK PLAN
MCKINLEYVILLE WASTEWATER MANAGEMENT FACILITY
MCKINLEYVILLE, CALIFORNIA

Site Location Map
Figure 1

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FRESHWATER MUSSEL STUDY WORK PLAN
MCKINLEYVILLE WASTEWATER MANAGEMENT FACILITY
MCKINLEYVILLE, CA

Discharge Point Location Map
Figure 2

2.0 McKinleyville WWMF Discharge Locations

2.1 Facility Discharge Points

During the discharge season, from October 1 through May 14, wastewater from the WWMF is discharged to the Mad River (Discharge Point 001, Figure 2) when the flow in the river is greater than 200 cubic feet per second (cfs).

When the flow in the river is less than 200 cfs, and during the summer discharge prohibition period, from May 15 through September 30, treated effluent is discharged from the WWMF to the percolation ponds (Discharge Point 002, Figure 2), recycled for dry-weather maintenance of the Hiller storm water wetlands and adjacent forested area (Discharge Point 005, Figure 2), and recycled for irrigation of agricultural lands (Discharge Points 003, 004, and 006, Figure 2).

2.2 Facility Monitoring Locations

The facility monitoring locations are identified as follows:

Monitoring Location	Representative Discharge
INF-001	Influent at the headworks of the treatment facility prior to treatment.
EFF-001	Location for monitoring effluent from the chlorine contact chamber following dechlorination and prior to discharge to the Mad River.
LND-001	Location for monitoring effluent from the chlorine contact chamber prior to discharge to the Mad River percolation ponds.
REC-001	Location for monitoring treated effluent from the chlorine contact chamber prior to water recycling.
RSW-001	Receiving water location in the Mad River at the Highway 101 bridge.
RSW-002	Receiving water location on the north bank of the Mad River as close as possible to Discharge Point 001 under the Hammond Trail bridge.

3.0 Approach to Mussel Presence/Absence Determinations

The EPA technical support document (TSD) recommends the following phased approach to determine if mussels are present or absent when pursuing site-specific criteria for ammonia (EPA 2013):

Phase 1. Delineate the study area and define presence and absence.
Phase 2. Check databases, literature, and reports for mussel survey records.
Phase 3. If no records of mussel presence are available, conduct a mussel survey(s) at the site.
Phase 4. If, after steps 1-3 mussels are still not detected, develop site-specific criteria using the Recalculation Procedure.
Phase 5. Re-evaluate the site-specific criteria as needed.

The following sections provide a description of the application of the phased approach for the determination of mussel presence/absence for Phases 1 through 3. Phase 4, development of site-specific criteria using the Recalculation Procedure, and Phase 5, re-evaluation of the site-specific criteria for ammonia, are additional tasks to be completed by the Regional Water Board based on the outcome of the mussel study and site-specific mussel survey task. Further review and discussion regarding the steps to be taken in Phases 4 and 5 of the study are not addressed in this work plan.

4.0 Site Delineation and Presence/Absence Definitions

The first phase of the approach for the mussel study involves delineating the study area and defining presence and absence for freshwater mussel occurrences at the project site.

4.1 Delineate the Study Area

The minimum study area for the site was delineated by defining the area of direct impact (ADI) at the facility discharge location (Discharge Point 001), and then applying appropriate upstream buffers (UB), downstream buffers (DB) and lateral buffers (LB) around the ADI.

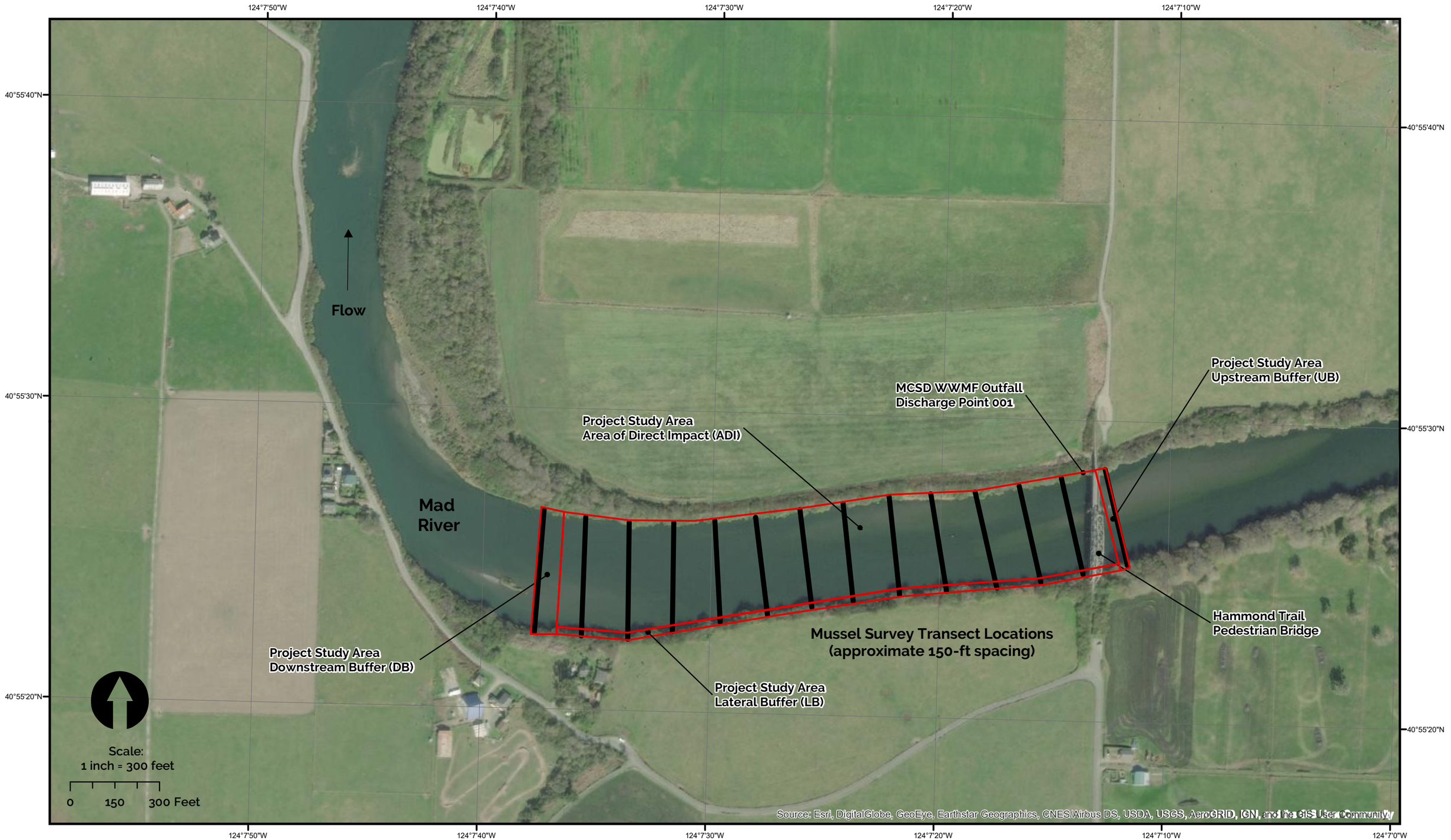
Appropriate study buffers for the project site were selected based on guidance for mussel survey buffer distances for outfall disturbances (Clayton et. al 2015). In the case of disturbances from outfalls, the recommended UB zone is approximately 30 feet (ft) upstream of the outfall discharge point, the recommended DB zone varies from approximately 60 ft to 300 ft beyond the mixing zone (MZ), and there is a 30-foot LB zone recommendation.

The downstream study limit for discharge outfalls typically includes the discharge MZ and the appropriate DB, depending on whether there is established presence of federally-listed mussel species (requires a 300-foot DB) or absence of federally-listed mussel species (limited to a 60-foot DB). For outfalls without a defined MZ, an initial downstream estimate of the MZ can be estimated assuming the MZ extends approximately 5 river widths downstream of the discharge point (Clayton et. al 2015).

Since there is no defined MZ for the WWMF discharge outfall at Discharge Point 001, the downstream length of the MZ was estimated based on river width, as described above. The width of the Mad River at Discharge Point 001 is approximately 350 ft, and an estimated MZ equal to 1,750 ft, and a DB equal to approximately 60 ft, was used to establish the downstream study limit for the project site. The extent of lateral mixing at Discharge Point 001 is also unknown, and the ADI and the applicable LB were set to span the width of the river through the study reach. Figure 3 shows the extent of the study area based on the application of the ADI, UB, DB and LB for the project site. Table 1 provides a summary of the recommended buffer spacing used for the study area delineation process at the project site.

Table 1. Summary of Buffer Spacing for Outfall Disturbances

Buffer Type	Recommended Buffer Distance[1]	Notes
Upstream (UB)	30 ft	---
Downstream (DB)	60 ft	Study area extends approximately 1,750 ft downstream of discharge point to account for estimated MZ prior to application of 60 ft DB, for a total downstream study length of approximately 1,810 ft
Lateral (LB)	30 ft	---
1. Adapted from mussel survey buffer values listed for outfall disturbances in Clayton, et. al 2015.		



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FRESHWATER MUSSEL STUDY WORK PLAN
MCKINLEYVILLE WASTEWATER MANAGEMENT FACILITY
MCKINLEYVILLE, CA
SEPTEMBER 2020

Project Study Area
and Transect Locations
Figure 3

4.2 Define Presence and Absence

The current NPDES permit for the facility notes that adequate information is not available to determine if freshwater mussels are present in the receiving water (RWQCB 2018). The EPA notes that for freshwater mussels, presence can be defined in terms of the existence of live mussels, mussel tracks, recently dead mussels' shells, unweathered shells, suitable habitat, and/or historical presence data. Similarly, the EPA notes that information that could indicate that mussels are absent at a site could include the lack of live mussels, shells, fish hosts, historical presence data, and lack of records in any database and published and unpublished literature as well as the existence of only weathered or sub-fossil shells without evidence of live mussels (EPA 2013). For purposes of this freshwater mussel study work plan, presence and absence of freshwater mussels will be defined for the lower Mad River using the EPA definitions outlined above.

5.0 Mussel Survey Records Review

The second phase of the mussel study approach includes checking databases, literature, and reports for historical and recent mussel survey records. This step provides an initial screening of available mussel occurrence data for the project site. Typical sources of data for mussel presence/absence information include published and unpublished literature, mussel and macroinvertebrate surveys and databases, and data from other experts including environmental consulting firms and agencies (EPA 2013).

5.1 Agency Databases and Reports

5.1.1 State Water Resources Control Board

The State Water Resources Control Board (SWRCB) Division of Water Rights developed a presentation in 2007 that provided an overview on the status of freshwater mussels in California (Kanz 2007). The presentation described four species of freshwater mussels found in the Pacific Northwest and provided a review of their historic distribution in California. Table 2 provides a summary of the California freshwater mussels identified and described in the 2007 SWRCB presentation.

Table 2. Freshwater Mussels of the Pacific Northwest[1]

Common Name	Latin Name	Notes
California Floater	*Anodonta californiensis*	The California floater is identified as a federal species of concern. Most natural populations in California have been extirpated, particularly in southern California and most of the Central Valley.
Oregon Floater	*Anodonta oregoniensis*	The current range of the Oregon floater is not well understood, much less its taxonomic standing.
Western Pearlshell	*Margaritifera falcata*	---
Western Ridged Mussel	*Gonidea angulata*	Western ridged mussels have been extirpated throughout their original range in California, particularly in southern California and the Central Valley.

1. As described in SWRCB 2007 Presentation

The SWRCB presentation also provided a review of current freshwater mussel studies in California including surveys of freshwater mussel habitat in the nearby Eel River and Klamath River watersheds. The presentation did not identify any historical freshwater mussel presence data for the Mad River, or any current studies of known occurrences of freshwater mussels in the Mad River watershed.

5.1.2 California Department of Fish and Wildlife

The California Department of Fish and Wildlife (CDFW) published a paper in 2015 on the decline of native freshwater mussels in California. The paper presented an overview of the current distribution of freshwater mussels in California, including identification of known occurrences of historical and current mussel populations in California rivers (Howard et al. 2015).

The paper evaluated the relative change between historical and contemporary surveys and used a total of 450 historical records that represented 116 unique, locatable sites. The paper included a list of the historical locatable sites by waterbody and the Mad River was not listed in the table for California lakes, rivers, and creeks with known occurrences of freshwater mussels (Howard et. al 2015).

Current biogeographic data collected by CDFW is presented in the Biogeographic Information and Observation System (BIOS) database records accessed online at https://apps.wildlife.ca.gov/bios/. A search of the BIOS database for occupied mussel reaches in California identified no occupied mussel reaches in the Mad River watershed (BIOS 2020).

A search of the BIOS database for California Natural Diversity Database (CNDDB)-tracked elements by quadrangle, for the Arcata North USGS 7.5-minute quadrangle, identified one mollusk, *Margaritifera falcata* (western pearlshell) within the limits of the quadrangle (BIOS 2020). Further review of the BIOS 2015 California Freshwater Species Database provided the reference for the one historical record of occurrence of mollusks in the Mad River watershed. The entry was based on unpublished data presented in a compilation of freshwater mussel surveys prepared by the Nature Conservancy in 2014. The observation type listed for the occurrence was based on species range and was not noted as a current observation record (post 1980) or a historical observation record (pre 1980) for the species (BIOS 2020).

5.2 Local Studies

Two local studies were reviewed relative to information readily available on substrate and species composition in the lower Mad River near the WWMF point of discharge. The first study reviewed was the 2008 geomorphic assessment of the Mad River prepared by Stillwater Sciences for the County of Humboldt (Stillwater 2008). The second study reviewed was the 2010 watershed assessment of the Mad River prepared by Stillwater Sciences for the Redwood Community Action Agency (Stillwater 2010).

The Mad River geomorphic assessment noted that the river mouth for the Mad River has been shifting its position since the 1940's and that the lower section of the Mad River has undergone significant changes over historical time (Stillwater 2008). The Mad River watershed assessment noted that the lower Mad River, from the Highway 101 bridge to the Pacific Ocean, is mostly intertidal in nature. There is a pool and riffle morphology present through the reach at low tide and then the lower river area is backwatered at high tide. It was noted that the intertidal nature of the river precludes salmon from spawning in the lower Mad River reach (Stillwater 2010).

6.0 Freshwater Mussel Survey Work Plan

The third phase of the mussel study approach involves conducting a site-specific mussel survey to support a presence/absence determination for a project site. The information collected and reviewed in support of development of this work plan suggests that MCSD should conduct a mussel survey to provide sufficient justification for a ***mussels-absent decision*** for the lower Mad River receiving water. There are four steps involved in developing a site-specific survey work plan for mussel studies:

Step 1. Define the Study Objective
Step 2. Choose a Sampling Approach
Step 3. Choose a Sampling Design Plan
Step 4. Choose a Sampling Method

The following sections provide a brief overview of the different sampling options and types of mussel surveys that can be conducted for a presence/absence determination and include recommendations for specific survey protocols to be implemented for the site-specific mussel survey for MCSD. The survey protocols discussed in this document were adapted from the mussel survey protocols developed for Michigan (Hanshue et al. 2019), Ohio (Boyer et al. 2016) and West Virginia (Clayton et al. 2015).

6.1 Study Objective

The first step in developing a site-specific mussel survey work plan is to clearly define the objective for the study. The objective of the freshwater mussel study for the McKinleyville WWMF is to determine whether freshwater mussels in the Order *Unionoida* are present or absent in the lower reach of the Mad River, the receiving water for the WWMF. The Regional Water Board will use the results of the site-specific mussel study to inform the determination of ammonia effluent limitations, if necessary, during the next NPDES permit renewal cycle for the facility.

6.2 Sampling Approaches

The second step in developing a site-specific mussel survey work plan is to choose a sampling approach. There are four primary sampling approaches that are used for mussel studies: reconnaissance, qualitative, semi-quantitative, and quantitative approaches.

6.2.1 Reconnaissance Level Approach

A reconnaissance level approach is considered appropriate when there is reasonable probability of mussel absence within a project reach. This approach generally starts at the downstream end of a project study area and all of the waterbody substrates, banks, and gravel bars are visually searched for evidence of shells, shell fragments, or live freshwater mussels as the survey progresses upstream. The survey work must be conducted when water levels at the site are at normal or low flows and water clarity and visibility are good. All habitats are visually inspected with special attention paid to substrates where living mussels may be difficult to see (e.g. sand and gravel interspersed with cobbles). If no mussels are found (shells or live individuals) and habitat is determined to be unsuitable, no other surveys are generally required.

6.2.2 Qualitative Sampling Approach

A qualitative sampling approach using visual and time-search sampling provides more comprehensive information than reconnaissance level surveys. Qualitative timed-search sampling can be used in well-defined areas to demonstrate reasonable probability of mussel presence or absence. Qualitative sampling may involve excavation of sediment in select habitats to aid the visual and tactile search for live mussels and spent shell materials, but generally does not include collection or identification of specific mussel species in the waterbody.

6.2.3 Semi-Quantitative Sampling

Semi-quantitative sampling involves surveying a given area both visually and tactually to determine mussel distribution, species composition, and relative abundance. This approach generally involves qualitative sampling techniques with additional systematic sampling of the substrate surface along transects or within grid cells set at designated intervals.

6.2.4 Quantitative Sampling

Quantitative sampling methods provide more detailed information about a site through systematic excavation of the substrate surface. Quantitative methods are time consuming and labor intensive and generally not used unless the study objective includes defining mussel community metrics. Depending on the extent of the information collected, quantitative surveys can be used to estimate freshwater mussel density, relative species abundance, and/or age or size class distributions within individual mussel populations.

The sampling approach that will be used for the MCSD site-specific mussel survey will be based on an initial visual reconnaissance level survey, followed by a semi-quantitative survey, if the presence of live mussels or fresh dead shells is confirmed in the project study area. Further description of the recommended site-specific survey protocols for the MCSD freshwater mussel survey is included in Section 6.6.

6.3 Sampling Design Plans

The third step in developing a site-specific mussel survey work plan is to layout a sampling design plan. The sampling design plan will identify what project areas will be sampled and where sampling will occur in the waterbody. Sampling layout spacing can be informal, or based on simple random, systematic, doubled, stratified, or complete coverage spacing.

6.3.1 Informal Sampling

Informal sampling is a non-probabilistic method of identifying mussel communities during mussel surveys that can be applied in reconnaissance, qualitative, and semi-quantitative sampling approaches. Informal sampling surveys can be useful as the first step in preliminary mussel surveys to evaluate mussel presence or absence and, if applicable, evaluate general species distribution and composition.

6.3.2 Simple Random, Systematic, Doubled, Stratified, and Complete Coverage Sampling

Simple random sampling design plans are based on the sampling of random sample units placed throughout a project area. This layout is generally considered inefficient at detecting mussels and not generally appropriate for mussel surveys. Systematic sampling design plans are similar to simple random sampling plans except that samples are spatially distributed throughout a project area such that relatively complete coverage of the site is achieved. Double sampling design plans can be developed for both qualitative and quantitative sample approaches. Double sampling design plan are useful in mussel distribution studies to identify the percentage of mussels buried in the substrate compared to those at the substrate surface. Stratified sampling design plans allow the sampling area to be divided into different strata, with different survey methods and sampling techniques applied in each differentiated area. Complete coverage design plans require that the same sampling method be used throughout the entire study area regardless of differentiation in substrate, flow depth, habitat type, etc.

6.4 Sampling Methods

The fourth step in developing the site-specific mussel survey work plan is to select the sampling method. Sampling methods include shoreline, wading, snorkeling, diving, and excavation sampling techniques.

Shoreline searches are generally used in reconnaissance surveys to identify live mussels in the water and mussel shells along the shoreline. Searches while wading can be used in reconnaissance and qualitative sampling approaches to provide a visual assessment of mussels along the bank and in deeper, but wadable sections of the waterbody. This method can also be used to conduct tactile searches of the substrate in the wadable sections of the river. Snorkeling methods can be used in reconnaissance, qualitative, semi-quantitative, and quantitative sampling approaches. Diving methods are similar to snorkeling in utility but can also be used in deeper waters greater than three ft in depth. Excavation is the most effective sampling method for identifying entire mussel communities; however, these methods are also the most invasive and time-consuming sampling techniques that can be applied.

6.5 Other Considerations for Mussel Surveys

Other considerations that need to be taken into account when developing a mussel survey work plan include time of year, visibility requirements, surveyor experience, permits required, and safety considerations.

6.6 Recommended Mussel Survey Protocol

This section of the freshwater mussel study work plan describes the recommended site-specific mussel survey protocol for the MCSD freshwater mussel survey.

6.6.1 Survey Objectives

The specific objectives of the MCSD site-specific freshwater mussel survey are:

1. determine the presence or absence of freshwater mussels within the defined project study area, and
2. if mussels are present, delineate the area of mussel concentration(s) and collect mussels, as appropriate, for species identification.

The defined project study area for the project site extends across the width of the Mad River channel (350 ft), from approximately 30 ft upstream of Discharge Point 001, to approximately 1,800 ft downstream of Discharge Point 001 (Figure 3).

6.6.2 Sampling Approach

Initial Reconnaissance Survey

An initial reconnaissance survey will be used to visually inspect all habitats in the project study area and if fresh dead mussel shells and/or live mussels are observed in the project reach, the reconnaissance level survey will stop and a semi-quantitative mussel survey will be completed.

The initial reconnaissance survey will begin at the downstream end of the project study area, and all river substrates, banks, and gravel bars through the project reach will visually searched for evidence of mussel shells, shell fragments, and live mussels.

All habitat areas will be visually inspected, with special attention paid to heterogeneous substrates where living mussels may be difficult to see (e.g. sand and gravel interspersed with cobbles). The reconnaissance survey will be conducted using shoreline, wading and snorkeling survey methods. Mussel viewing tubes, glass-bottom buckets, and other underwater viewing equipment may be used during the visual reconnaissance survey to aid in viewing the substrates. Live mussels will not be removed from the substrate for identification during the reconnaissance survey.

The project study area will be searched for at least 90 minutes unless evidence of a mussel population is found. If the presence of live mussels or fresh dead shells is confirmed, the reconnaissance level survey will stop and a semi-quantitative survey will be conducted.

If only weathered dead shells or shell fragments are observed, the entire 90-minute reconnaissance survey time will be spent in the project reach and an additional 20 minutes will be added to the survey duration to determine if any fresh dead or live mussels are still present in the project survey area. The additional 20-minute survey time will be spent searching for live mussels in the project survey area that may not be visible above the substrate surface. Representative photos of the project survey area, and any live mussels and/or mussel shell materials observed will be taken.

Semi-Quantitative Survey

If the presence of live mussels or fresh dead shells is confirmed in the project study area during the reconnaissance survey, a semi-quantitative survey of the project study area will be conducted using the sampling design plan outlined in the following section.

6.6.3 Sampling Design Plan

The proposed semi-quantitative sampling design plan uses a systematic sampling layout to sample for live mussel distribution through the project study area. The layout is based on sampling transects placed perpendicular to stream flow for the length of the project study area and spaced no more than 150 ft apart (Figure 3). Each transect will be sub-divided into 30-ft segments and the surveyors will visually search for mussels in an area 3 ft wide along each transect, with findings recorded per transect segment. The minimum search effort for transects shall be 1 minute per 10 square feet (sf) in heterogeneous substrates and 0.5 minutes per 10 sf in areas with observations of live mussels. All data will be recorded separately for each interval along each transect.

If no mussels (live or shells) are observed in two adjacent transects, with at least one of the transects containing suitable mussel habitat, then a timed visual–tactile search will occur between the two transects in the area of suitable habitat. If any live or recent dead mussels are found between the two transects during the search, then an additional transect will be placed there and searched as described above.

The quantitative survey will be conducted with a minimum search effort of 0.5 minutes per 10 square feet per pass in areas with live mussels identified. Additional passes through each transect containing mussels will be conducted until two or fewer mussels, or until less than 5 percent of the number collected on the original pass, are recovered on the final pass. Live mussels will not be removed from the substrate for identification unless the contracted surveyor is qualified to collect samples and has obtained the appropriate permits for sample collection.

Live mussels observed during the survey may be brought to the surface for processing and positive identification, if allowed in accordance with applicable sample collection permits. Mussels will be kept in water at all times, except for the brief period that they need to be out of the water to be measured or photographed, but no longer than five minutes at a time, or as permit conditions dictate. Mussels observed along a transect will be recorded as occurring in a particular segment of the transect. Appropriate information describing the depth and habitat conditions along each transect and in the area of live mussel observations will be recorded for each segment. Additional descriptions along the project reach, such as identified depositional or scour areas, and noted debris or detritus, will be included for further clarification.

6.6.4 Survey Reporting Requirements

No species list will be generated from the reconnaissance level survey, unless the presence of live mussels or fresh dead shells is confirmed. If the surveyor is qualified to collect and identify specimens and has obtained all necessary permits to do so, then mussel samples will be collected during the subsequent semi-quantitative survey for identification.

The survey contractor will use a Mussel Habitat Assessment Form to document the results of the reconnaissance level survey (Attachment A). Representative photos of the river reach, river habitats/substrates, and shells/live mussels will also be included in a project photo log.

Additional information collected during the reconnaissance level survey will include the following:

1. Total length of project survey area.
2. A description of the search methods used at the site.
3. A habitat description including substrate types, average water depths, river reach types (riffle/run/pool), river flows during survey, turbidity reading of river at start and end of survey, and any obvious pollution or reach stability issues.
4. Approximate numbers and location(s) of shells and live mussels (including species list if biologist has identification expertise).

If a semi-quantitative survey is conducted, the survey contractor will use a Benthic Macroinvertebrate Field Data Sheet to record the findings of the survey (Appendix B). The survey contractor will also provide updated field maps with the approximate locations of the survey transects noted along with any survey findings per transect. The survey data recorded by 30-ft segment along each transect will be compiled and reported separately for each project study area (UB, ADI, LB and DB). If freshwater mussels are determined to be present in the project study area, the distribution of mussels will be delineated and mapped for the project area using the survey data obtained during sampling of the transects.

6.6.5 Survey Limitations

The mussel survey work will be scheduled to be conducted during the warm, low-flow months in the Mad River, extending from June through October. The water levels in the Mad River during the survey time-frame will need to be normal or below normal, and water clarity and visibility will need to be good (minimum visibility of approximately 20 inches at depth of survey). If suitable water levels and/or visibility is not present at the intended time of the survey, then the survey will be re-scheduled for more suitable conditions.

7.0 Implementation and Reporting Schedule

Under the current NPDES permit requirements, MCSD is required to initiate the Mussel Study within 3 years of the permit effective date (by November 1, 2021) and a final report summarizing the results of the study is due for submittal in conjunction with the ROWD for the facility by November 1, 2022. Table 3 outlines the estimated schedule for the tasks required for the study including contractor selection and implementation of the site-specific mussel survey for the MCSD facilities.

Table 3. Freshwater Mussel Study Reporting Schedule

Year	Requirement	Reference Date	Comments
2020	**Ammonia Study Workplan** (Special Provision VI.C.2.a) - Literature search - Site-specific survey review	**October 2020** Work Plan Due	Required for submittal by October 1, 2020
2021	**Ammonia Study (Mussel Survey)** (Special Provision VI.C.2.a) - Conduct survey	**January through March 2021** Bid Process and Contractor Selection	Prepare bid package following Regional Board approval of the work plan
		April 2021 Project Initiation with Contractor	Review work plan with contractor, discuss proposed contractor work plan revisions with Regional Board, as necessary
		June through October 2021 Contractor Conducts Site-Specific Mussel Survey	Contractor implementation of the approved work plan
2022	**Ammonia Study Final Report** (Special Provision VI.C.2.a) - Reporting Requirement	**October 2021 through October 2022** Contractor Prepares Report of Finding for Study	Final report is due to Regional Board by November 1, 2022

8.0 References

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APPENDIX A
Freshwater Mussel Habitat Assessment Form

Freshwater Mussel Habitat Assessment Form

Project Information

Project Name: _____

County: _____ City/Town: _____

Latitude (DD.DDDD): _____ Longitude (DD.DDDD): _____

River/Stream: _____ Watershed/Drainage Area: _____

Methods

Name of Surveyor(s): _____

Qualification of Surveyor(s): ☐ USFWS Approved ☐ CDFW Approved ☐ Aquatic Biologist (minimum)

Date of Survey: _____ Distance Surveyed (ft.): _____

Survey Start/End Time: _____ Total Survey Time (min. x people): _____

General notes, including any deviations from the approved habitat assessment methods :

Habitat Description of Survey Area

Drainage Area at Survey Location (mi^2): _____ Water Temp. (^oF): _____ Air Temp. (^oF): _____

Substrate Types (include %):

☐ Boulder _____	☐ Gravel _____	☐ Bedrock _____	☐ Detritus _____	☐ Silt _____
☐Cobble _____	☐ Sand _____	☐ Hardpan _____	☐ Muck _____	☐ Artificial _____

Water Level: ☐ High ☐ Up ☐ Normal ☐ Low ☐Dry/Interstitial

Visibility: ☐ 0-15 cm ☐ 15-30 cm ☐ 30-50 cm ☐ >50 cm ☐ Visible to Bottom

Average Depth (cm): Riffle _____ Run _____ Pool _____

Max Depth (cm): Riffle _____ Run _____ Pool _____

Results

Evidence of Mussels:

Presence of fresh dead mussel shells and/or living mussels will trigger a qualitative mussel survey.

☐ None ☐ Mussel Shell Only - Subfossil ☐ Mussel Shell Only - Weathered Dead ☐ Mussel Shell Only - Fresh Dead ☐ Living Mussels

Site Sketch. Approximate numbers and locations of shells and live mussels. Include species list if possible.

Required Attachments 1) Location Map and 2) Photo Log

APPENDIX B
Benthic Macroinvertebrate Field Data Sheet

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME	LOCATION	
STATION #_____RIVERMILE_____	STREAM CLASS	
LAT _____LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS		LOT NUMBER
FORM COMPLETED BY	DATE _____ TIME____ AM PM	REASON FOR SURVEY

HABITAT TYPES	**Indicate the percentage of each habitat type present** ❑ Cobble_____% ❑ Snags_____% ❑ Vegetated Banks_____% ❑ Sand_____% ❑ Submerged Macrophytes_____% ❑ Other ( )_____%
SAMPLE COLLECTION	**Gear used** ❑ D-frame ❑ kick-net ❑ Other _____ **How were the samples collected?** ❑ wading ❑ from bank ❑ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ❑ Cobble_____ ❑ Snags_____ ❑ Vegetated Banks_____ ❑ Sand_____ ❑ Submerged Macrophytes_____ ❑ Other ( )_____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

Source: Rapid bioassessment protocols for use in streams and wadeable rivers, Second Edition, Form 1 (Barbour et al. 1999)