FREYER & LAURETA, INC.

February 16, 2024 (Rev. 3)

Lynwood Pump Station Replacement

Engineering Assessment

NORTH MARIN WATER DISTRICT

FINAL Technical Report

Appendices

Prepared By

wra Environmental Consultants

CE&G Pragmatic Expertise™

ADVANCED HYDRO ENGINEERING

Beecher Engineering, Inc.

APPENDIX A

Lynwood Pump Station Engineering Assessment

FREYER & LAURETA, INC.
Civil Engineers – Surveyors – Construction Managers

MEMORANDUM

May 8, 2023 (Rev.1)

To: Tim Fuette, P.E.
Senior Engineer
North Marin Water District
999 Rush Creek Place
P.O. Box 146
Novato, CA 94948

From: Camille Bandy, P.E. (Freyer & Laureta, Inc.)
Sean Chou (Freyer & Laureta, Inc.)

Reviewed By: Jeffrey Tarantino, P.E. (Freyer & Laureta, Inc.)

RE: Lynwood Pump Station Engineering Assessment

Introduction

The North Marin Water District's (District) Lynwood Pump Station (Lynwood PS) was built in 1960 in conjunction with the San Marin Pump Station. The Lynwood PS feeds the southern portion of Zone 2 (Figure 1). The Lynwood PS components are beginning to show signs of reduced reliability. Freyer & Laureta, inc. along with Beecher Engineering, Inc. (F&L team) conducted a site visit with the District staff to document the existing conditions of Lynwood PS.

Existing Conditions

Site Visit to Review Physical Site Conditions

The existing physical site conditions were assessed during a site visit on October 27, 2022. District staff provided access to Lynwood PS. The F&L team observed the site location, took photographs of the existing conditions, and compared the record drawings to the site existing conditions. The F&L team also observed potential alternative locations with District staff.

The information from the site visit is summarized in a Field Assessment Report. A copy of the Field Assessment Report is provided in Attachment A.

Physical Conditions and General Findings

The pump station components were overall in poor condition and the F&L team observed multiple deficiencies with the existing site. The main deficiencies were found in four main categories and are summarized in Table A-1:

- Access,
- Location and Environment,
- Mechanical Components, and
- Electrical

Access

The Lynwood Pump Station was built all below grade, creating limited access to all pumps, motors, valves, and electrical components. With equipment only accessible below grade, it is difficult for the District to perform critical equipment maintenance and, if necessary, replacement of failed components. Within the below grade structure, isolation valves on the influent side of the pumps are located below the pump station structural concrete floor and are only accessible through three meter boxes. The meter boxes are small and only allow minimal access to the valve operating nut, to open and close the valve. One of the three valves has broken, and District staff was required to sawcut the floor to remove and replace the broken valve.

The current vertical clear space within the below grade pump station structure is severely limited. The current room height is only six and a half feet, creating limited space for people and equipment. In addition, there are several overhead obstructions that limit clear head space in select locations. The existing room height also does not meet the current California Building Code requirement of eight-feet minimum height. To meet current code requirements, significant modification to the structure, likely by raising the height of the structure by removing and replacing the existing roof, would be required.

Location and Environment

The existing location of Lynwood Pump Station, shown in Figure A-1, is located adjacent to South Novato Boulevard and Sunset Parkway. South Novato Boulevard is a minor arterial street with moderate traffic. Sunset Parkway is a local street and is one of the main access points for Lynwood Elementary School. The location of the existing pump station is within an existing traffic island on Sunset Parkway to the east of the South Novato Boulevard intersection. The constrained location can impact maintenance activities due to traffic from the minor arterial street and school access. Since the pump station is within the traffic island, there is limited on-site parking and limited maintenance vehicle access. The existing pump station site does not provide an opportunity to improve parking or staging accessibility even with removal and replacement of the existing pump station facility in place. In addition, there are multiple existing utilties within the traffic island such as stormwater mains, water mains, gas main, and significant Pacific Gas & Electric (PG&E) infrastructure on poles within the easterly end of the traffic island where the pump station is located.

Groundwater and stormwater are also a concern for the existing pump station location. The District staff noted that during storms, stormwater regularly collects in the existing pump room. District staff has observed approximately three inches of stormwater that collects on the pump station floor within two hours of most storm events. Groundwater was present in the open sawcut portion of the floor. District staff mentioned that the groundwater level never recedes.

Finally, the existing pump station site is not within the mapped Federal Emergency Management Agency (FEMA) 100-year floodplain but it is immediately adjacent to the floodplain. Although the existing pump station is not in the 100-year floodplain, due to the proximity to the floodplain and being below grade, flooding is a concern.

Mechanical Components

Generally, the existing mechanical components are ductile iron with epoxy coating and were observed to be in fair condition. However, several potential areas of corrosion were observed. The piping and valves that were accessible did have limited access for maintenance and repair. Key components of the automatic valves are wall mounted and, although accessible, do require an operator to work in a space between two pumps or a pump and the wall.

The existing Lynwood Pump Station does not include provisions for potential differential displacement resulting from a seismic event. The ductile iron pipes directly penetrate the concrete walls without any form of flexible fittings and appear to have no seismic protection. The lack of seismic fittings increases the vulnerability of the components to be damaged during a significant seismic event. The corrosion observed further increases the risk for failure during a seismic event.

There are three existing pumps in the pump station. At least two of the three pump shafts appear to be out of alignment based on District staff's observation of vibration. Consistent leaking was observed from one of the pumps. Finally, the pump motors are difficult to access for maintenance and repairs.

Electrical

The electrical equipment appears to be approximately 40 years of age or older, is obsolete and well beyond its useful service life. The main service switchboard was manufactured by Autocon which is a company that is no longer in business. The motor control center line-up was manufactured by Sierra Switchboard Company, a company that is no longer in business. Any repairs to this equipment will involve a customized field retrofit that will allow modern components to be installed within the obsolete equipment enclosures. There is evidence that the District has been faced with this in the past based on what appears to be the presence of aftermarket components installed within the existing equipment. Additional information about the existing electrical and control system assessment can be found in Attachment B.

There were multiple electrical components of the pump station that appear to be out of compliance with current code. The electrical equipment is obsolete and no longer manufactured. Nonstandard exposed conduits and pathing for electrical components were observed. Additionally, the conduits routed below the finished floor of the pump station are in a vault used for operation of a valve which is currently not up to code per National Electric Code (NEC). Due to the age of the pump controls, the reduced-voltage starter for one pump appears to be failed and bypassed. In additional to the pump station electrical components, the PG&E service no longer meets the current coding requirements, PG&E Electric and Gas Service Requirements (TD-7001M) 2022-2023[1].

The majority of the station's power and control system equipment including the utility service-entrance switchboard, motor control center line-up and PLC-based control system are all installed below-grade within the pump room. Because the existing pump room is below street level and below flood levels, there is an elevated risk that the existing power and control system equipment could be submerged and may be damaged should even a small amount of stormwater (or groundwater infiltration) intrude into the pump room. The below ground access to electrical equipment is also limited and will require removal and disassembly of pumps.

[1] https://www.pge.com/pge_global/common/pdfs/services/building-and-renovation/greenbook-manual-online/greenbook_manual_full.pdf

During Public Safety Power Shutoff (PSPS) at this station is priority as it has the capacity to run the whole zone 2 area. Currently, the emergency power is provided by a portable generator that is not permanently onsite. The current diesel generator runs for approximately 13 hours without a refill and the District notes that it is sufficient to operate for one operational day.

Recommendations

The existing Lynwood Pump Station is in poor condition with multiple upgrades required to ensure that the pump station is up to date with the latest electrical code and seismically upgraded. A summary of electrical equipment replacement feasibility can be found in Attachment B. Since the pump station is currently below grade, it limits the District's ability to perform any necessary repairs and upgrades. Per discussion with the District, it is beneficial for the Lynwood Pump Station to be reconstructed above grade. F&L will work with the District to identify potential locations for the new Lynwood Pump Station and evaluate if additional capacity is needed.

Figures and Tables

- Figure A-1: Lynwood Pump Station Zone 2
- Table A-1: Lynwood Pump Station Deficiencies Matrix

Attachments

- Attachment A: Field Assessment Report
- Attachment B: Electrical Equipment Replacement Feasibility

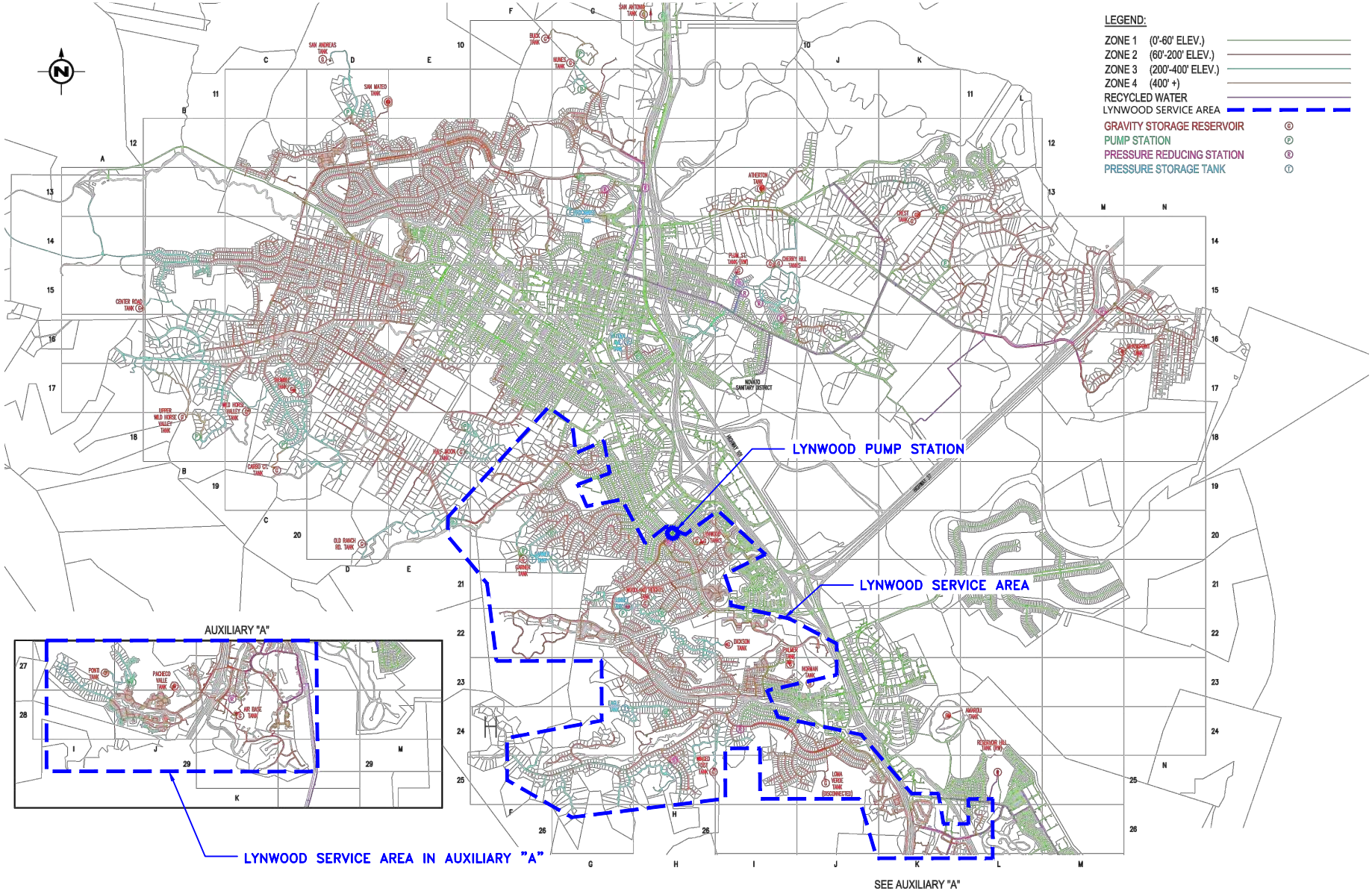

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FIGURE A-1
LYNWOOD PUMP STATION ZONE 2 SEVICE AREA
NORTH MARIN WATER DISTRICT
NOVATO, CA, 94945

Table A-1
Lynwood Pump Station Deficiencies Matrix
Lynwood Pump Station Capacity Assessment
North Marin Water District, Novato, California

Deficiency Category	Description	Operational Risk	Operational Impacts
Access	Limited space on site.	No room to upgrade/upsize if needed.	Trucks and larger equipment potentially need traffic control to access the site.
	Pumps are only accessible from inside the building.	Replacement and maintenance is a hassle as space and movement is limited.	Increased down time while pumps are replaced.
	Limited space within pump house. - (2022 California Building Code, Title 24, Part 2 Chapter 1208.2)	Personal injury and subpar repair and maintenance.	Hard for staff to move and work around the equipment withing the pump house. This can lead to subpar repair and additional repair costs.
	Most equipment including the pumps is below grade. (Novato, California - Code of Ordinances Chapter 5 Development Standards 5-31- Flood Damage Prevention Requirements)	Can not easily and quickly replace equipment within the station.	Increased down time while access to pumps is restricted.
Location/Environment	Within the island median.	Potential hazard to work crews.	On street parking is available with very limited space on site. Moving even smaller hand held equipment becomes tedious.
	Below grade facilities. (Novato, California - Code of Ordinances Chapter 5 Development Standards 5-31- Flood Damage Prevention Requirements)	Personal injury. Property damage. Hard to access.	Repairs or maintained requires significant planning and time to fix. Delay/ Failure of the station to supply water to customers.
	Ground water elevation is almost at existing bottom floor elevation. (Novato, California - Code of Ordinances Chapter 5 Development Standards 5-31- Flood Damage Prevention Requirements)	Potential electrical hazard due to proximity to MCC.	Loss of life and no access to pump station until water can be removed creating delay/failure to supply water to customers.
	Multiple existing utilities adjacent to pump station facility including two 36-inch storm drain pipes, one 4-inch PG&E gas main, existing PG&E transformer and two 24-inch water mains.	No room to upsize if needed. Potential maintenance issues if pipe needing repair is under/adjacent to multiple existing utilities.	Repairs or maintained requires significant planning and time to fix. Delay/ Failure of the station to supply water to customers.
	Currently no back up generator on site.	Increased time while staff move portable generator into position.	Delay/Failure of the station to supply water to customers.
Mechanical Components	Corrosion of piping.	Weakened pipes may break/bust and may cause maintenance issues/repairs.	Delay/Failure of the station to supply water to customers.
	Pipe penetrations are exact and lack seismic stabilization. (Seismic Design and Retrofit of Piping Systems dated July 2002).	Potential for failure in piping during a seismic event.	Delay/Failure of the station to supply water to customers.
Electrical	Elevation of electrical equipment is below flood levels. (NEC Article 682: Natural and Artificially Made Bodies of Water)	Potential personal and material damage. Electrocution hazard.	Delay in service due to restricted access and ability to repair facilities.
	Obsolete electrical equipment. That is no longer manufactured.	Difficulties replacing and maintaining the older equipment in an emergency.	Delay in service due to staff not being able to repair pumps. Any retrofitting or major component repair for this equipment will need to be field-customized by a third-party integration firm.
	Below ground access to electrical equipment is limited. Requires removal/disassembly of pumps.	Equipment can not be replaced without significant timing and planning.	Delay/Downtime while trying to replace equipment or even repair existing equipment.
	Nonstandard exposed conduits and pathing for electrical components. Additionally are routed below the finished floor of the pumpstation in a vault used for operation of a valve. Not up to code per NEC (Article 352: Rigid Polyvinyl Chloride Conduit: Type PVC).	Potential for damage to occur while repairing or maintaining other aspects of the station. Electrical Hazard due to suspected ground water elevation.	Delay/Downtime while trying to replace equipment or even repair existing equipment.
	Age of the pump controls. The reduced-voltage starter for pump “P1” appears to be failed and bypassed.	Only two of the three pumps are capable of being run off a backup generator.	Failure to deliver service in a PSPS event should only one pump fail. No backups.
	PG&E service no longer meeting current coding requirements. (PG&E Electric and Gas Service Requirements (TD-7001M) 2022-2023 (aka “Greenbook”))	Replacing equipment and connection to PG&E service would require new facilities/location above the rest of the pump station (outside) and then linked back to the pumpstation.	Repairs or maintained requires significant planning and time to fix. Delay/ Failure of the station to supply water to customers.

ATTACHMENT A

Field Assessment Report

Field Assessment Report

Project Name: Lynwood Pump Station **Location:** Novato CA

Date 10/27/22, 1PM

Day	S	M	T	W	TH	F	Sat	

Weather Sunny

Observer Name: Sean Chou, Ioana Taropa, Camille Bandy, Jeffrey Tarantino, Todd Beecher

Number of Tanks: N/A

Tank Address: N/A

Pump Station Address: Intersection of Sunset Parkway and South Novato Boulevard

Suction Pressure: N/A

Site Size Constraints:	**Yes**
Parking Availability:	**Yes**
SCADA Data Available:	**Yes**
Have there been recent repairs:	**Yes**
	Pump Station
Number of Pumps:	**3**
Bypass Available:	**Yes**
Conforms to Record Drawings:	**No**
Noise Level	**Low**
Easement type:	**ROW**
Grounds Condition	**Fair**

Site Size Constraints:

- Pump station is below ground in enclosed room.
- Height clearance within the pump station is 6.5 feet. Height of the pump station makes the location very hard to access.
- Access to the pumps is through three meter boxes. When repairs are needed, District staff must saw cut the floors to gain access.

Parking Availability:

- Pump station is in the middle of the traffic island and provides minimal onsite space for maintenance and access (see picture 1).
- Existing structure and other infrastructure does not provide opportunity to improve parking/staging accessibility.
- Existing Pump station is a block away from the Lynwood Elementary School. The drop off area for the school is located on Lynwood drive right off of Sunset Parkway where the pump station is located.

Changes in record drawings:

- Sump pump is located in the west corner and not in the stated north corner of the room.
- Floor drains are cut and drain to a sawcut portion of floor in front of Pump 2 (see picture 2).

Recent repairs:

- District started a repair to Pump 2, but the District staff is unsure if work had been completed. Floor adjacent to Pump 2 was sawcut to access the influent piping and pump and sawcut location remains open and covered by plywood (see picture 2).

Other Notable Observations:

- Pump station appears to have no seismic protection for piping (see picture 3).
- Current emergency power is provided by a portable generator. District staff mentioned that during the Public Safety Power Shutoff (PSPS) at this station is priority as it has the capacity to run the whole zone 2 area. Current generator is a diesel and runs for about 13 hours without a refill. District staff says that the emergency generator is sufficient to operate for one operational day.
- There was a leak in the piping on Pump 2, water dripped on the floor the whole time we were present in the facility (picture 4).
- Groundwater was present in the open sawcut portion of the floor. District staff mention that the water level never goes down from that elevation. The sump pump drains and other cut pipes appear to drain to the sawcut location (see picture 2).
- When it rains the pump station tends to flood. District staff has observed approximately 3 inches of water on the floor within 2 hours during most storm events.
- Multiple points of corrosion were observed on piping (see picture 3).
- MCC is placed at motor level and is below ground level, potential hazard as the previously stated flooding could create electrocution issues (see picture 5).

Future Items and Potential Locations

- District staff would like pumps to be equipped with Cal-Val pneumatic valves.
- Observed three potential sites for replacement. One at the mid-road island at Cambridge St. and Sunset Parkway (Location 1). One at the mid-road island at the end of Sunset Parkway (Location 2). One at the Scottsdale Pond (Location 3).
- Mid-road island at Cambridge St. and Sunset Parkway was 33 feet wide and 80 feet from last tree to first tree. The Island had existing landscaping and irrigation. Utility vault and blow off at the southeast side of the island.
- Mid-road island at the end of Sunset Parkway was 34 feet wide and 96 feet long from radius to radius. PG&E pole across the street was the only local power that serves one streetlight. Irrigation and backflow preventor on the island. There is a large access gate from Sunset Parkway to property at 1005 Greenwood Drive. No curb cut with this gate.
- Scottsdale Pond is a two-sided pond/retention area. One that is permanently wet (northwest side) and one that was dry at the time of the inspection (southeast side). They are separated by an earthen levy with a pathway on top. PG&E transformer was identified within proximity. A cut curb exists on Redwood Blvd next to the pond.

Pictures:

Picture 1: Looking Southwest from Lynwood Drive at the back of the pump station.

Picture 2: Sawcut floor from previously unfinished pump repairs. Ground water present. Electrical conduit and additional piping observed in proximity to ground water.

Picture 3: Picture taken within existing pump station. Picture features corrosion on effluent side. Also shown is the pneumatic valve and lack of seismic protection with wall penetration.

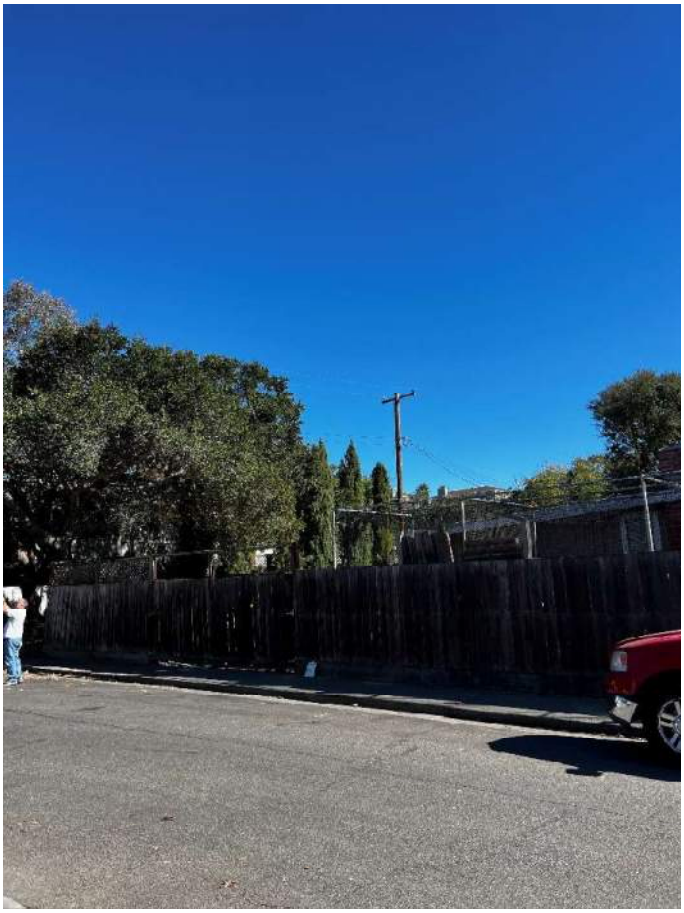
Picture 4:
Picture taken within existing pump station. Corrosion and leaking of pipes shown are on the pump 2 piping.

Picture 5: Pump station motor control center.

Picture 6: Looking Northeast from Cambridge Street and Sunset Parkway at potential pump station location Mid-road island at Cambridge St. and Sunset Parkway.

Picture 7: Looking Northeast from Greenwood Drive and Sunset Parkway at potential pump station location Mid-road island at the end of Sunset Parkway.

Picture 8: Looking southeast at the large access gate from Sunset Parkway to property at 1005 Greenwood Drive.



Picture 9: Looking northwest at potential pump station location Scottsdale Pond.

Attachments:

1. Location Map.pdf
2. Pages from Lynwood PS AsBuilts.pdf


Location Map
Scottsdale Pond
Scottsdale Pond
Location 3
Location 2
Existing Lynwood Pump Station Location
Location 1
Rowland Blvd
Redwood Blvd
Leafwood Dr
Novato 325 Rowland
O'Reilly Auto Parts
Marin Pool Renovators
Buchanan St
Joyce St
Donna St
Adele
Cambridge St
Wild Flowers Residential Care
LYHT - Coaching with Maya
Marin Christian Academy
Buchanan St
Rowland Blvd
Lynwood Elementary School
Sunset Pkwy
Greenwood Dr
Leafwood Heights
Margarita Terrace
Redwood Blvd
Redwood Hwy
Vintage Way
Park Crest Ct
Monte Maria Ave
S Novato Blvd
Hillswood Dr
Drakewood Ln
Cambridge St
Fetch! Pet Care of Marin
Jonathan Bassil Pair
Hydro Tech Pools Inc
Monte Maria Ave
Kimberly Blanck Nursing Conslt
Denlynn St
Kaden Ct
Kaden Dr
Baita Dr
Eldridge Ave
Morrison Lighting
Lynwood Dr
Cambridge Heights
Ross Dress for Less
Vintage Oaks Shopping Center
Target
In-N-Out Burger
Marshalls
SEPHORA
Nordstrom Rack
Costco Wholesale
Tamalpais Pediatrics
Western Oaks HOA Clubhouse
Daniel Spain Bodywork and Personal...
KingSings PR
Birchwood Dr
Cricklewood Dr
101
Google
Imagery ©2022 Maxar Technologies, U.S. Geological Survey, USDA/FPAC/GEO, Map data ©2022
United States
Terms
Privacy
Send feedback
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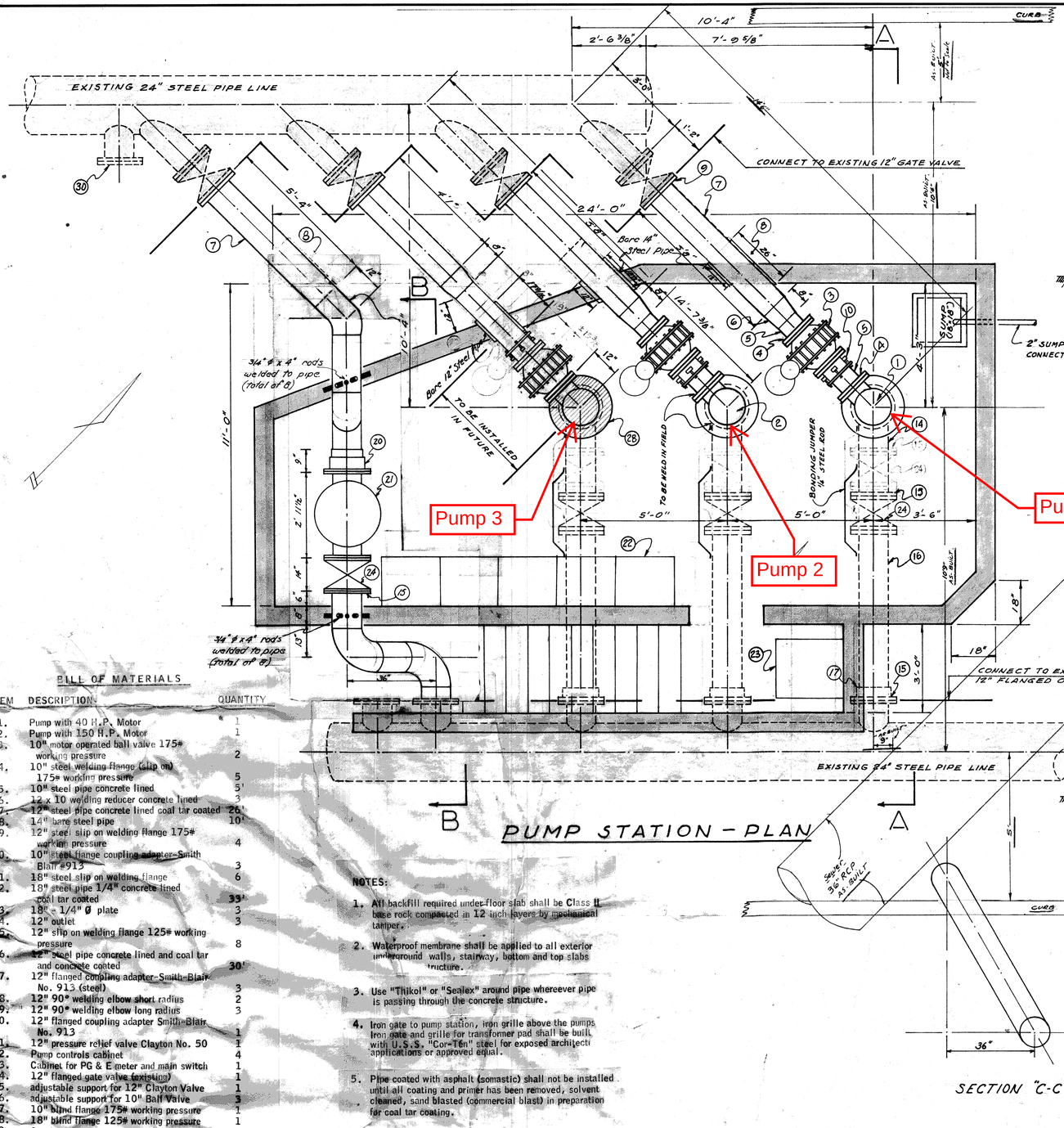

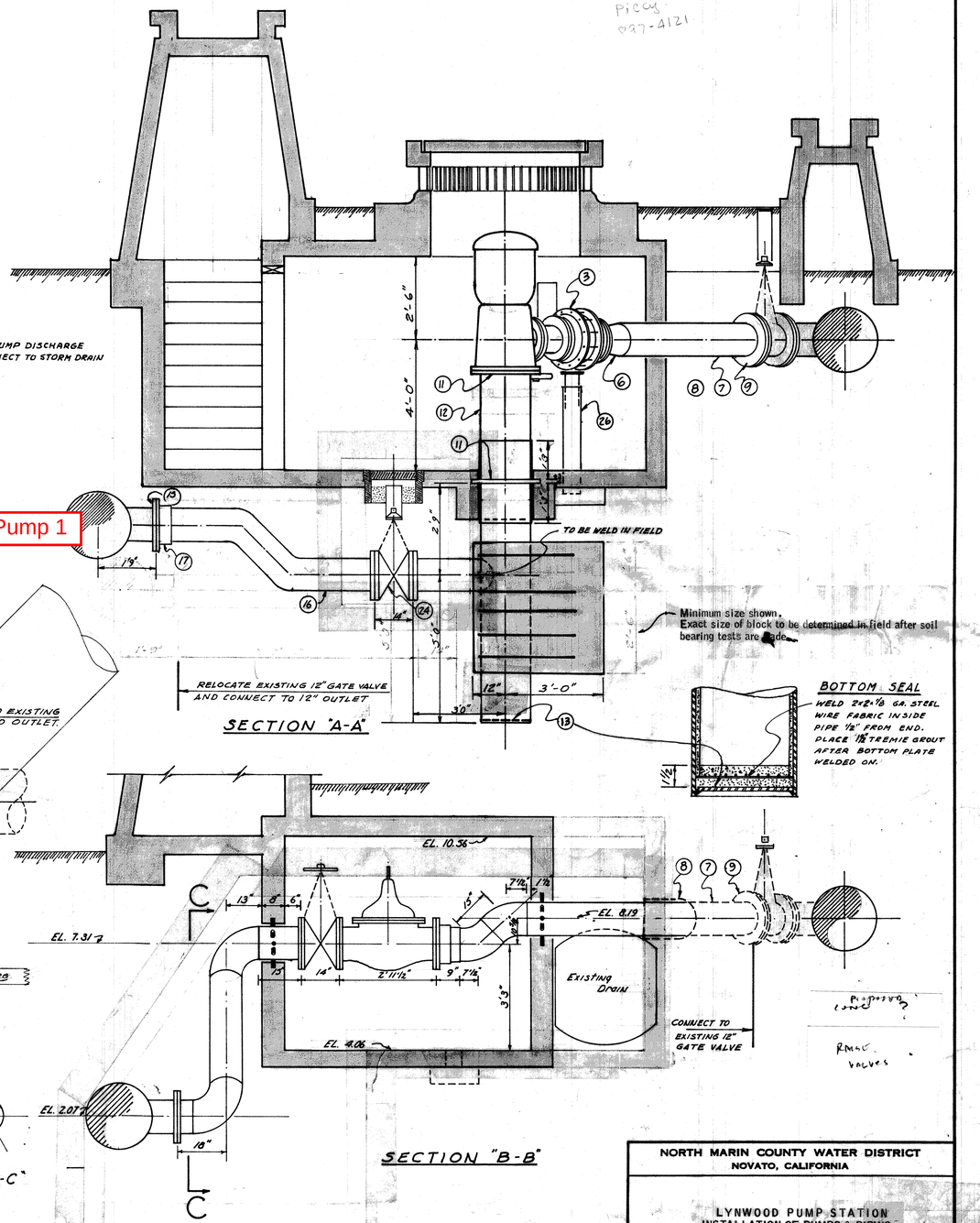

BILL OF MATERIALS

ITEM	DESCRIPTION	QUANTITY
1.	Pump with 40 H.P. Motor	1
2.	Pump with 150 H.P. Motor	1
3.	10" motor operated ball valve 175# working pressure	2
4.	10" steel welding flange (slip on) 175# working pressure	5
5.	10" steel pipe concrete lined	5'
6.	12 x 10 welding reducer concrete lined	3
7.	12" steel pipe concrete lined coal tar coated	26'
8.	14" bare steel pipe	10'
9.	12" steel slip on welding flange 175# working pressure	4
10.	10" steel flange coupling adapter-Smith Blair #913	3
11.	18" steel slip on welding flange	6
12.	18" steel pipe 1/4" concrete lined coal tar coated	33'
13.	18" - 1/4" ø plate	3
14.	12" outlet	3
15.	12" slip on welding flange 125# working pressure	8
16.	12" steel pipe concrete lined and coal tar and concrete coated	30'
17.	12" flanged coupling adapter-Smith-Blair No. 913 (steel)	3
18.	12" 90° welding elbow short radius	2
19.	12" 90° welding elbow long radius	3
20.	12" flanged coupling adapter Smith-Blair No. 913	1
21.	12" pressure relief valve Clayton No. 50	1
22.	Pump controls cabinet	4
23.	Cabinet for PG & E meter and main switch	1
24.	12" flanged gate valve (existing)	1
25.	adjustable support for 12" Clayton Valve	1
26.	adjustable support for 10" Ball Valve	3
27.	10" blind flange 175# working pressure	1
28.	18" blind flange 125# working pressure	1
29.	Sump pump	1
30.	12" blind flange 175# working pressure	2
31.	circulation pump for fountain	1

NOTES:

1. All backfill required under floor slab shall be Class II base rock compacted in 12 inch layers by mechanical tamper.
2. Waterproof membrane shall be applied to all exterior underground walls, stairway, bottom and top slabs of structure.
3. Use "Thikol" or "Sealex" around pipe whereever pipe is passing through the concrete structure.
4. Iron gate to pump station, iron grille above the pumps Iron gate and grille for transformer pad shall be built with U.S.S. "Cor-Ten" steel for exposed architecti applications or approved equal.
5. Pipe coated with asphalt (somastic) shall not be installed until all coating and primer has been removed, solvent cleaned, sand blasted (commercial blast) in preparation for coal tar coating.

REMOVE EXISTING 12" GATE VALVE AND CONNECT TO 12" FLANGED OUTLET

AS BUILT INFO UNDERLINED IN RED PENCIL

NO.	DATE	REVISION	BY	APP.
4	4/21/98	ADDED SHEET #REV. (4-20)	TM	EC
3	9-13-66	Relocate Ball Valve Future Pump	CMG	
2	8-25-66	Revision of Pres Rod Valve Piping	CMG	
1	8-16-66	Set Meter Boxes Over Valves	CMG	

NORTH MARIN COUNTY WATER DISTRICT
NOVATO, CALIFORNIA

LYNWOOD PUMP STATION
INSTALLATION OF PUMPS & PIPING

DES	DR	CH	REC
C.M.G.	C.M.G.		

APPROVED:

SCALE 1/2" = 1'-0"
DATE 5-4-1966
SHEET NO. 3 OF 31 SHEETS
NO. 830-C-3

APPENDIX B

Modeling Modifications

FREYER & LAURETA, INC.
Civil Engineers – Surveyors – Construction Managers

MEMORANDUM

May 8, 2023 (Rev.1)

To: Tim Fuette, P.E.
Senior Engineer
North Marin Water District
999 Rush Creek Place
P.O. Box 146
Novato, CA 94948

From: Camille Bandy, P.E. (Freyer & Laureta, Inc.)
Sean Chou (Freyer & Laureta, Inc.)

Reviewed By: Jeffrey Tarantino, P.E. (Freyer & Laureta, Inc.)

RE: Lynwood Pump Station Replacement Hydraulic Modeling Modifications

Introduction

To develop potential Lynwood Pump Station alternatives, F&L performed hydraulic evaluation of the North Marin Water District's (District) system both under existing conditions and with the future Primary Zone 2 demands. In this memorandum, we will document the modeling modifications used to simulate how the District currently operates the water distribution system in order to perform a cursory check that the model results were similar to the operating conditions described in the 2018 Novato Water System Master Plan Update, dated September 2019[1] (2018 Master Plan) as well as during discussions with the District staff.

Hydraulic Modeling Modifications

To develop the potential Lynwood Pump Station replacement alternatives, F&L utilized a hydraulic model that was previously developed utilizing InfoWater by Innovyze an Autodesk company, by Kennedy/Jenks Consultants (K&J). F&L was provided with a copy of the model and we assumed for the purpose of this study that the model received had been calibrated and configured correctly. The model did include all of the District's water distribution network including existing gravity tanks, pumps, pipes,

[1] https://nmwd.com/wp-content/uploads/2020/04/2018WMP.pdf

and valves. The model also includes various scenarios including average day demand scenarios, maximum day demand scenarios, and peak hour demand scenarios.

Starting with the "MD_2022_SS", 2022 Max Day scenario, F&L made modifications for analysis of Lynwood Pump Station capacity. A few components remained the same and are noted below:

- The 2022 Max Day scenario was a steady state scenario and F&L continued its analysis as a steady state scenario.
- The source of water for the 2022 Max Day scenario was solely from the North Marin Aqueduct, with Stafford Treatment Plant Offline.

Building on top of the 2022 Max Day scenario, F&L incrementally added modifications to simulate how the District operates their water distribution system. After each modification, the model was run to ensure no errors were recorded. The following changes were implemented:

- All tanks were filled to maximum capacity.
- Primary Zone 2 pump stations (San Marin and Lynwood) were activated. Two of the three pumps at each station were turned on, to model one pump at each pump station being on standby.
- Zone 3 pump stations (Nunes, San Andreas, Trumbull, Ridge, Davies, Truman, Woodland Heights, Wing Foot, and Ponti) were all activated. The number of pumps activated depended on the total pumps at the station. One pump at each pump station was turned off and shown as being on standby. The exception to this was if a pump station only had one pump, then the one pump was activated. (In the model, Cabro Pump Station only has one pump)
- Zone 4 pump stations (Buck, Wild Horse, and Cabro) were activated following the same activation as Zone 3 pumps.
- Once Zone 4 pump stations were activated the model produced a continuity balancing error. The error was caused by the Buck Tank. To fix the error Buck Tank was reduced to 1 foot below maximum capacity.
- The isolation valve dividing the northern part and southern part of Primary Zone 2, was left open. The choice to keep the Indian Valley isolation valve open was made due to the fact the maximum day demand scenario would occur during the summer season.
- Nodes currently within the system model near the added demand locations were used to add additional demand to the model. All future demands were included under the "Demand 2 Category" in the model.
- Using the model, all maximum day demands located in Primary Zone 2, Zone 3, Zone 4, and hydro-pneumatic zone service areas connected to Primary Zone 2 were summed to calculate the future maximum day demand. The future maximum day demand was multiplied by 24/16 or a 1.5 multiplier to calculate the maximum day pumping requirement for demand on a 16-hour pump cycle rather than 24-hour pumping cycle.

APPENDIX C

Lynwood Pump Station Replacement Siting Study

FREYER & LAURETA, INC.
Civil Engineers – Surveyors – Construction Managers

MEMORANDUM

January 17, 2024 (Rev. 2)

To: Tim Fuette, P.E.
Senior Engineer
North Marin Water District
999 Rush Creek Place
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From: Camille Bandy, P.E. (Freyer & Laureta, Inc.)
Sean Chou (Freyer & Laureta, Inc.)

Reviewed By: Jeffrey Tarantino, P.E. (Freyer & Laureta, Inc.)

RE: Lynwood Pump Station Replacement Siting Study

Introduction

With guidance from North Marin District (District) staff and considering the key project goals, F&L developed the following alternative concepts for the replacement of Lynwood Pump Station:

- A new pump station that matches the existing Lynwood Pump Station with one additional pump to meet future demands.
- Determine if, by relocating the pump station away from the current Lynwood Pump Station site, the new pump station could continue to provide adequate ability to meet future peak demands throughout Primary Zone 2, and also improve the District's ability to deliver water to Pacheco Valley Tank.
- Include both the replacement of the Lynwood Pump Station and add a pump station at a location within the southern portion of Primary Zone 2 that would improve the District's ability to fill Pacheco Valley Tank without having to isolate Sunset Tank from the system.

Site Evaluation

Site Evaluation Criteria

Based on the alternative concepts, three potential locations for each site (Site 1, Site 2, and Site 3) were investigated, with the exception of Site 4 and Site 5, which were located in coordination with the District. The site investigation included parcel ownership, flood plain proximity, sea level rise, and hydraulic compatibility. Parcel

ownership was taken from the Marin County Assessor's Maps from their online portal[1]. Flood plain proximity was determined using 100-year flood plain taken from Federal Emergency Management Agency's FloodMap provided by Marin Maps[2]. Projected sea level rise was determined by using the National Oceanic and Atmospheric Administration's Sea Level Rise Viewer[3]. Hydraulic compatibility was determined by modeling each location and reviewing the pressures within the system as well as the tank inflow or outflow.

Site 1 Locations

Three locations were evaluated for Site 1 as shown in Figure C-1:

- Location 1A. Sunset Parkway median at Greenwood;
- Location 1B. Scottsdale Pond and;
- Location 1C. Sunset Parkway median between Monte Maria Avenue and Cambridge Street.

Location 1A. Sunset Parkway median at Greenwood:

- Location was public right of way.
- Location was located within the 100-year flood plain.
- Location was not located within the projected sea level rise.

Location 1B. Scottsdale Pond:

- Location had an undetermined ownership but is suspected to be public right of way. The existing area is used as an open space and a park. Two detention ponds also occupy the area to collect excess water during large rain events.
- Location was located within the 100-year flood plain.
- Location was not located within the projected sea level rise.

Location 1C. Sunset Parkway median between Monte Maria Avenue and Cambridge Street:

- Location was public right of way.
- Location was located outside of the 100-year flood plain.
- Location was not located within the anticipated sea level rise.

See Table C-1 for the site comparisons. Due to the proximity of each location to one another hydraulically, the model returned similar results. When tested in the model all three locations produced a maximum pressure change between 0 to 5 psi. Reviewing the data, the maximum increase and decrease do not negatively affect the pressures the customers observed. When reviewing the locations in regard to the tank levels all three locations increased flow to Sunset Tank while decreasing flow to Pacheco Valley Tank.

It was determined that the Sunset Parkway median between Monte Maria Avenue and Cambridge Street (Location 1C) would be the best location for Site 1. The District had many concerns with the existing Lynwood Pump Station and flooding. The alternative location is best suited to negate those concerns while not negatively affecting the hydraulics of the system.

Site 2 Site Locations

Three locations were evaluated for Site 2 as shown in Figure C-2:

- Location 2A. Palmer Drive and White Oak Way;
- Location 2B. Calle de La Selva and;
- Location 2C. Ignacio Boulevard at Palmer Drive.

Location 2A. Palmer Drive and White Oak Way:

- Location had undetermined ownership but is suspected to be Marin County due to its open space and existing utility easements.

[1] https://www.marinmap.org/Html5Viewer/Index.html?viewer=smmdataviewer
[2] https://www.marinmap.org/Html5Viewer/index.html?viewer=FEMA_LOMC_Child.FEMA_LOMC_H5&run=AutoSuggestAddress
[3] https://coast.noaa.gov/slr/#/layer/slr/4/13641888.421369052/4588906.547729096/14/streets/none/1/2050/interHigh/midAccretion

- Location was not located within the 100-year flood plain.
- Location was not located within the anticipated sea level rise areas.
- Hydraulically this location increased pressure around 0 to 5 psi.
- The location increased flow to Pacheco Valley Tank.

Location 2B. Calle de la Selva:

- Location was a public utility easement.
- Location was not within the 100-year flood plain.
- Location was not within the anticipated sea level rise area.
- Hydraulically this location increased pressure around 0 to 5 psi.
- The location increased flow to Pacheco Valley Tank.

Location 2C. Ignacio Boulevard at Palmer Drive:

- Location was public right of way.
- Location was not located within 100-year flood plain.
- Location was not located within the anticipated sea level rise.
- Hydraulically this location increased pressure around 0 to 5 psi.
- The location increased flow to Pacheco Valley Tank.

See Table C-2 for the site comparisons. Due to its favorable land ownership rights and best hydraulic compatibility, the location of Ignacio Boulevard at Palmer Drive (Location 2C) was chosen for the Site 2 site.

Site 3 Site Locations

Site 3 will be a smaller, third pump station with two 1,800 GPM pumps. For Site 3's pump station, three locations as shown in Figure C-3;

- Location 3A. Bolling Drive at Captain Nurse Circle;
- Location 3B. C Street adjacent to 931 C Street and;
- Location 3C. Bolling Circle at Bolling Drive.

Location 3A. Bolling Drive at Captain Nurse Circle:

- Location was public right of way.
- Location was located within the 100-year flood plain and looked to be a seasonal drainage area.
- Location was not located within the anticipated sea level rise area.
- Hydraulically this location increased pressure around 0 to 5 psi.
- The location increased flow to Pacheco Valley Tank.

Location 3B. C Street adjacent to 931 C Street:

- Location had undetermined ownership but is expected to be Marin County land due to the 931 C street being a public library.
- Location was not located within the 100-year flood plain.
- Location was not located within anticipated sea level rise.
- Hydraulically, this location increased pressure around 0 to 5 psi.
- The location increased flow to Pacheco Valley Tank.

Location 3C. Bolling Circle at Bolling Drive:

- Location was undetermined land but is on a parcel used currently as a park.
- Location was not located within the 100-year flood plain.
- Location was not located within the anticipated sea level rise.
- Hydraulically this location increased pressure around 0 to 5 psi.
- The location increased flow to Pacheco Valley Tank.

See Table C-3 for comparison. Due to favorable land ownership rights and the best hydraulic compatibility, the Bolling Circle at Bolling Drive (Location 3C) location was chosen for the Site 3 site.

Site 4 Site Location

During a site visit and coordination with the District, NMWD requested and confirmed through email[4] to evaluate an additional site for the third pump station. Site 4 will be a smaller, third pump station with two 1,800 GPM pumps. Site 4's pump station location is shown in Figure C-4 and is in a publicly maintained open space area at the intersection of C Street and Main Gate Road.

Location 4. Main Gate Road:

- Location was public right of way.
- Location is located within the 100-year flood plain.
- Location was not located within anticipated sea level rise.
- Hydraulically, this location increased pressure around 0 to 56 psi.
- The location increased flow to Pacheco Valley Tank.

See Table C-4 for a summary of the site attributes.

Site 5 Site Location

During a site visit and coordination with the District, NMWD requested during the Kickoff Meeting[5] for the F&L team to evaluate an additional site for the third pump station. Site 5 will be a smaller, third pump station with two 1,800 GPM pumps. Site 5's pump station location is shown in Figure C-5;

Location 5. C Street:

- Location is owned by the Novato Unified School District.
- Location was not located within the 100-year flood plain.
- Location was not located within anticipated sea level rise.
- Hydraulically this location increased pressure around 0 to 56 psi.
- The location increased flow to Pacheco Valley Tank.

See Table C-5 for a summary of the site attributes.

Final Site Locations

F&L will further evaluate the alternative site locations below in a technical report. The final site locations are as follows:

- Site 1: Location 1C. Sunset Parkway median between Monte Maria Avenue and Cambridge Street
- Site 2: Location 2C. Ignacio Boulevard at Palmer Drive
- Site 3: Location 3C. Bolling Circle at Bolling Drive
- Site 4: Location 4. Main Gate Road
- Site 5: Location 5. C Street

Figures and Tables

- Figure C-1: Site 1 Location Map
- Figure C-2: Site 2 Location Map
- Figure C-3: Site 3 Location Map
- Figure C-4: Site 4 Location Map
- Figure C-5: Site 5 Location Map
- Table C-1: Site 1 Locations
- Table C-2: Site 2 Locations

[4] A copy of the email from Camille Bandy (F&L) to Tim Fuette (NMWD) is included in Appendix C-1.
[5] A copy of the Lynwood Pump Station CEQA Kickoff Meeting minutes dated September 8, 2023, is included in Appendix C-2.

Appendix

FIGURES

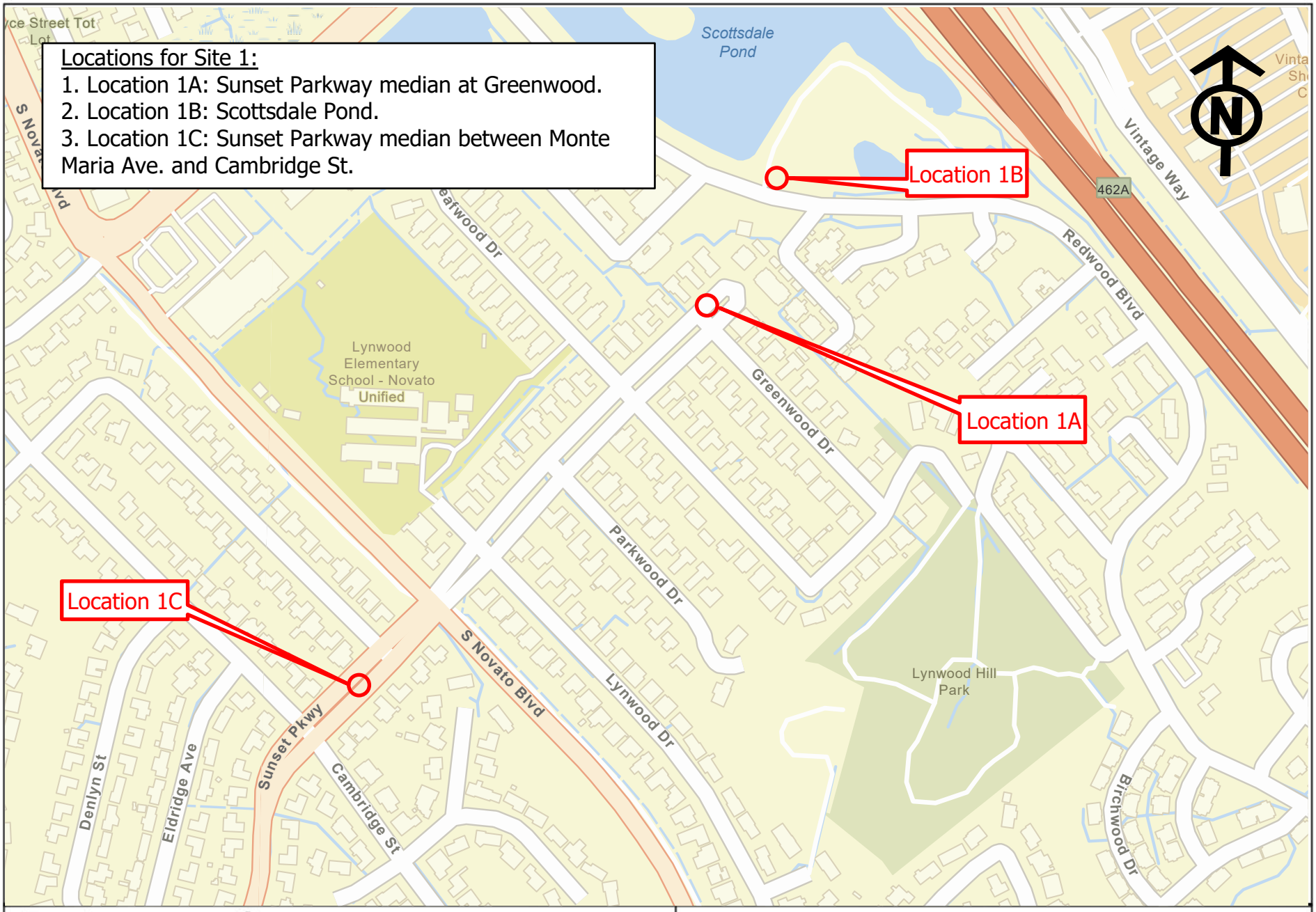

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FIGURE C–1
SITE 1 LOCATION MAP
NORTH MARIN WATER DISTRICT
NOVATO, CA 94945

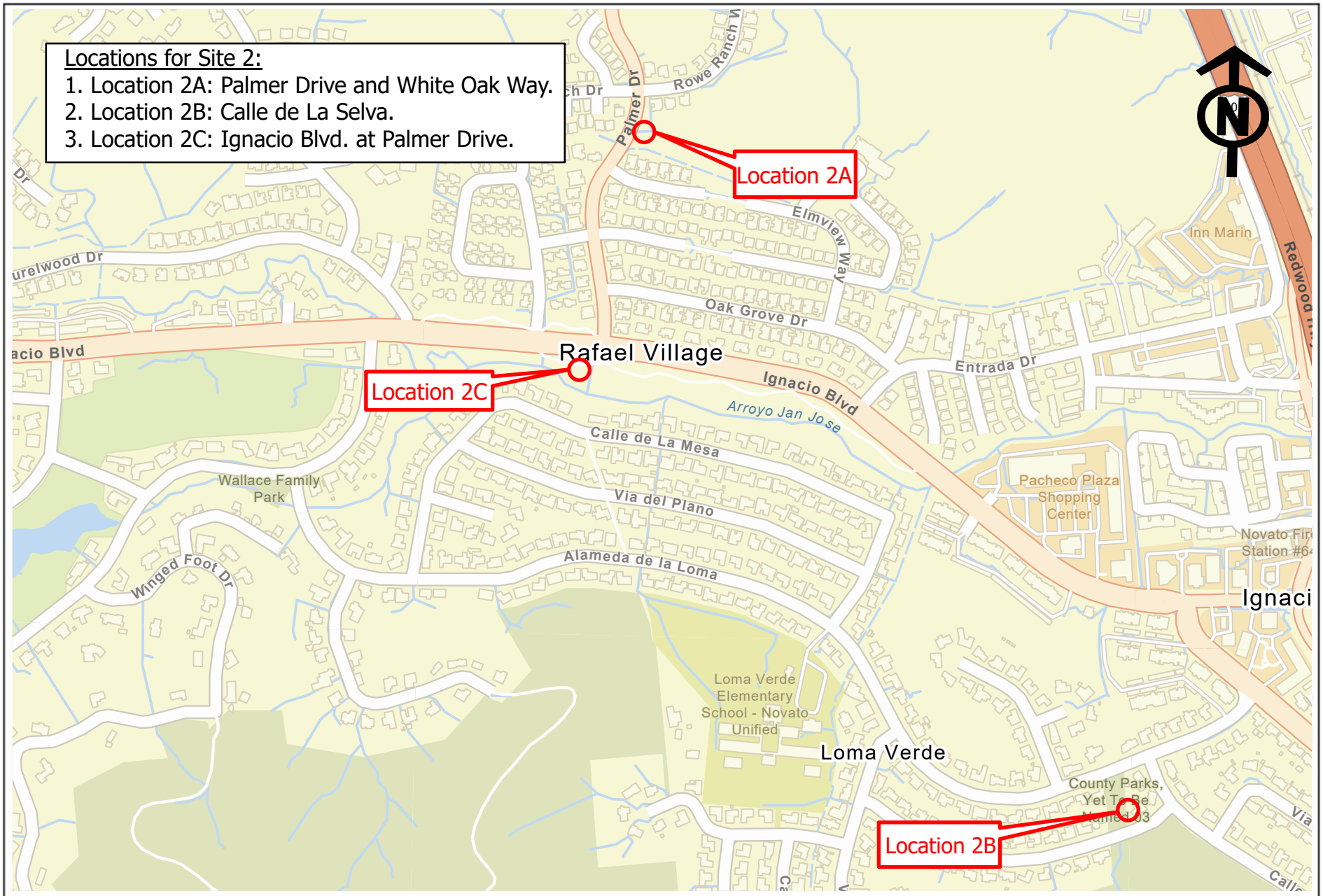

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FIGURE C–2
SITE 2 LOCATION MAP
NORTH MARIN WATER DISTRICT
NOVATO, CA 94945

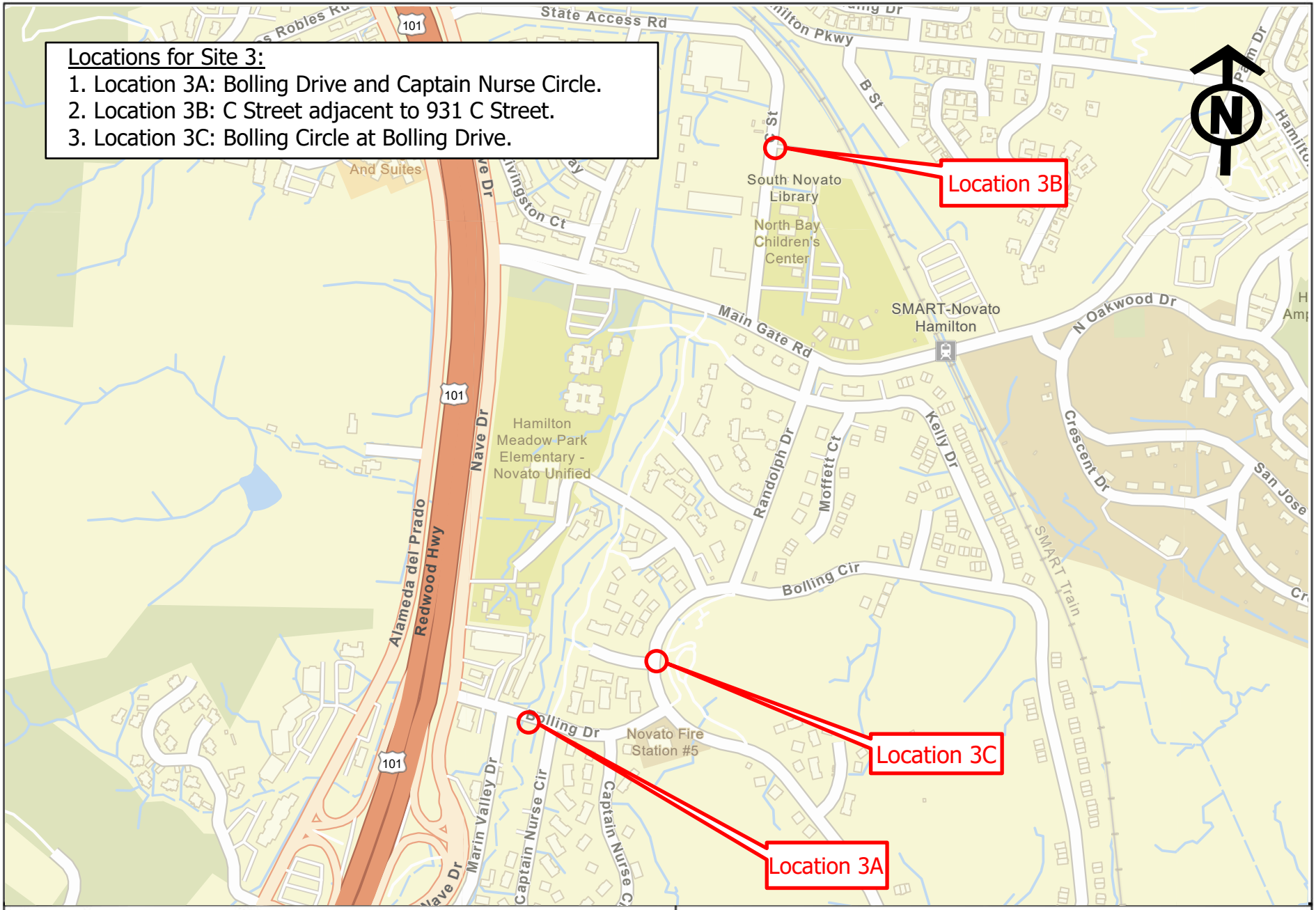

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FIGURE C–3
SITE 3 LOCATION MAP
NORTH MARIN WATER DISTRICT
NOVATO, CA 94945

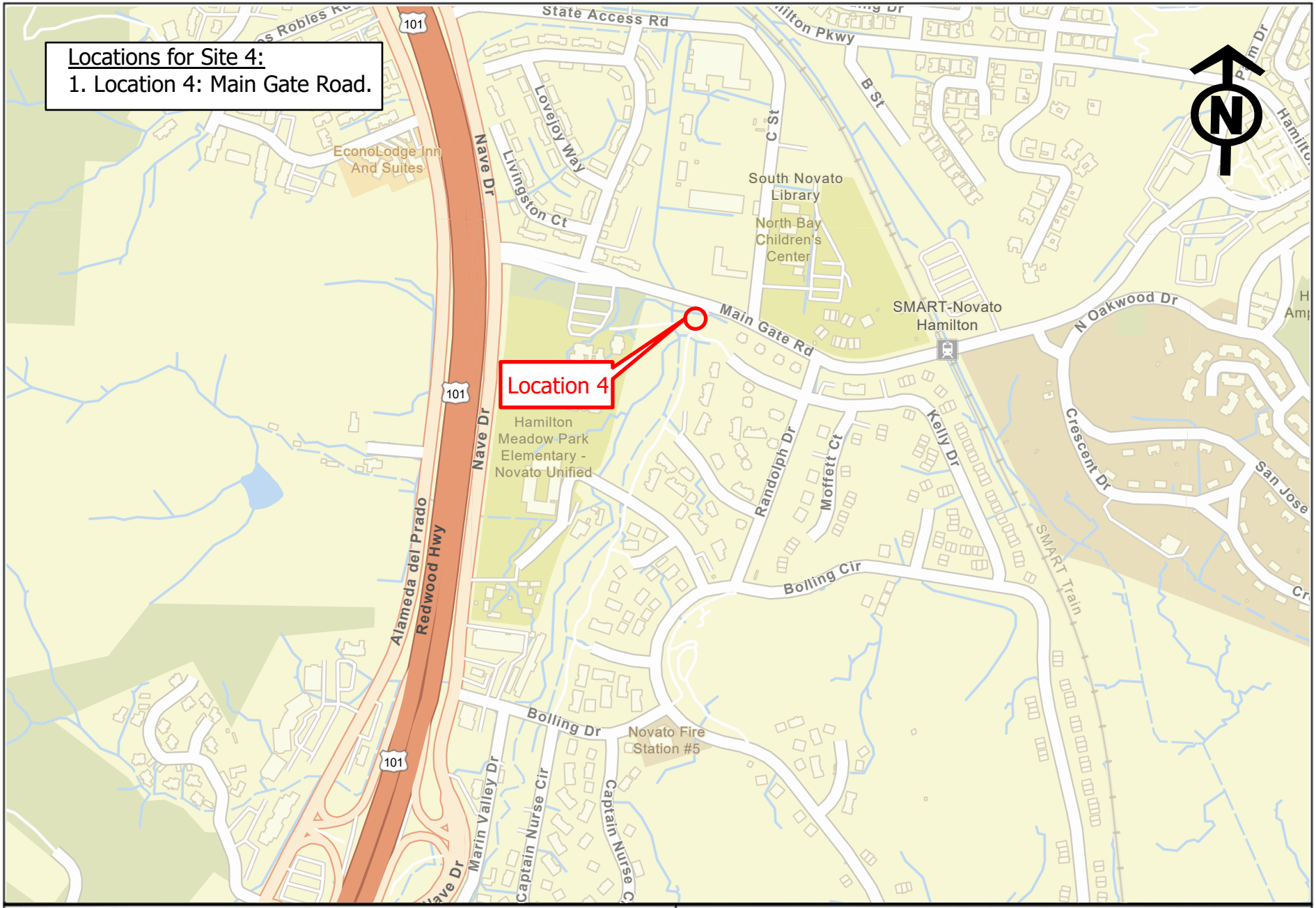

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FIGURE C–4
SITE 4 LOCATION MAP
NORTH MARIN WATER DISTRICT
NOVATO, CA 94945

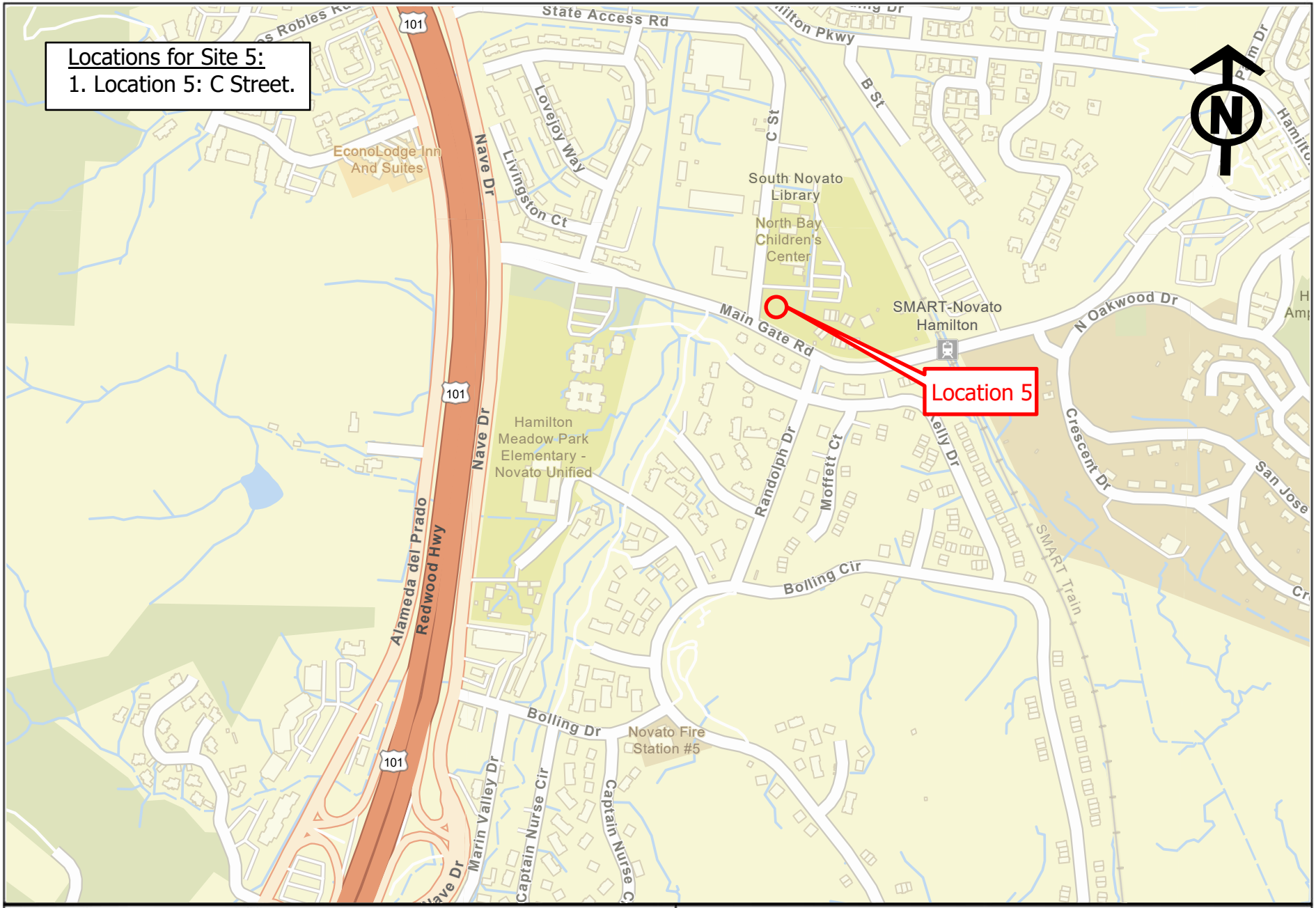

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FIGURE C–5
SITE 5 LOCATION MAP
NORTH MARIN WATER DISTRICT
NOVATO, CA 94945

TABLES

Table C-1
Site 1 Locations
Lynwood Pump Capacity Assessment
North Marin Water District, Novato, California

Site	Locations	Parcel Type (1)	Within 100 Year Flood Zone (2)	Within Sea Level Rise Area (3)	Hydraulic Compatibility (4)
1A	Sunset Parkway Median at Greenwood	Public ROW	Yes	No	Fair
2A	Scottsdale Pond	Undetermined(5)	Yes	No	Fair
3A	Sunset Parkway Median between Monte Maria Avenue and Cambridge Street	Public ROW	No	No	Good

Notes
(1) Parcel Type determined through Marin County Assessor Portal.
(2) Flood Plain determined from Federal Emergency Management Agency's FloodMap provided by Marin Maps webpage.
(3) Sea level rise taken from National Oceanic and Atmospheric Administration's Sea Level Rise Viewer.
(4) Hydraulic Compatibility based on a three tier rating, Good, Fair, and Poor.
(5) Land rights are undetermined, but are suspected to have public access.

Abbreviations
ROW: Right of Way

References
Marin County Parcel Map Viewer
https://www.marinmap.org/Html5Viewer/Index.html?viewer=smmdataviewer

Federal Emergency Management Agency's FloodMap provided by Marin Maps
https://www.marinmap.org/Html5Viewer/index.html?viewer=FEMA_LOMC_Child.FEMA_LOMC_H5&run=AutoSuggestAddress

National Oceanic and Atmospheric Administration's Sea Level Rise Viewer
https://coast.noaa.gov/slr/#/layer/slr/4/-13641888.421369052/4588906.547729096/14/streets/none/1/2050/interHigh/midAccretion

Table C-2
Site 2 Locations
Lynwood Pump Capacity Assessment
North Marin Water District, Novato, California

Site	Locations	Parcel Type (1)	Within 100 Year Flood Zone (2)	Within Sea Level Rise Area (3)	Hydraulic Compatibility (4)
2A	Ignacio Boulevard at Palmer Drive	Public ROW	No	No	Good
2B	Calle de La Selva adjacent to 212 Calle de la Selva	Public Utility Easement	No	No	Poor
2C	Palmer Drive adjacent to 1 White Oak Way	Undetermined (5)	No	No	Fair

Notes
(1) Parcel Type determined through Marin County Assessor Portal
(2) Flood Plain determined from Federal Emergency Management Agency's FloodMap provided by Marin Maps webpage.
(3) Sea level rise taken from National Oceanic and Atmospheric Administration's Sea Level Rise Viewer.
(4) Hydraulic Compatibility based on a three tier rating, Good, Fair, and Poor.
(5) Land rights are undetermined, but are suspected to have public access.

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Table C-3
Site 3 Locations
Lynwood Pump Capacity Assessment
North Marin Water District, Novato, California

Site	Locations	Parcel Type (1)	Within 100 Year Flood Zone (2)	Within Sea Level Rise Area (3)	Hydraulic Compatibility (4)
3A	Bolling Drive at Captain Nurse Circle	Public ROW	Yes	No	Good
3B	C Street adjacent to 931 C Street	Undetermined (5)	No	No	Fair
3C	Bolling Circle at Bolling Drive	Undetermined (5)	No	No	Good

Notes
(1) Parcel Type determined through Marin County Assessor Portal
(2) Flood Plain determined from Federal Emergency Management Agency's FloodMap provided by Marin Maps webpage.
(3) Sea level rise taken from National Oceanic and Atmospheric Administration's Sea Level Rise Viewer.
(4) Hydraulic Compatibility based on a three tier rating, Good, Fair, and Poor.
(5) Land rights are undetermined, but are suspected to have public access.

Abbreviations
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Table C-4
Site 4 Location
Lynwood Pump Capacity Assessment
North Marin Water District, Novato, California

Site	Locations	Parcel Type (1)	Within 100 Year Flood Zone (2)	Within Sea Level Rise Area (3)	Hydraulic Compatibility (4)
4	Main Gate Road adjacent to 5500 Nave Drive	Public ROW	Yes	No	Good

Notes
(1) Parcel Type determined through Marin County Assessor Portal
(2) Flood Plain determined from Federal Emergency Management Agency's FloodMap provided by Marin Maps webpage.
(3) Sea level rise taken from National Oceanic and Atmospheric Administration's Sea Level Rise Viewer.
(4) Hydraulic Compatibility based on a three tier rating, Good, Fair, and Poor.
(5) Land rights are undetermined, but are suspected to have public access.

Abbreviations
ROW: Right of Way

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National Oceanic and Atmospheric Administration's Sea Level Rise Viewer
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Table C-5
Site 5 Location
Lynwood Pump Capacity Assessment
North Marin Water District, Novato, California

Site	Locations	Parcel Type (1)	Within 100 Year Flood Zone (2)	Within Sea Level Rise Area (3)	Hydraulic Compatibility (4)
5	C Street and Main Gate Road	Novato Unified School District	No	No	Good

Notes
(1) Parcel Type determined through Marin County Assessor Portal
(2) Flood Plain determined from Federal Emergency Management Agency's FloodMap provided by Marin Maps webpage.
(3) Sea level rise taken from National Oceanic and Atmospheric Administration's Sea Level Rise Viewer.
(4) Hydraulic Compatibility based on a three tier rating, Good, Fair, and Poor.
(5) Land rights are undetermined, but are suspected to have public access.

Abbreviations
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APPENDIX C-1

Email from Camille Bandy to Tim Fuette dated December 7, 2023

Camille Bandy

From: Camille Bandy
Sent: Thursday, December 7, 2023 1:07 PM
To: tfuette@nmwd.com
Cc: Jeffrey Tarantino; Sean Chou
Subject: RE: Alternative Site 4
Attachments: Alternative 4 Locations - Final.pdf

Hi Tim,

Thanks for taking my call. I've attached an updated exhibit showing the location of the proposed Site 4A site. As we discussed, this site appears to be within the 100-year flood zone and is in a public parcel.

F&L will let the subs know to proceed with this new site. We will also make sure to let you know when our team will be at Site 4B (Novato Charter School).

Thanks,
Camille

Camille Bandy, P.E., QSD/P (she/her/hers)
Project Manager

(415) 534-7070
office

From: Camille Bandy
Sent: Thursday, December 7, 2023 10:25 AM
To: tfuette@nmwd.com
Cc: Jeffrey Tarantino <tarantino@freyerlaureta.com>; Sean Chou <chou@freyerlaureta.com>
Subject: Alternative Site 4

Hi Tim,

Jeff mentioned that we will no longer evaluate the Thompson Builders site. Please confirm that I have the correct site per your discussion with Jeff. Please see "New Alt 4 Locations -Lynwood PS.pdf". I did want to note that when looking at the parcel for this location, it's a portion of the large parcel shown in the image attached. We don't have any other information regarding this parcel besides that its land use is 61-Exemption.

I'll give you a call to follow up and confirm this is the correct site.

Thanks,
Camille

Camille Bandy, P.E., QSD/P (she/her/hers)
Project Manager

(415) 534-7070
office


FINAL SITE 4 LOCATIONS
F&L
12/7/2023
Note: Site outlines are schematic.
Previous Site 4A - No longer used.
SITE 4B - No changes
NEW SITE 4A.
Main Gate Rd
Main Gate Rd
Main Gate Rd
C St
C St
ESPINO C FAMILY CHILD CARE
Kelly Ct
Kelly Dr
Kelly Dr

APPENDIX C-2

Lynwood Pump Station CEQA Kickoff Meeting Minutes dated September 8, 2023

NMWD
Lynwood Pump Station CEQA
Kickoff Meeting Agenda

Date & Time: September 8, 2023, 11:00 a.m.
Location: Microsoft Teams
Attendees: Jeff Tarantino, Sean Chou (F&L)
Geoff Reilly, Liv Niederer (WRA)
Tim Fuette (NMWD)

The meeting summary below has been prepared by Freyer & Laureta; Inc. (F&L) based on the best recollection of Sean Chou. If there are any discrepancies, please inform Sean Chou at chou@freyerlaureta.com.

Summary of discussions are written in *italics*. Summary of post meeting notes, if any, are written in *italics* and underlined. Open action items are written in **bold**.

Discussion Items:

1. **Introductions (All)**
2. **Meeting Purpose (F&L)**
    1. *Beginning CEQA process.*
3. **Relevant Reports and Drawings Required (WRA)**
    1. See Request for Information (RFI)
        i. MS Word RFI (attached for discussion purposes)
            1. *NMWD alerted the team that most of the proposed projects are potential and can vary depending on city pavement requirements.*
            2. *County projects may also affect the specific alternatives sites; however, the county has historically*

been slow or uncommunicative in relaying their projects.

3. ***WRA will need a list of proposed projects. NMWD will provide a proposed project list and Map including potential City pavement projects.***
4. *In creating responses and approaching each site description the team should use the most conservative methods possible. i.e., All alternatives should be analyzed.*

ii. MS Excel Construction Equipment RFI

1. *Baseline Environmental Consulting will be utilized by WRA for the review of noise and air pollution.*
    a. ***NMWD suggests that a sound study monitors the existing station. Results from the study should be used to determine noise reduction at the new pump station.***
    b. ***WRA currently doesn't have a sound study in the scope, but F&L and WRA are to discuss offline about including the study.***
2. *Air pollution – There is potential that any of the alternatives may need to have an emergency generator. Any emergency generator would follow the air district regulations, including regular testing requirements.*

2. Draft Lynwood Pump Station Replacement Engineering Assessment by F&L, dated May 8, 2023

4. Overall Assumptions (WRA)

1. No additional project description information is available beyond what is included in the Engineering Assessment
2. No additional technical reports are available beyond what is included in the Engineering Assessment
    i. *NMWD confirms no other reports have been found.*
3. For worst-case CEQA analysis it is assumed the existing pump station will be demolished.
    i. *Confirmed.*

4. The preferred alternative has not been identified yet.
    i. For worst-case CEQA analysis it is assumed we will analyze all three alternatives as well as the existing site
        1. Some but not all CEQA analyses will need to be broken up for each site.
        2. *Additional alternative 4 will be added. The alternative location is private property at the intersection of Main Gate Road and C Street.*
            a. *One location is the baseball field on Novato School District land.*
                i. *NMWD will reach out to the school district to see if land acquisition is possible.*
            b. *Or the West side of C St., a privately owned parcel.*
                i. *West Parcel was previously a super fund site at some time.* ***NMWD will send any information/documentation they have.***
            c. ***The City of Novato is amenable to NMWD purchasing City-owned land if necessary.***
        3. ***WRA and F&L will create a new proposal to conduct a study, like that done for the other alternatives in the engineering assessment for the new alternative 4 potential sites.***
        4. *Alternative 3 locations may change depending on land acquisition and spacing at the specified locations. Potential reconfiguration may be Ignacio Way and Hamilton area instead of Sunset Parkway and Bolling Drive.*
        5. *Regardless of site, each alternative needs to be analyzed and reported on individually. However similar information or report sections may be used.*
5. Tree removal may be required.
    i. F&L will ensure that the design of buildings does not affect existing trees, especially at the alternative 2 location.
6. Temporary traffic lane closures may be required.

7. No pile driving will be required.
    i. ***F&L to confirm mat slab will work with CEG.***
8. Staging will occur on paved surfaces; if not, it will not be in environmentally sensitive areas – ***confirmed.***
    i. ***The contractor is to figure out staging, however, NMWD believes F&L, WRA, and NMWD should be thinking about it in CEQA planning.***
    ii. ***F&L and NMWD to discuss staging sites.***
9. No site access permissions will be required.
    i. *All sites are accessible for the performance of CEQA work.*
10. F&L will review and comment on deliverables before NMWD.
11. The City of Novato will not review CEQA deliverables but will be included in the CEQA process (early notification and receipt of the Public Draft IS/MND)
12. WRA can use its own CEQA IS/MND and CEQA notice templates.
    i. ***NWMD will confirm with WRA on the notices. Generally, NMWD would be fine with using WRA's template but would like to check internally.***
13. CEQA noticing will be done by the Marin Independent Journal and not by mailing notices to a radius list.
    i. *At a minimum, an Independent Journal notification is needed. NMWD would prefer to do mailers.*
    ii. *WRA recommends mailers in a specified radius to all potential alternative sites.*
    iii. *Regarding public outreach NMWD would like knowledge of the project to be up front, potentially even before the draft report is published.*
    iv. *WRA expressed concern that bringing the project to the public before the draft report is finished may result in the public dictating elements of the project that can not be modified. i.e., building size and appearance.*
        1. *Due to a lack of a finalized design, the CEQA draft report should use performative requirements without having the full design.*

v. ***F&L and WRA will have an offline discussion to tweak the renderings to create performative requirements.***

14. The District will pay the CEQA Notice of Determination (NOD) County Clerk Filing Fee ($50) and the CDFW CEQA Review Fee ($2,764)

5. Key NMWD Contacts and Overall Communication Protocols (WRA)

1. *Tim is to be the stated NMWD contact within CEQA. Questions may be routed through F&L first.*

2. *The CEQA signing of intent will be Tony or Eric with the District.* ***NMWD will give the names of those signing.***

3. *Resolutions - NMWD will let F&L and WRA know if they need help. NMWD would like WRA to, at minimum, to review the resolutions.*

6. Schedule – Preliminary Schedule (WRA)

1. CEQA Flow Chart
   - ***i. WRA will conduct the screen check draft.***
   - ***ii. WRA will provide a review of all steps in the CEQA process before sending to F&L for review.***

   Preliminary Schedule
   - ***iii. NMWD would like to go to the board before the draft is submitted.***
2. Board Meeting to Adopt CEQA and Approve Project in Concept
   - i. Any additional board meetings?
3. NMWD and F&L Review of Administrative Draft IS/MND
   - ***i. F&L will first review the draft before sending it to NMWD.***
4. City of Novato – Engage after Project Description?
5. ***NMWD would like to set up sometime in October and November to do public outreach before the draft report is published.***
   - i. ***NMWD will set up a meeting to discuss the above approach if F&L can provide the overall schedule. F&L will participate in that meeting.***

7. Next Steps (F&L/WRA)

1. F&L
   - i. CEQA RFI Responses

2. WRA
    i. CEQA RFI Responses
    ii. CEQA Project Description
    iii. CEQA Technical Reports
    iv. Administrative Draft IS/MND
3. *Action Items*
    i. F&L to provide WRA a boundary for the potential alternative 4 sites.
    ii. NMWD will send planned utility and pavement maps to F&L and WRA.
    iii. F&L and NMWD to set a time to discuss the overall schedule.
    iv. F&L to add to the schedule.

APPENDIX D

Biological Resources Technical Report

Biological Resources Technical Report

Lynwood Pump Station Replacement

Novato, Marin County, California

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WRA#320289

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List of Acronyms

BGEPA	Bald and Golden Eagle Protection Act
Caltrans	California Department of Transportation
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
CFGC	California Fish and Game Code
CFP	California Fully Protected Species
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
Corps	U.S. Army Corps of Engineers
CPRC	California Public Resources Code
CSRL	California Soils Resource Lab
CWA	Clean Water Act
District	North Marin Water District
EFH	Essential Fish Habitat
ESA	Federal Endangered Species Act
Inventory	California Native Plant Society Rare Plant Inventory
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation & Management Act
MBTA	Migratory Bird Treaty Act
MM	Mitigation Measure
NCCP	Natural Community Conservation Plan
NETR	National Environmental Title Research
NOAA	National Oceanic and Atmospheric Administration
NMFS	National Marine Fisheries Service
NPPA	California Native Plant Protection Act
NRCS	Natural Resource Conservation Service
NWI	National Wetland Inventory
OHWM	Ordinary High Water Mark
Rank	California Rare Plant Ranks
RHA	Rivers and Harbors Act
RWQCB	Regional Water Quality Control Board
SFEI	San Francisco Estuary Institute
SSC	Species of Special Concern
SWRCB	State Water Resource Control Board
TOB	Top of Bank
USC	U.S. Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WBWG	Western Bat Working Group
WRA	WRA, Inc.

1.0 INTRODUCTION

This Biological Resources Technical Report evaluates existing biological resources, potential impacts, and mitigation measures (if required) for the Lynwood Pump Station Replacement Project located in Novato, Marin County, CA (Appendix A – Figure 1). The proposed project (Project) involves replacing the existing Lynwood pump station (PS) with either one or two new pump stations at a different location to continue to provide reliable potable water service to the North Marin Water District's (District) existing customers and in order to meet demands associated with the anticipated future growth within the service area.

The analysis provided in this report considers five potential sites on which the proposed project would be located, all of which are within the City of Novato (City) (Figure 1). Each potential site would be an alternative location for a proposed new PS to replace the existing Lynwood PS and are all analyzed in the IS/MND at the same level of detail. These sites are located as follows:

- Sunset Parkway Site (Site 1): Within the Sunset Parkway median between Monte Maria Avenue and Cambridge Street
- Ignacio Boulevard Site (Site 2): Within an open space area south of the intersection of Ignacio Boulevard and Palmer Drive
- Bolling Drive Site (Site 3): Within an open space area northeast of the intersection of Bolling Drive and Bolling Circle. A pump station built at the Bolling Drive site requires construction of a parallel pump station at the Ignacio Boulevard site.
- Main Gate Road Site (Site 4): Within a public property situated along the south side of Main Gate Road between its intersection with Nave Drive and C Street. The site is situated in an open space area adjacent to the northeastern corner of a parking lot covered with solar canopies. A pump station built at the Main Gate Road Site (Site 4) requires construction of a parallel pump station at the Ignacio Boulevard site.
- C Street Site (Site 5): Within a baseball field situated northeast of the intersection of C Street and Main Gate Road. A pump station built at the C Street (Site 5) requires construction of a parallel pump station at the Ignacio Boulevard site.

The analysis provided herein also evaluates the potential impacts associated with the demolition of the existing Lynwood PS, which is located on Sunset Parkway between Lynwood Drive and South Novato Boulevard (Existing PS Site), and potential temporary impacts associated with staging areas. The Existing PS Site, five alternative projects sites, and the associated staging areas are referred to collectively as the Study Area.

1.1 Overview and Purpose

This Biological Resources Technical Report provides an assessment of biological resources within the Study Area and the immediate vicinity. The purpose of the assessment is to develop and gather information on sensitive land cover types and special-status plant and wildlife species to support an evaluation of the Project under the California Environmental Quality Act (CEQA). This report describes the results of the site visits which assessed the Study Area for (1) the presence of sensitive land cover types, special-status plant species, and special-status wildlife species, and (2) the potential for the Study Area to support special-status plant and wildlife species. Based on the results of the site assessment, potential impacts to sensitive land cover types and special-status species resulting from the proposed project were evaluated. If the project has the

potential to result in significant impacts to biological resources, measures to avoid, minimize, or mitigate for those significant impacts are described.

This assessment is based on the information available at the time of the study and the on-site conditions that were observed on the dates the Study Area was visited. Conclusions are based on currently available information used in combination with the professional judgement of the biologists completing this study.

1.2 Project Description

The District has decided to move forward with the replacement of the Lynwood PS at a different location. Five potential alternative solutions for replacing the existing Lynwood PS have been identified as described above. Each alternative would involve either a new PS at one of the sites or two new PS at a combination of the sites. This report considers the environmental impacts of each proposed alternative for the replacement of the existing Lynwood PS at the same level of detail. In order to provide a conservative analysis of the potential impacts of the proposed project, this report analyzes impacts associated with the "worst-case scenario," and therefore assumes demolition of the existing PS will be included as part of the project.

A detailed description of each alternative is provided in the sections that follow. Each new PS would include a pump station building and parking. The analysis also considers that an emergency generator may be installed at each site, but the District may choose not to install an emergency generator as part of the final design effort. The footprint for pipe improvements assumes a ten-foot-wide T trench.

Construction equipment would be stored in designated staging areas, which are shown in Figures 2 through 6. The staging area on Sunset Parkway would be used for any project work at the Sunset Parkway Site or the Existing PS Site. Separate staging areas are identified for the four other sites on Ignacio Boulevard, Bolling Drive, Main Gate Road Site, and C Street Site.

1.2.1 Alternative A

Alternative A would include one new PS with four pumps located at the Sunset Parkway Site (Site 1). This PS would match the existing PS but would include one additional pump to meet future demands. The Sunset Parkway Site is located approximately 330 feet southwest of the Existing PS Site. This alternative was chosen because the existing PS location provides the ability to meet demands to the north and south of the existing facility location, which is especially critical during peak demand periods (F&L 2023). The proposed PS footprint is approximately 2,000 square feet (SF) and proposed pipe improvements footprint is approximately 9,000 SF.

1.2.2 Alternative B

Alternative B would include one new PS with four pumps located at the Ignacio Boulevard Site (Site 2). The Ignacio Boulevard Site is located approximately 1.3 miles south of the Existing PS Site. This alternative was chosen because, by relocating the PS away from the existing PS, the new PS could meet future peak demands throughout Primary Zone 2 and would also improve the District's ability to deliver water to the Pacheco Valley Tank (F&L 2023). The proposed PS footprint is approximately 2,000 SF and proposed pipe improvements footprint is approximately 37,500 SF.

1.2.3 Alternative C

Alternative C would include the construction of two new PS, one at the Ignacio Boulevard Site (Site 2) and one at the Bolling Drive Site (Site 3). The new PS at the Ignacio Boulevard Site would include three pumps and the new PS at Bolling Drive Site would include two pumps. This alternative was developed to include both replacement of the Lynwood PS near the Existing PS Site and to add a third PS at a location within or in the vicinity of the southern portion of Primary Zone 2 that would improve the District's ability to fill the Pacheco Valley Tank (F&L 2023) while also meeting future demands. The proposed PS footprint at the Ignacio Boulevard Site is approximately 1,800 SF and proposed pipe improvements footprint is approximately 37,500 SF. The proposed PS footprint at the Bolling Drive Site is approximately 1,600 SF and proposed pipe improvements footprint is approximately 31,000 SF.

1.2.4 Alternative D

Alternative D would include the construction of two new PS, one at the Ignacio Boulevard Site (Site 2) with three pumps, and one at the Main Gate Road Site (Site 4) with two pumps. This alternative would fulfill the same objectives as Alternative C given that the Main Gate Road Site (Site 4) is located approximately 0.3 miles north of the Bolling Drive Site (Site 3). The proposed PS footprint at the Ignacio Boulevard Site is approximately 1,800 SF and proposed pipe improvements footprint is approximately 37,500 SF. The proposed PS footprint at the Main Gate Road Site is approximately 1,600 SF and the proposed pipe improvements footprint is approximately 4,700 SF.

1.2.5 Alternative E

Alternative E would include the construction of two new PS, one at the Ignacio Boulevard Site (Site 2) with three pumps, and one at the C Street Site (Site 5) with two pumps. This alternative would fulfill the same objectives as Alternative C given that the C Street Site is located approximately 0.3 miles north of the Bolling Drive Site (Site 3). The proposed PS footprint at the Ignacio Boulevard Site is approximately 1,800 SF and proposed pipe improvements footprint is approximately 37,500 SF. The proposed PS footprint at the C Street Site is approximately 1,600 SF and the proposed pipe improvements footprint is approximately 1,200 SF.

2.0 REGULATORY BACKGROUND

The following sections explain the regulatory context of the biological assessment, including applicable laws and regulations that were applied to the field investigations and analysis of potential project impacts.

2.1 Federal and State Regulatory Setting

2.1.1 Vegetation and Aquatic Communities

CEQA provides protections for particular vegetation types defined as sensitive by the California Department of Fish and Wildlife (CDFW) and aquatic features protected by laws and regulations administered by the U.S Army Corps of Engineers (Corps), State Water Resources Control Board (SWRCB), and Regional Water Quality Control Boards (RWQCB). The laws and regulations that provide protection for these resources are summarized below.

Sensitive Natural Communities: Sensitive natural communities include habitats that fulfill special functions or have special values. Natural communities considered sensitive are those identified in local or regional plans, policies, regulations, or by the CDFW. CDFW ranks sensitive communities as "threatened" or "very threatened" (CDFW 2024a) and keeps records of their occurrences in its California Natural Diversity Database (CNDDB; CDFW 2024b). Natural communities are ranked 1 through 5 in the CNDDB based on NatureServe's (2024) methodology, with those communities ranked globally (G) or statewide (S) as 1 through 3 considered sensitive. Impacts to sensitive natural communities identified in local or regional plans, policies, or regulations or those identified by the CDFW or U.S. Fish and Wildlife Service (USFWS) must be considered and evaluated under CEQA (California Code of Regulations [CCR] Title 14, Div. 6, Chap. 3, Appendix G). In addition, this general class includes oak woodlands that are protected by local ordinances under the Oak Woodlands Protection Act and Section 21083.4 of California Public Resources Code (CPRC).

Waters of the United States, Including Wetlands: The Corps regulates “Waters of the United States” under Section 404 of the Clean Water Act (CWA). Waters of the United States are defined in the Code of Federal Regulations (CFR) as including the territorial seas, and waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, such as tributaries, lakes and ponds, impoundments of waters of the U.S., and wetlands that are hydrologically connected with these navigable features (33 CFR 328.3). Potential wetland areas, according to the three criteria used to delineate wetlands as defined in the *U.S. Army Corps of Engineers Wetlands Delineation Manual* (Corps Manual; Environmental Laboratory 1987), are identified by the presence of (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology. Unvegetated waters including lakes, rivers, and streams may also be subject to Section 404 jurisdiction and are characterized by an ordinary high water mark (OHWM) identified based on field indicators such as the lack of vegetation, sorting of sediments, and other indicators of flowing or standing water. The placement of fill material into Waters of the United States generally requires a permit from the Corps under Section 404 of the CWA.

The Corps also regulates construction in navigable waterways of the U.S. through Section 10 of the Rivers and Harbors Act (RHA) of 1899 (33 U.S. Code [USC] 403). Section 10 of the RHA requires Corps approval and a permit for excavation or fill, or alteration or modification of the course, location, condition, or capacity of, any port, roadstead, haven, harbor, canal, lake, harbor

or refuge, or enclosure within the limits of any breakwater, or of the channel of any navigable water of the United States. Section 10 requirements apply only to navigable waters themselves, and are not applicable to tributaries, adjacent wetlands, and similar aquatic features not capable of supporting interstate commerce.

Waters of the State, Including Wetlands: The term "Waters of the State" is defined by the Porter-Cologne Act as "any surface water or groundwater, including saline waters, within the boundaries of the state." The SWRCB and nine RWQCB protect waters within this broad regulatory scope through many different regulatory programs. Waters of the State in the context of a CEQA Biological Resources evaluation include wetlands and other surface waters protected by the *State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State* (SWRCB 2019). The SWRCB and RWQCB issue permits for the discharge of fill material into surface waters through the State Water Quality Certification Program, which fulfills requirements of Section 401 of the CWA and the Porter-Cologne Water Quality Control Act. Projects that require a Clean Water Act permit are also required to obtain a Water Quality Certification. If a project does not require a federal permit but does involve discharge of dredge or fill material into surface waters of the State, the SWRCB and RWQCB may issue a permit in the form of Waste Discharge Requirements.

Sections 1600-1616 of California Fish and Game Code: Streams and lakes, as habitat for fish and wildlife species, are regulated by CDFW under Sections 1600-1616 of California Fish and Game Code (CFGC). Alterations to or work within or adjacent to streambeds or lakes generally require a 1602 Lake and Streambed Alteration Agreement. The term "stream," which includes creeks and rivers, is defined in the CCR as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life [including] watercourses having a surface or subsurface flow that supports or has supported riparian vegetation" (14 CCR 1.72). The term "stream" can include ephemeral streams, dry washes, watercourses with subsurface flows, canals, aqueducts, irrigation ditches, and other means of water conveyance if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife (CDFG 1994). Riparian vegetation has been defined as "vegetation which occurs in and/or adjacent to a stream and is dependent on, and occurs because of, the stream itself" (CDFG 1994). Removal of riparian vegetation also requires a Section 1602 Lake and Streambed Alteration Agreement from CDFW.

2.1.2 Special-status Species

Endangered and Threatened Plants, Fish, and Wildlife. Specific species of plants, fish, and wildlife species may be designated as threatened or endangered by the federal Endangered Species Act (ESA), or the California Endangered Species Act (CESA). Specific protections and permitting mechanisms for these species differ under each of these acts, and a species' designation under one law does not automatically provide protection under the other.

The ESA (16 USC 1531 et seq.) is implemented by the USFWS and the National Marine Fisheries Service (NMFS). The USFWS and NMFS maintain lists of endangered and threatened plant and animal species (referred to as "listed species"). "Proposed" or "candidate" species are those that are being considered for listing and are not protected until they are formally listed as threatened or endangered. Under the ESA, authorization must be obtained from the USFWS or NMFS prior to take of any listed species. "Take" under the ESA is defined as "harass, harm, pursue, hunt, shoot,

wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Take under the ESA includes direct injury or mortality to individuals, disruptions in normal behavioral patterns resulting from factors such as noise and visual disturbance and impacts to habitat for listed species. Actions that may result in take of an ESA-listed species may obtain a permit under ESA Section 10, or via the interagency consultation described in ESA Section 7. Federal-listed plant species are only protected when removal or destruction occurs on federal land; however, if a federal agency authorizes, funds, or carries out an action, that agency must insure through Section 7 consultation that the action is not likely to jeopardize the continued existence of the species.

The ESA also provides for designation of critical habitat, which are specific geographic areas containing physical or biological features "essential to the conservation of the species." Protections afforded to designated critical habitat apply only to actions that are funded, permitted, or carried out by federal agencies. Critical habitat designations do not affect activities by private landowners if there is no other federal agency involvement.

The CESA (CFGC 2050 et seq.) prohibits the take of any plant and animal species that the CFGC determines to be an endangered or threatened species in California. CESA regulations include take protection for threatened and endangered plants on private lands, as well as extending this protection to candidate species that are proposed for listing as threatened or endangered under CESA. The definition of a "take" under CESA ("hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill") only applies to direct impact to individuals, and does not extend to habitat impacts or harassment. CDFW may issue an Incidental Take Permit under CESA to authorize take if it is incidental to otherwise lawful activity and if specific criteria are met. Take of these species is also authorized if the geographic area is covered by a Natural Community Conservation Plan (NCCP), as long as the NCCP covers that activity. CDFW may also authorize take for voluntary restoration projects through the Restoration Management Permit (RMP).

Fully Protected Species and Designated Rare Plant Species. This category includes specific plant and wildlife species that are designated in the CFGC as protected even if not listed under CESA or ESA. Fully Protected Species includes specific lists of birds, mammals, reptiles, amphibians, and fish designated in CFGC. Fully protected species may not be taken or possessed at any time. No licenses or permits may be issued for take of fully protected species, except for necessary scientific research and conservation purposes. The definition of "take" is the same under the California Fish and Game Code and the CESA. By law, CDFW may not issue an Incidental Take Permit for Fully Protected Species. Under the California Native Plant Protection Act (NPPA), CDFW has listed 64 "rare" or "endangered" plant species, and prevents "take," with few exceptions, of these species. CDFW may authorize take of species protected by the NPPA through the Incidental Take Permit process, or under a NCCP. CDFW may also authorize take for voluntary restoration projects through the Restoration Management Permit (RMP).

Special Protections for Nesting Birds and Bats. The federal Bald and Golden Eagle Protection Act provides relatively broad protections to both of North America's eagle species [bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*)] that in some regards are similar to those provided by the ESA. In addition to regulations for special-status species, most native birds in the United States, including non-status species, have baseline legal protections under the Migratory Bird Treaty Act of 1918 and CFGC, i.e., sections 3503, 3503.5 and 3513. Under these laws/codes, the intentional harm or collection of adult birds as well as the

intentional collection or destruction of active nests, eggs, and young is illegal. For bat species, the Western Bat Working Group (WBWG) designates conservation status for species of bats, and those with a high or medium-high priority are typically given special consideration under CEQA.

Essential Fish Habitat. The Magnuson-Stevens Fishery Conservation and Management Act provides for conservation and management of fishery resources in the U.S., administered by NMFS. This Act establishes a national program intended to prevent overfishing, rebuild overfished stocks, ensure conservation, and facilitate long-term protection through the establishment of Essential Fish Habitat (EFH). EFH consists of aquatic areas that contain habitat essential to the long-term survival and health of fisheries, which may include the water column, certain bottom types, vegetation (e.g., eelgrass (*Zostera* spp.)), or complex structures such as oyster beds. Any federal agency that authorizes, funds, or undertakes action that may adversely affect EFH is required to consult with NMFS.

Species of Special Concern, Movement Corridors, and Other Special-status Species under CEQA. A Species of Special Concern (SSC) is a species formally designated by the CDFW which meets one or more criteria related to a Federal ESA status (if it is not listed under CESA), including extirpation from California, documented population declines, or small population size within California and risk of declines. In addition, CDFW has developed a special animals list as "a general term that refers to all of the taxa the CNDDB is interested in tracking, regardless of their legal or protection status." This list includes lists developed by other organizations, including for example, the Audubon Watch List Species, the Bureau of Land Management Sensitive Species, and USFWS Birds of Conservation Concern. Plant species on the California Native Plant Society (CNPS) Rare Plant Inventory (Inventory; CNPS 2024) with California Rare Plant Ranks (Rank) of 1 and 2, as well as some with a Rank of 3 or 4, are also considered special-status plant species and must be considered under CEQA. Some Rank 3 and Rank 4 species are typically only afforded protection under CEQA when such species are particularly unique to the locale (e.g., range limit, low abundance/low frequency, limited habitat) or are otherwise considered locally rare. Additionally, any species listed as sensitive within local plans, policies and ordinances are likewise considered sensitive. Movement and migratory corridors for native wildlife (including aquatic corridors) as well as wildlife nursery sites are given special consideration under CEQA.

2.2 Local Plans and Policies

City of Novato Tree Ordinance (Private Property)

The City of Novato Tree Ordinance defines a "tree" on private property as any native or non-native woody plant having a major trunk or trunk of a diameter of 6 inches or greater measured at 24 inches above grade, and a "heritage tree" is defined as any tree having a diameter of 24 inches or greater, measured at 24 inches above grade (Ord. No. 1576, § 2 [Exhibit A], 10-23-12). The alteration or removal of a heritage tree on any parcel or of one ore more tree on an undeveloped parcel is prohibited without a permit from the City of Novato (Ord. No. 1441 § 2(E); Ord. No. 1576, § 2 [Exhibit A], 10-23-2012).

City of Novato Tree Ordinance (Public Places)

The City of Novato Tree Ordinance defines a "tree" on or adjacent to public places as any woody perennial plant having a single main axis or stem commonly achieving ten feet in height and capable of shaping and pruning to develop a branch-free trunk at least nine feet in height, and a "shrub" is defined as any woody perennial plant, normally low, several stemmed, adaptable to shaping, trimming and pruning without injury within the area planted (Ord. No.

1576, § 2 [Exhibit A], 10-23-12). The trimming, alteration, or removal of and street tree or shrub is prohibited without approval from the City of Novato (Ord. No. 1441 § 2(E); Ord. No. 1576, § 2(E), 10-23-2012).

City of Novato Wetland Protection and Restoration

The City of Novato municipal code stipulates that any development shall be designed and constructed to avoid wetlands to the maximum extent feasible (Ord. No. 1576, § 2 [Exhibit A, amd.], 10-23-2012). Wetlands are defined as waters delineated by the Corps under the provisions of the CWA. Permit approval is required for any project within 50 feet of a wetland, requiring wetland protection measures, involving wetland/encroachment, or requiring wetland mitigation; and, for all wetland protection, restoration, enhancement, and/or mitigation projects (Ord. No. 1576, § 2 [Exhibit A, amd.], 10-23-2012).

City of Novato Waterways and Riparian Protection

The City of Novato municipal code stipulates that all lands adjoining or encompassing watercourses and their significant tributaries shall be subject to a Stream Protection Zone (Ord. No. 1576, § 2 [Exhibit A, amd.], 10-23-2012). These lands are shown on "ES- 1" within the General Plan. A Stream Protection Zone includes the streambed, stream banks, all riparian vegetation, and an upland buffer at least 50 feet wide measured from top of the channel bank. Proposed development, land uses *and* activities including any proposed development application, land division, use permit, grading or building permit for any excavation, fill, grading, or paving; removal or planting of vegetation; construction, alteration, or removal of any structure; or alteration of any embankment within the Stream *Protection* Zone requires Use Permit approval (Ord. No. 1576, § 2 [Exhibit A, amd.], 10-23-2012).

3.0 ASSESSMENT METHODOLOGY

On March 29 and December 13, 2023, WRA, Inc. (WRA) biologists visited the Study Area to map vegetation, aquatic features, and other land cover types; document plant and wildlife species present; and evaluate on-site habitat for the potential to support special-status species as defined by CEQA. Prior to the site visit, WRA biologists reviewed literature resources and performed database searches to assess the potential for sensitive land cover types and special-status species, including:

- Contemporary aerial photographs (Google Earth 2024)
- Historical aerial photographs (NETR 2024)
- National Wetlands Inventory (USFWS 2024a)
- California Aquatic Resources Inventory (SFEI 2024)
- CNDDB (CDFW 2024b)
- CNPS Inventory (CNPS 2024)
- Consortium of California Herbaria (CCH1 2024, CCH2 2024)
- USFWS Information for Planning and Consultation (USFWS 2024b)
- eBird Online Database (Cornell Lab of Ornithology 2024)
- California Bird Species of Special Concern in California (Shuford and Gardali 2008)

- California Amphibian and Reptile Species of Special Concern (Thomson et al. 2016)
- A Field Guide to Western Reptiles and Amphibians (Stebbins 2003)
- A Manual of California Vegetation, Online Edition (CNPS 2024)
- California Natural Community List (CDFW 2024a)
- Database searches (i.e., CNDDB, CNPS) for special-status species focused on the Novato and eight surrounding USGS 7.5-minute quadrangles.

Following the remote assessment, WRA biologists completed a field review over the course of 2 days to document: (1) land cover types (e.g., vegetation communities, aquatic resources), (2) existing conditions and to determine if such provide suitable habitat for any special-status plant or wildlife species, (3) if and what type of aquatic land cover types (e.g., wetlands) are present, and (4) if special-status species are present.

3.1 Vegetation Communities and Other Land Cover Types

During the site visit, WRA evaluated the species composition and area occupied by distinct vegetation communities, aquatic communities, and other land cover types. Mapping of these classifications utilized a combination of aerial imagery and ground surveys. In most instances, communities are characterized and mapped based on distinct shifts in plant assemblage (vegetation) and follow the California Natural Community List (CDFW 2024a) and A Manual of California Vegetation, Online Edition (CNPS 2024). These resources cannot anticipate every component of every potential vegetation assemblage in California, and so in some cases, it is necessary to identify other appropriate vegetative classifications based on best professional judgment of WRA biologists. When undescribed variants are used, it is noted in the description. Vegetation alliances (natural communities) with a CDFW Rank of 1 through 3 (globally critically imperiled [S1/G1], imperiled [S2/G2], or vulnerable [S3/G3]) (CDFW 2024a), were evaluated as sensitive as part of this evaluation.

The Study Area was reviewed for the presence of wetlands and other aquatic resources according to the methods described in the Corps Manual (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West* (Corps 2008). The presence of riparian habitat was evaluated based on woody plant species meeting the definition of riparian provided in *A Field Guide to Lake and Streambed Alteration Agreements, Section 1600-1607, California Fish and Game Code* (CDFG 1994) and based on best professional judgement of biologists completing the field surveys.

3.2 Special-status Species

3.2.1 General Assessment

Potential occurrence of special-status species in the Study Area was evaluated by first determining which special-status species occur in the vicinity of the Study Area through a literature and database review as described above. Presence of suitable habitat for special-status species was evaluated during the site visits based on physical and biological conditions in the Study Area as well as the professional expertise of the investigating biologists. The potential for each special-status species to occur in the Study Area was then determined according to the following criteria:

- **No Potential.** Habitat on and adjacent to the Study Area is clearly unsuitable for the species requirements (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).
- **Unlikely.** Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the Study Area is unsuitable or of very poor quality. The species is not likely to be found in the Study Area.
- **Moderate Potential.** Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the Study Area is unsuitable. The species has a moderate probability of being found in the Study Area.
- **High Potential.** All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the Study Area is highly suitable. The species has a high probability of being found in the Study Area.
- **Present.** Species is observed on the Study Area or has been recorded (i.e., CNDDB, other reports) in the Study Area in the recent past.

If a more thorough assessment was deemed necessary, a targeted or protocol-level assessment or survey was conducted or recommended as a future study. If a special-status species was observed during the site visits, its presence was recorded and discussed below in Section 5.2. If designated critical habitat is present for a species, the extent of critical habitat present and an evaluation of critical habitat elements is provided as part of the species discussions below.

3.3 Wildlife Corridors and Native Wildlife Nursery Sites

To account for potential impacts to wildlife movement/migratory corridors, biologists reviewed maps from the California Essential Connectivity Project (CalTrans 2010), and habitat connectivity data available through the CDFW Biogeographic Information and Observation System (CDFW 2024). Additionally, aerial imagery (Google Earth 2024) for the local area was referenced to assess if local core habitat areas were present within, or connected to the Study Area. This assessment was refined based on observations of on-site physical and/or biological conditions, including topographic and vegetative factors that can facilitate wildlife movement, as well as on-site and off-site barriers to connectivity.

The potential presence of native wildlife nursery sites is evaluated as part of the site visits and discussion of individual wildlife species below. Examples of native wildlife nursery sites include nesting sites for native bird species (particularly colonial nesting sites), marine mammal pupping sites, and colonial roosting sites for other species (such as for monarch butterfly [*Danaus plexippus*]).

4.0 ECOLOGICAL SETTING

The Study Area is located in Novato, and includes all areas potentially affected by the Project. Additional details of the local setting are below.

4.1 Soils and Topography

The overall topography of the Study Area is flat with elevations ranging from approximately 10-100 feet above sea level. According to SoilWeb (CSRL 2024) and Web Soil Survey (USDA 2024), the Study Area is underlain by two soil mapping units: Xerorthents-Urban land complex, 0 to 9 percent slope and Saurin-Urban land-Bonnydoon complex, 30 to 50 percent slope. Neither soil mapping unit is considered hydric (USDA 2024). The parent soil series of all the Study Area's mapping units are summarized below.

Xerorthents: Xerorthents occur on valley floors covered in fill from cut or fill soils at various depths with various drainage. This mapping unit is used for homesites, urban, and recreational development (CSRL 2024).

Urban Land: Urban land consists of areas covered by roads, driveways, houses, parking lots and other structures. The underlain soil is similar to xerorthents (CSRL 2024).

Saurin Series: This series consists of moderately deep clay loam, formed in material derived from sandstone and shale in uplands. This series is well drained with slow to very rapid runoff and moderate permeability. This soil series is used for rangeland, watershed, and wildlife habitat. Typical vegetation is annual grassland (CSRL 2024).

Bonnydoon Series: This series consists of shallow loam formed in material weathered from sandstone and shale in uplands. This series is somewhat excessively drained with medium to rapid runoff and moderate permeability. Typical land use includes rangeland, wildlife habitat, and some homesites. Typical vegetation includes annual grassland (CSRL 2024).

4.2 Climate and Hydrology

The Study Area is located in the inland region of Marin County. The average monthly maximum temperature in the area is 70 degrees Fahrenheit, while the average monthly minimum temperature is 48 degrees Fahrenheit. Predominantly, precipitation falls as rainfall between November and March with an annual average precipitation of 36 inches.

The local watershed is Miller Creek-Frontal San Pablo Bay Estuaries (HUC 12: 180500020607) and the regional watershed is San Pablo Bay (HUC 8: 18050002). The Study Area is located in the western portion of the San Pablo Bay watershed. There are no blue-line streams in the Study Area (USGS 2018) nor are there aquatic resources identified in the California Aquatic Resources Inventory (CARI) or National Wetland Inventory (NWI) (SFEI 2017, USFWS 2024). There are blue-line streams located adjacent to Sites 2 and 4. Detailed descriptions of aquatic resources are provided in Section 5.1 below.

4.3 Land Use

The majority of the Study Area is developed. Developed areas include landscaping and hardscaping (sidewalks, pavement, and the existing pump station). Detailed land cover type

descriptions are included in Section 5.1 below, and all observed plant species are included in Appendix B. Surrounding land uses include residential and commercial development, urban parks, and open space (Google Earth 2024).

5.0 ASSESSMENT RESULTS

5.1 Vegetation Communities and Other Land Cover

WRA observed two land cover types within the Study Area: developed/landscaped and ruderal herbaceous. Land cover types within the Study Area are illustrated in Appendix A – Figure 2. There are no sensitive communities within the Study Area. For a full list of species observed during the site visits, see Appendix B.

Table 1: Vegetation Communities and Other Land Cover Types

COMMUNITY / LAND COVERS	SENSITIVE STATUS	RARITY RANKING	ACRES WITHIN STUDY AREA
TERRESTRIAL / COMMUNITY LAND COVER			
Developed/ Landscaped	Non-sensitive	None	0.63 acres
Ruderal herbaceous	Non-sensitive	None	0.17 acres

5.1.1 Terrestrial Land Cover

Developed/ Landscaped Area (no vegetation alliance). CDFW Rank: None. The majority of the Study Area is developed and includes landscaping, sidewalks, pavement, and the existing structures. The developed areas total 0.63 acres in the Study Area. The vegetation composition varied from site to site. Herbaceous vegetation included Crane's bill geranium (*Geranium molle*), burclover (*Medicago polymorpha*), slim oat (*Avena barbata),* bristly ox-tongue *(Helminthotheca echioides)* and stinkwort (*Dittrichia graveolens*). Landscaping trees included olive (*Olea sp.),* mulberry (*Morus* sp.), valley oak (*Quercus lobata*), and Siberian elm (*Ulmus parvifolia*). Several landscaped areas included wood chips.

Ruderal herbaceous (no vegetation alliance). CDFW Rank: None: Within the Study Area, this community is located in a relatively flat area, contains a very low diversity of native species, and is surrounded by the existing paved roads, sidewalks, and landscaping. The ruderal herbaceous areas total 0.17 acres in the Study Area. Dominant herbs include greater periwinkle (*Vinca major*), fennel (*Foeniculum vulgare*), bur clover, slim oat, *and* bristly ox-tongue.

5.1.2 Aquatic Resources

No seasonal wetlands were observed within the Study Area. Site 2 and Site 4 are located within 50 feet of riparian vegetation associated with Arroyo San Jose and Pacheco Creek, respectively.

5.2 Special-status Species

5.2.1 Special-status Plants

No special-status plants have been documented on or adjacent to the Study Area (CDFW 2024). Species observed within the Study Area during the March 29 and December 13, 2023 site visits are listed in Appendix B. Based upon a review of the resource databases listed in Section 3.0, 105 special-status plant species have been documented in the vicinity of the Study Area. Appendix C summarizes the potential for each of these species to occur within the Study Area.

Of the 105 special-status species, all are considered unlikely, or have no potential, to occur in the Study Area for one or more of the following reasons:

- Hydrologic conditions (e.g., tidal, riverine) necessary to support the special-status plant species are not present in the Study Area;
- Edaphic (soil) conditions (e.g., volcanic tuff, serpentine) necessary to support the special-status plant species are not present in the Study Area;
- Topographic conditions (e.g., north-facing slope, montane) necessary to support the special-status plant species are not present in the Study Area;
- Unique pH conditions (e.g., alkali scalds, acidic bogs) necessary to support the special-status plant species are not present in the Study Area;
- Associated natural communities (e.g., interior chaparral, tidal marsh) necessary to support the special-status plant species are not present in the Study Area;
- The Study Area is geographically isolated (e.g. below elevation, coastal environ) from the documented range of the special-status plant species;
- The historical landscape and/or habitat(s) of the Study Area were not suitable habitat prior to land/type conversion (e.g., reclaimed shoreline) to support the special-status plant species;
- Land use history and contemporary management (e.g., grading, development) has degraded the localized habitat necessary to support the special-status plant species.

5.2.2 Special-status Wildlife

No special-status wildlife species have been documented on or adjacent to the Study Area (CDFW 2024). Species observed within the Study Area during the March 29 and December 13, 2023 site visits are listed in Appendix B. Based upon a review of the resource databases listed in Section 3.0, 54 special-status wildlife species have been documented in the vicinity of the Study Area. Appendix C summarizes the potential for each of these species to occur within the Study Area. Of the 54 special-status species, all are considered unlikely, or have no potential, to occur in the Study Area based on a lack of habitat features.

Features not found within the Study Area that are required to support special-status wildlife species include:

- Vernal pools
- Perennial aquatic habitat (e.g. streams, rivers or ponds)
- Tidal marsh areas
- Old growth redwood or fir forest
- Open grassland
- Sandy beaches or alkaline flats
- Presence of specific host plants
- Caves, mine shafts, or abandoned buildings

The absence of such habitat features eliminates components critical to the survival or movement of special-status species found in the vicinity. Given the Study Area's relative proximity to sensitive habitats on the San Francisco Bay, many species documented nearby are additionally obligates to marine or tidal marsh habitats which are not present on or in the immediate vicinity of the Study Area.

5.3 Wildlife Corridors and Native Wildlife Nursery Sites

No native wildlife nursery sites are present in the Study Area.

Wildlife movement between suitable habitat areas can occur via open space areas lacking substantial barriers. The terms "landscape linkage" and "wildlife corridor" are often used when referring to these areas. The key to a functioning corridor or linkage is that it connects two larger habitat blocks, also referred to as core habitat areas (Soulé and Terbough 1999; Beier and Loe 1992). It is useful to think of a "landscape linkage" as being valuable in a regional planning context, a broad scale mapping of natural habitat that functions to join two larger habitat blocks. The term "wildlife corridor" is useful in the context of smaller, local area planning, where wildlife movement may be facilitated by specific local biological habitats or passages and/or may be restricted by barriers to movement. Above all, wildlife corridors must link two areas of core habitat and should not direct wildlife to developed areas or areas that are otherwise void of core habitat (Hilty et al. 2019).

The Study Area is not within a designated wildlife corridor (CalTrans 2010). The sites are generally located within a larger tract of developed land within the City of Novato. Riparian areas and stream channels adjacent to Site 2 and Site 4 may facilitate movement of resident wildlife species at a local scale. However, the Study Area itself is set back from riparian habitat and is immediately bordered by roadways, residential development, and commercial development, which likely creates a barrier for wildlife with limited crossing opportunities.

6.0 ANALYTICAL METHODOLOGY AND SIGNIFICANCE THRESHOLD CRITERIA

Pursuant to Appendix G, Section IV of the State CEQA Guidelines, a project would have a significant impact on biological resources if it would:

1. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or U.S. Fish and Wildlife Service;
2. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or U.S. Fish and Wildlife Service;
3. Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means
4. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
5. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; and/or,
6. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

These thresholds were utilized in completing the analysis of potential project impacts for CEQA purposes. For the purposes of this analysis, a "substantial adverse effect" is generally interpreted to mean that a potential impact could directly or indirectly affect the resiliency or presence of a local biological community or species population. Potential impacts to natural processes that support biological communities and special-status species populations that can produce similar effects are also considered potentially significant. Impacts to individuals of a species or small areas of existing biological communities may be considered less than significant if those impacts are speculative, beneficial, de minimis, and/or would not affect the resiliency of a local population.

7.0 IMPACTS AND MITIGATION EVALUATION

Using the CEQA analysis methodology outlined in Section 6.2 above, the following section describes potential significant impacts to sensitive resources within the Project Area as well as suggested mitigation measures which are expected to reduce impacts to less than significant.

7.1 Special-status Species

This section analyzes the Project's potential impacts and mitigation for special-status species in reference to the significance threshold outlined in CEQA Appendix G, Part IV (a):

> *Does the project have the potential to have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or U.S. Fish and Wildlife Service?*

Potential impacts and mitigation for potentially significant impacts are discussed below.

Nesting Birds

Special-status bird species are unlikely to nest within the Study Area. However, common birds protected under the MBTA and CFGC may nest within trees or on the ground within the Study Area. Impacts to nesting birds or their eggs and young would be considered a potentially significant impact.

> **Potential Impact BIO-1:** Potential impacts to nesting bird species from the proposed Project include disturbance to nesting birds and possibly death of adults and/or young. Impacts to nesting birds from the proposed Project would be potentially significant.

To reduce potential impacts to nesting bird species to a less-than-significant level, the following measure will be implemented:

> **Mitigation Measure BIO-1:** If Project activities must be conducted during the nesting season (February 15 and September 1), a pre-construction nesting bird survey will be conducted by a qualified biologist no more than 7 days prior to vegetation removal or initial ground disturbance. The survey will include the Study Area and within a minimum 500 feet of all Project areas to identify the location and status of any nests that could potentially be affected either directly or indirectly by Project activities.
>
> If active nests of native nesting bird species are located during the preconstruction nesting bird survey, a work exclusion zone will be established around each nest by the qualified biologist. Established exclusion zones will remain in place until all young in the nest have fledged or the nest otherwise becomes inactive (e.g., due to predation). Suggested buffer zone distances differ depending on species, location, baseline conditions, and placement of nest and shall be determined in the field by a qualified biologist.

Implementation of this mitigation measure will reduce potential impacts to nesting birds to a level that is less than significant pursuant to CEQA.

7.2 Sensitive Natural Communities and Land Cover Types

This section addresses the question:

b) Does the Project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or U.S. Fish and Wildlife Service;

No sensitive natural communities were observed within the Study Area.

Site 2 and Site 4 are located within 50 feet of riparian vegetation associated with Arroyo San Jose and Pacheco Creek, respectively. No impacts to riparian vegetation are anticipated if the staging areas are not located under dripline of riparian vegetation. The Project will have no impacts to sensitive natural communities.

7.3 Aquatic Resources

This section analyzes the Project's potential impacts and mitigation for wetlands and other areas presumed or determined to be within the jurisdiction of the Corps or BCDC in reference to the significance threshold outlined in CEQA Appendix G, Part IV (c):

c) Does the Project have the potential to have a substantial adverse effect on state or federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;

No aquatic resources were observed within the Study Area. All adjacent streams will be avoided by the project. The Project will have no impacts to aquatic resources.

7.4 Wildlife Corridors and Native Wildlife Nursery Sites

This section analyzes the Project's potential impacts and mitigation for habitat corridors and linkages in reference to the significance threshold outlined in CEQA Appendix G, Part IV (d):

d) Does the Project have the potential to interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;

The Study Area does not serve as a migration corridor. The Project will have no impacts to wildlife corridors.

7.5 Local Policies and Ordinances

This section analyzes the Project's potential impacts and mitigation based on conflicts with local policies and ordinances in reference to the significance threshold outlined in CEQA Appendix G, Part IV (e):

e) Does the Project have the potential to conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance;

A limited amount of tree removal may be required for the Project, as needed for construction. Some of the trees removed may be protected by local ordinances.

Upland areas within 50 feet of streambanks or riparian vegetation is subject to a Stream Protection Zone per the City of Novato Waterways and Riparian Protection Ordinance. Site 2 and Site 4 are located within 50 feet of riparian vegetation (Arroyo San Jose and Pacheco Creek, respectively). The District is not required to comply with the City of Novato Ordinances. As such, there is no potential conflict with these local ordinances and there is no impact due to tree removal or proposed development within the Stream Protection Zone.

7.6 Habitat Conservation Plans

This section analyzes the Project's potential impacts and mitigation based on conflicts with any adopted local, regional, and state habitat conservation plans in reference to the significance threshold outlined in CEQA Appendix G, Part IV (f):

> *f) Does the Project have the potential to conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.*

The proposed project will not conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan. No such plan exists applicable to the Study Area. No impact will occur.

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APPENDIX A. FIGURES

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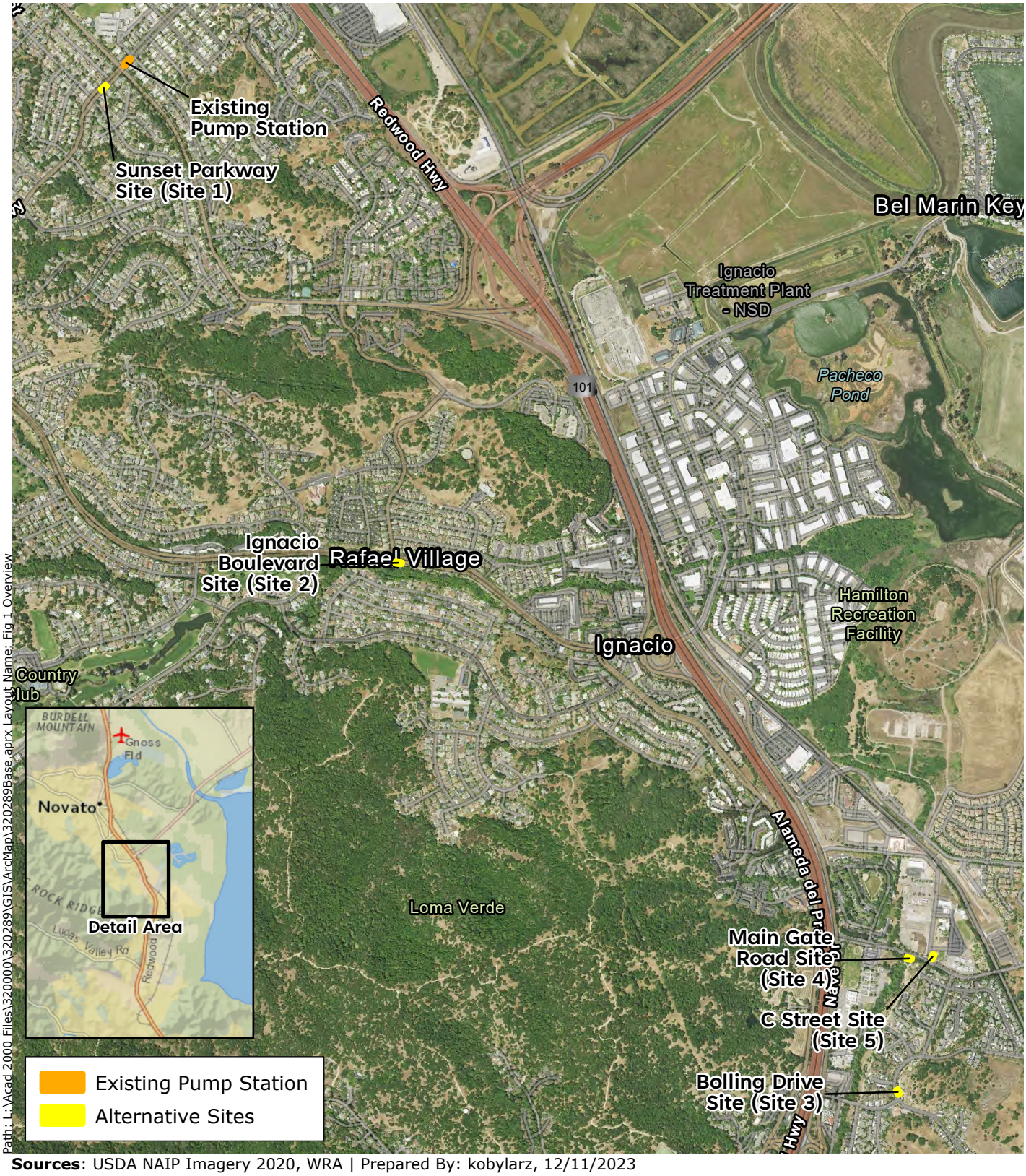

Sources: USDA NAIP Imagery 2020, WRA | Prepared By: kobylarz, 12/11/2023

Figure 1. Project Regional Location Map

North Marin Water District
Lynwood Pump Station Replacement
Novato, California

0 0.25 0.5 Miles

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wra Environmental Consultants

Sources: USDA NAIP Imagery 2020, WRA | Prepared By: kobylarz, 1/4/2024

Figure 2. Land Cover Types within the Project Site and Staging Areas: Sunset Parkway Site (Site 1)

North Marin Water District
Lynwood Pump Station Replacement
Novato, California

0 50 100 Feet

N

wra Environmental Consultants

Sources: USDA NAIP Imagery 2020, WRA | Prepared By: kobylarz, 1/4/2024

Figure 3. Land Cover Types within the Project Site and Staging Areas: Ignacio Boulevard Site (Site 2)

North Marin Water District
Lynwood Pump Station Replacement
Novato, California

0 50 100 Feet

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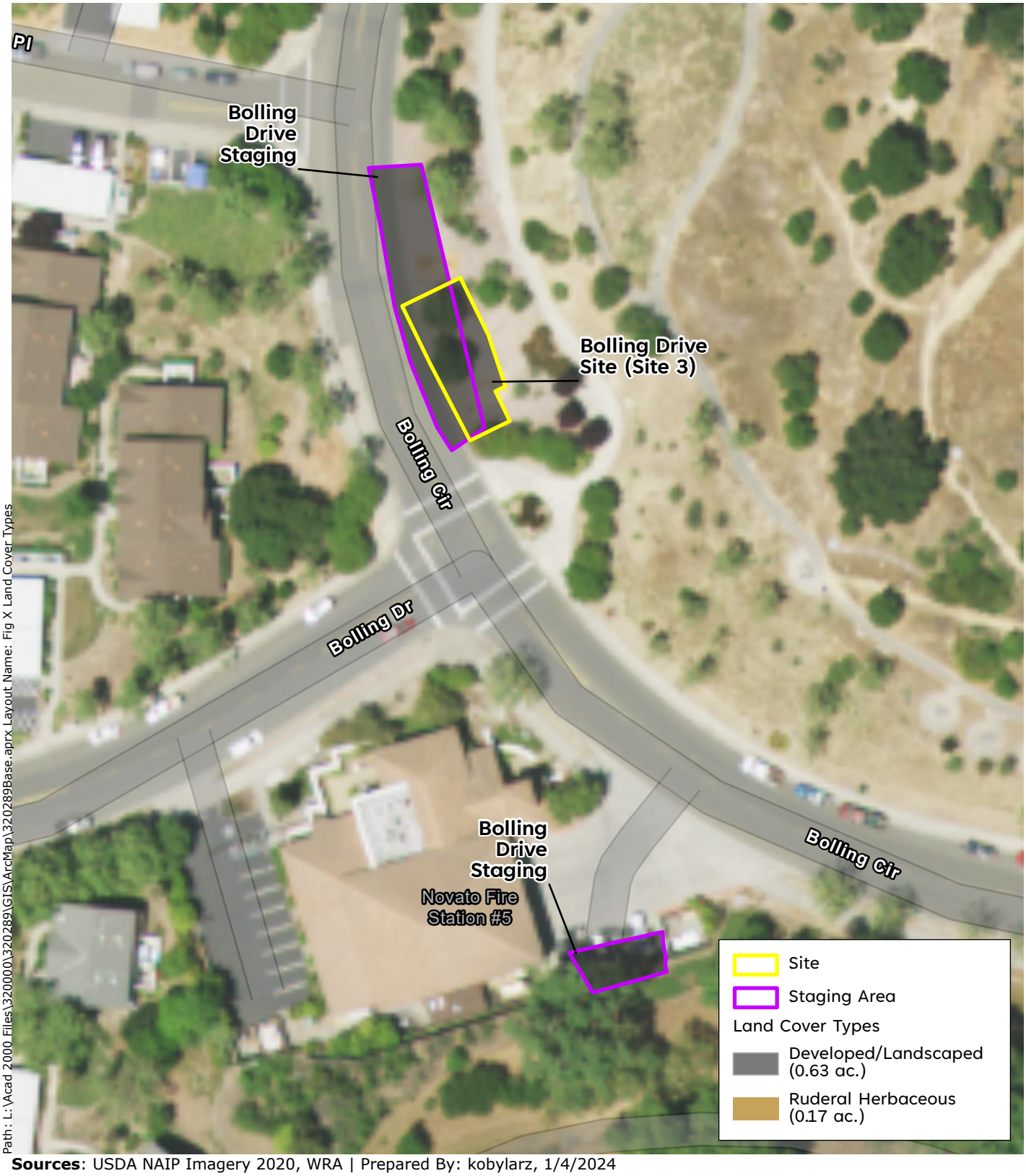

Sources: USDA NAIP Imagery 2020, WRA | Prepared By: kobylarz, 1/4/2024

Figure 4. Land Cover Types within the Project Site and Staging Areas: Bolling Drive Site (Site 3)

North Marin Water District
Lynwood Pump Station Replacement
Novato, California

0 50 100 Feet

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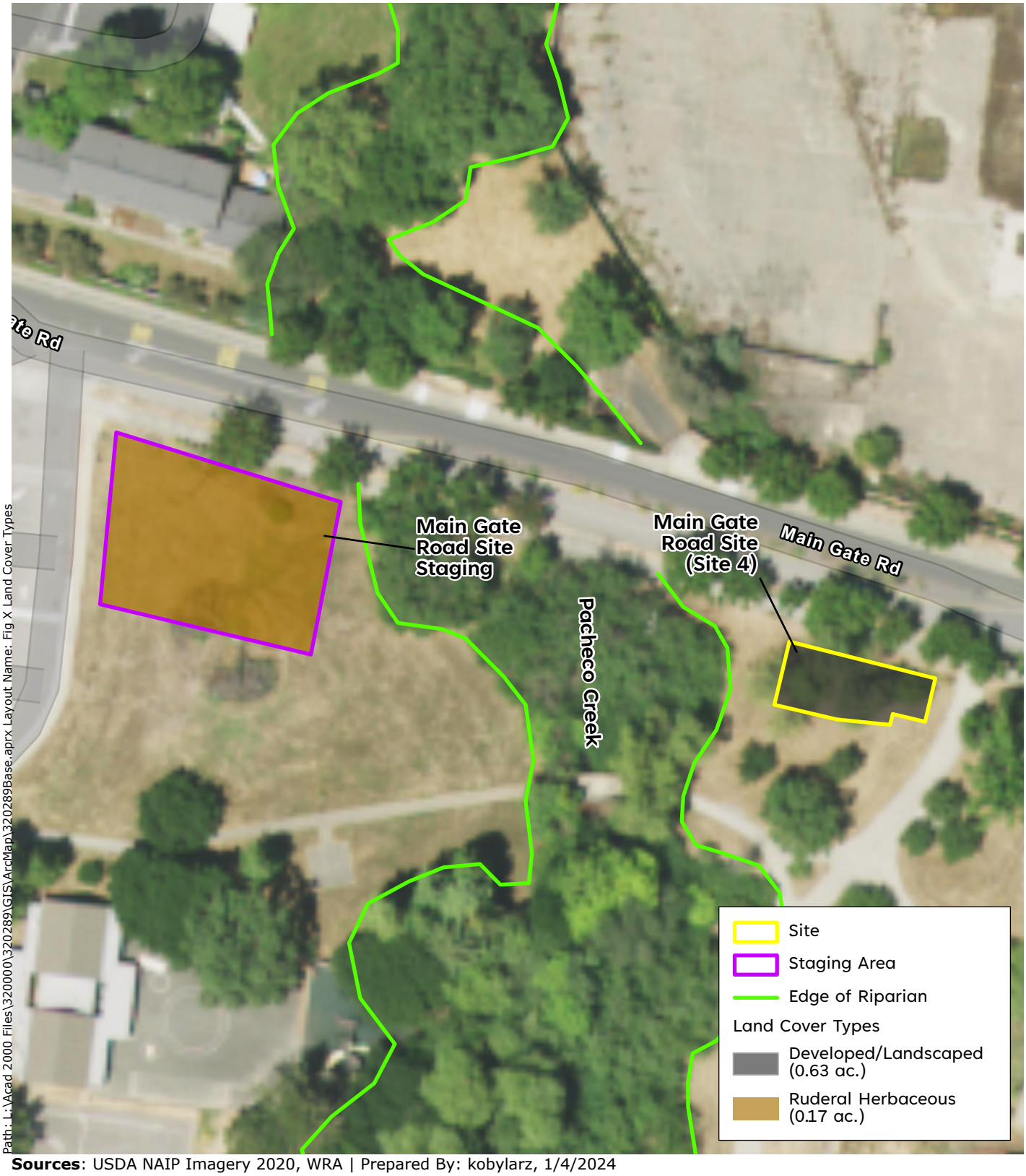

Sources: USDA NAIP Imagery 2020, WRA | Prepared By: kobylarz, 1/4/2024

Figure 5. Land Cover Types within the Project Site and Staging Areas: Main Gate Road Site (Site 4)

North Marin Water District
Lynwood Pump Station Replacement
Novato, California

0 50 100 Feet

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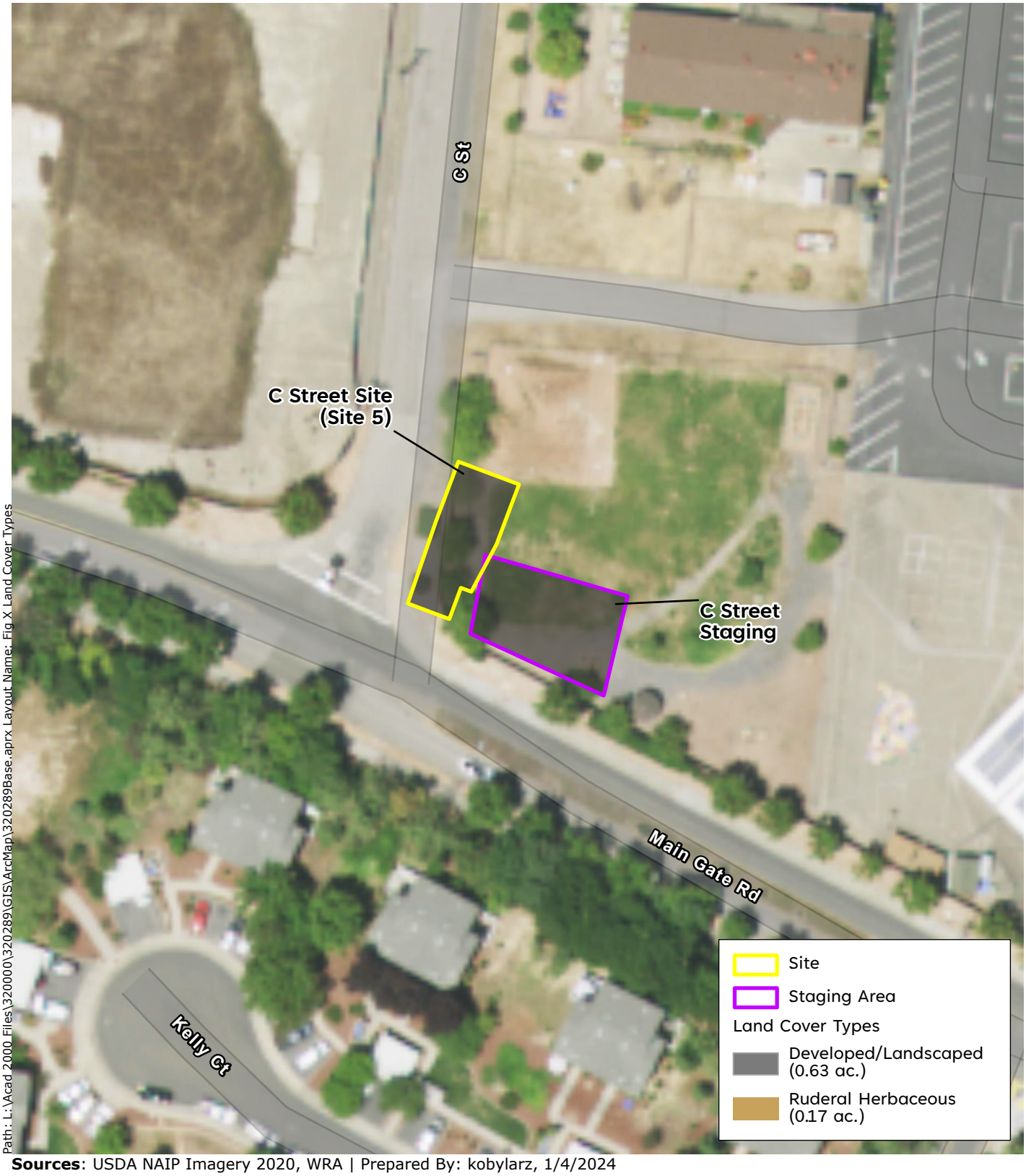

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Sources: USDA NAIP Imagery 2020, WRA | Prepared By: kobylarz, 1/4/2024

Figure 6. Land Cover Types within the Project Site and Staging Areas: C Street Site (Site 5)

North Marin Water District
Lynwood Pump Station Replacement
Novato, California

0 50 100 Feet

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wra Environmental Consultants

APPENDIX B. SPECIES OBSERVED IN AND AROUND THE STUDY AREA

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Appendix B. Plant species observed in the Study Area on March 29 and December 13, 2023

SCIENTIFIC NAME	COMMON NAME	LIFE FORM	ORIGIN	RARE STATUS[1]	INVASIVE STATUS[2]	WETLAND INDICATOR[3]
Achillea millefolium	Common yarrow	Native	perennial herb	-	-	FACU
Avena barbata	Slim oat	non-native (invasive)	annual, perennial grass	-	Moderate	-
Arctostaphylos sp.	manzanita	Native	Shrub	-	-	-
Baccharis pilularis	Coyote brush	native	shrub	-	-	-
Bromus diandrus	Ripgut brome	non-native (invasive)	annual grass	-	Moderate	-
Bromus hordeaceus	Soft chess	non-native (invasive)	annual grass	-	Limited	FACU
Centaurea solstitialis	Yellow starthistle	non-native (invasive)	annual herb	-	High	-
Cercis occidentalis	western redbud	native	tree, shrub	-	-	-
Cirsium vulgare	Bull thistle	non-native (invasive)	perennial herb	-	Moderate	FACU
Cortaderia jubata	Andean pampas grass	non-native (invasive)	perennial grass	-	High	FACU
Cotoneaster sp.	Cotoneaster	non-native (invasive)	shrub	-	-	-
Dittrichia graveolens	Stinkwort	non-native (invasive)	annual herb	-	Moderate	-
Erodium botrys	broadleaf filaree	non-native	annual herb	-	-	FACU
Erodium cicutarium	Red stemmed filaree	non-native (invasive)	annual herb	-	Limited	-
Festuca perennis	Italian rye grass	non-native (invasive)	annual, perennial grass	-	Moderate	FAC
Foeniculum vulgare	Fennel	non-native (invasive)	perennial herb	-	High	-
Galium aparine	Cleavers	native	annual herb	-	-	FACU
Geranium dissectum	Wild geranium	non-native (invasive)	annual herb	-	Limited	-
Geranium molle	Crane's bill geranium	non-native	annual, perennial herb	-	-	-
Hedera helix	English ivy	non-native (invasive)	vine, shrub	-	High	FACU
Helminthotheca echioides	Bristly ox-tongue	non-native (invasive)	annual, perennial herb	-	Limited	FAC
Hirschfeldia incana	Short-podded mustard	non-native (invasive)	perennial herb	-	Moderate	-
Hypochaeris radicata	Hairy cats ear	non-native (invasive)	perennial herb	-	Moderate	FACU
Juniperus sp.	Juniper	-	shrub	-	-	-
Lagerstroemia indica	Crepe myrtle	Non-native	Tree	-	-	-
Lactuca serriola	Prickly lettuce	non-native	annual herb	-	-	FACU

SCIENTIFIC NAME	COMMON NAME	LIFE FORM	ORIGIN	RARE STATUS[1]	INVASIVE STATUS[2]	WETLAND INDICATOR[3]
Ligustrum lucidum	Glossy privet	non-native (invasive)	tree, shrub	-	Limited	-
Lotus corniculatus	bird's foot trefoil	non-native	perennial herb	-	-	FAC
Madia sp.	Tarweed	-	-	-	-	-
Malva sp.	Mallow	Non-native	Annual herb	-	-	-
Medicago polymorpha	Bur clover	non-native (invasive)	annual herb	-	Limited	FACU
Morus alba	Mulberry	Non-native	tree	-	-	-
Olea europeaea	Olive	Non-native	tree	-	-	-
Oxalis pes-caprae	Bermuda buttercup	non-native (invasive)	perennial herb	-	Moderate	-
Paspalum dilatatum	Dallis grass	non-native	perennial grass	-	-	FAC
Platanus x hispanica	Lodon plane trees	Non-native	Tree	-	-	-
Platanus racemosa	California sycamore	native	tree	-	-	FAC
Plantago lanceolata	Ribwort	non-native (invasive)	perennial herb	-	Limited	FAC
Pseudognaphalium luteoalbum	Jersey cudweed	non-native	annual herb	-	-	FAC
Quercus agrifolia	Coast live oak	native	tree	-	-	-
Quercus lobata	Valley oak	native	tree	-	-	FACU
Rhamnus alaternus	Italian buckthorn	non-native	shrub	-	Watch	FACU
Ribes sanguineum	flowering currant	native	shrub	-	-	UPL
Rosmarinus officinalis	Rosemary	non-native	shrub	-	-	-
Rubus armeniacus	Himalayan blackberry	non-native (invasive)	shrub	-	High	FAC
Rumex crispus	Curly dock	non-native (invasive)	perennial herb	-	Limited	FAC
Senecio vulgaris	Common groundsel	non-native	annual herb	-	-	FACU
Solanum sp.	Wild nightshade	Non-native	Annual herb	-	-	-
Sonchus oleraceus	Common sow thistle	non-native	annual herb	-	-	UPL
Taraxacum officinale	Red seeded dandelion	non-native	perennial herb	-	-	FACU
Tulbaghia violacea	Society garlic	non-native	Perennial herb	-	-	-
Ulmus parvifolia	Siberian elm	non-native	tree	-	-	UPL

SCIENTIFIC NAME	COMMON NAME	LIFE FORM	ORIGIN	RARE STATUS[1]	INVASIVE STATUS[2]	WETLAND INDICATOR[3]
Vinca major	Greater periwinkle	non-native (invasive)	perennial herb	-	Moderate	FACU
Washingtonia robusta	Mexican fan palm	non-native (invasive)	tree	-	Moderate	FACW

All species identified using the *Jepson Manual, 2nd Edition* (Baldwin et al. 2012), *The Jepson Flora Project* (eFlora 2024), and *Marin Flora* (Howell et al. 2007); nomenclature follows *The Jepson Flora Project* (eFlora 2024) unless otherwise noted

Sp.: “species”, intended to indicate that the observer was confident in the identity of the genus but uncertain which species
Cf.: “*confer*” or “compared with”, intended to indicate a species appeared to the observer to be specific, but was not identified based on diagnostic characters

[1]Rare Status: The CNPS Inventory of Rare and Endangered Plants (CNPS 2024a)

FE:	Federal Endangered
FT:	Federal Threatened
SE:	State Endangered
ST:	State Threatened
SR:	State Rare
CRPR 1A:	Plants presumed extirpated in California and either rare or extinct elsewhere
CRPR 1B:	Plants rare, threatened, or endangered in California and elsewhere
CRPR 2A:	Plants presumed extirpated in California, but more common elsewhere
CRPR 2B:	Plants rare, threatened, or endangered in California, but more common elsewhere
CRPR 3:	Plants about which we need more information – a review list
CRPR 4:	Plants of limited distribution – a watch list

[2]Invasive Status: California Invasive Plant Inventory (Cal-IPC 2006)

High:	Severe ecological impacts; high rates of dispersal and establishment; most are widely distributed ecologically.
Moderate:	Substantial and apparent ecological impacts; moderate-high rates of dispersal, establishment dependent on disturbance; limited moderate distribution ecologically
Limited:	Minor or not well documented ecological impacts; low-moderate rate of invasiveness; limited distribution ecologically
Assessed:	Assessed by Cal-IPC and determined to not be an existing current threat

[3]Wetland Status: National List of Plant Species that Occur in Wetlands, Arid West Region (Corps 2020)

OBL:	Almost always a hydrophyte, rarely in uplands
FACW:	Usually a hydrophyte, but occasionally found in uplands
FAC:	Commonly either a hydrophyte or non-hydrophyte
FACU:	Occasionally a hydrophyte, but usually found in uplands
UPL:	Rarely a hydrophyte, almost always in uplands
NL:	Rarely a hydrophyte, almost always in uplands
NI:	No information; not factored during wetland delineation

APPENDIX C. SPECIAL-STATUS SPECIES POTENTIAL TABLE

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Appendix C. Potential for Special-status Species to Occur in the Study Area. List compiled from the CDFW BIOS database (CDFW 2023a), USFWS IPaC Report (USFWS 2023), and CNPS Electronic Inventory (CNPS 2023a) searches. The Novato, Petaluma, Petaluma River, Sears Point, San Geronimo, Petaluma Point, Bolinas, San Rafael, and San Quentin USGS 7.5' quadrangles were included in the search.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
PLANTS				
Franciscan onion *Allium peninsulare var. franciscanum*	Rank 1B.2	Cismontane woodland, valley and foothill grassland. Elevation ranges from 170 to 1000 feet (52 to 305 meters). Blooms (Apr)May-Jun.	**No Potential.** The Study Area does not contain woodland or grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.
Sonoma alopecurus *Alopecurus aequalis var. sonomensis*	FE, Rank 1B.1	Marshes and swamps (freshwater), riparian scrub. Elevation ranges from 15 to 1200 feet (5 to 365 meters). Blooms May-Jul.	**No Potential.** The Study Area does not contain marsh, swamp or riparian scrub habitat to support this species.	**Not Present.** No further actions are recommended for this species.
Napa false indigo *Amorpha californica var. napensis*	Rank 1B.2	Broadleafed upland forest (openings), chaparral, cismontane woodland. Elevation ranges from 165 to 6560 feet (50 to 2000 meters). Blooms Apr-Jul.	**No Potential.** The Study Area does not contain forest or woodland habitat to support this species.	**Not Present.** No further actions are recommended for this species.
bent-flowered fiddleneck *Amsinckia lunaris*	Rank 1B.2	Cismontane woodland, coastal bluff scrub, valley and foothill grassland. Elevation ranges from 10 to 1640 feet (3 to 500 meters). Blooms Mar-Jun.	**No Potential.** The Study Area does not contain Cismontane woodland, coastal bluff scrub, valley or foothill grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.
coast rockcress *Arabis blepharophylla*	Rank 4.3	Broadleafed upland forest, coastal bluff scrub, coastal prairie, coastal scrub. Elevation ranges from 10 to 3610 feet (3 to 1100 meters). Blooms Feb-May.	**No Potential.** The Study Area does not contain forest or scrub habitat to support this species.	**Not Present.** No further actions are recommended for this species.
Mt. Tamalpais manzanita *Arctostaphylos montana ssp. montana*	Rank 1B.3	Chaparral, valley and foothill grassland. Elevation ranges from 525 to 2495 feet (160 to 760 meters). Blooms Feb-Apr.	**No Potential.** The Study Area does not contain chaparral or gassland to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
Marin manzanita *Arctostaphylos virgata*	Rank 1B.2	Broadleafed upland forest, chaparral, closed-cone coniferous forest, north coast coniferous forest. Elevation ranges from 195 to 2295 feet (60 to 700 meters). Blooms Jan-Mar.	**No Potential.** The Study Area does not contain chaparral or coniferous forest to support this species.	**Not Present.** No further actions are recommended for this species.
Carlotta Hall's lace fern *Aspidotis carlotta-halliae*	Rank 4.2	Chaparral, cismontane woodland. Elevation ranges from 330 to 4595 feet (100 to 1400 meters). Blooms Jan-Dec.	**No Potential.** The Study Area does not contain chaparral or cismontane woodland to support this species.	**Not Present.** No further actions are recommended for this species.
Brewer's milk-vetch *Astragalus breweri*	Rank 4.2	Chaparral, cismontane woodland, meadows and seeps, valley and foothill grassland (openings, often gravelly). Elevation ranges from 295 to 2395 feet (90 to 730 meters). Blooms Apr-Jun.	**No Potential.** The Study Area does not contain chaparral, meadows and seeps, grassland, or cismontane woodland to support this species.	**Not Present.** No further actions are recommended for this species.
coastal marsh milk-vetch *Astragalus pycnostachyus var. pycnostachyus*	Rank 1B.2	Coastal dunes (mesic), coastal scrub, marshes and swamps (coastal salt, streamsides). Elevation ranges from 0 to 180 feet (0 to 55 meters). Blooms (Apr)Jun-Oct.	**No Potential.** The Study Area does not contain Coastal dunes (mesic), coastal scrub, marshes or swamps to support this species.	**Not Present.** No further actions are recommended for this species.
alkali milk-vetch *Astragalus tener var. tener*	Rank 1B.2	Playas, valley and foothill grassland (adobe clay), vernal pools. Elevation ranges from 5 to 195 feet (1 to 60 meters). Blooms Mar-Jun.	**No Potential.** The Study Area does not contain playas, valley and foothill grassland, or vernal pools to support this species.	**Not Present.** No further actions are recommended for this species.
Sonoma sunshine *Blennosperma bakeri*	FE, SE, Rank 1B.1	Valley and foothill grassland (mesic), vernal pools. Elevation ranges from 35 to 360 feet (10 to 110 meters). Blooms Mar-May.	**No Potential.** The Study Area does not contain valley and foothill grassland or vernal pools to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
Thurber's reed grass *Calamagrostis crassiglumis*	Rank 2B.1	Coastal scrub (mesic), marshes and swamps (freshwater). Elevation ranges from 35 to 195 feet (10 to 60 meters). Blooms May-Aug.	**No Potential.** The Study Area does not contain coastal scrub, or freshwater marshes and swamps to support this species.	**Not Present.** No further actions are recommended for this species.
serpentine reed grass *Calamagrostis ophitidis*	Rank 4.3	Chaparral (openings, often north-facing slopes), lower montane coniferous forest, meadows and seeps, valley and foothill grassland. Elevation ranges from 295 to 3495 feet (90 to 1065 meters). Blooms Apr-Jul.	**No Potential.** The Study Area does not contain chaparral, lower montane coniferous forest, meadows and seeps, or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
Brewer's calandrinia *Calandrinia breweri*	Rank 4.2	Chaparral, coastal scrub. Elevation ranges from 35 to 4005 feet (10 to 1220 meters). Blooms (Jan)Mar-Jun.	**No Potential.** The Study Area does not contain chaparral or coastal scrub to support this species.	**Not Present.** No further actions are recommended for this species.
Tiburon mariposa-lily *Calochortus tiburonensis*	FT, ST, Rank 1B.1	Valley and foothill grassland (serpentine). Elevation ranges from 165 to 490 feet (50 to 150 meters). Blooms Mar-Jun.	**No Potential.** The Study Area does not contain valley and foothill grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.
Oakland star-tulip *Calochortus umbellatus*	Rank 4.2	Broadleafed upland forest, chaparral, cismontane woodland, lower montane coniferous forest, valley and foothill grassland. Elevation ranges from 330 to 2295 feet (100 to 700 meters). Blooms Mar-May.	**No Potential.** The Study Area does not broadleafed upland forest, chaparral, cismontane woodland, lower montane coniferous forest, or valley and foothill grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.
pink star-tulip *Calochortus uniflorus*	Rank 4.2	Coastal prairie, coastal scrub, meadows and seeps, north coast coniferous forest. Elevation ranges from 35 to 3510 feet (10 to 1070 meters). Blooms Apr-Jun.	**No Potential.** The Study Area does not contain coastal prairie, coastal scrub, meadows and seeps, or north coast coniferous forest habitat to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
Mt. Saint Helena morning-glory *Calystegia collina ssp. oxyphylla*	Rank 4.2	Chaparral, lower montane coniferous forest, valley and foothill grassland. Elevation ranges from 915 to 3315 feet (279 to 1010 meters). Blooms Apr-Jun.	**No Potential.** The Study Area does not contain chaparral, lower montane coniferous forest, or valley and foothill grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.
seaside bittercress *Cardamine angulata*	Rank 2B.2	Lower montane coniferous forest, north coast coniferous forest. Elevation ranges from 50 to 3000 feet (15 to 915 meters). Blooms (Jan)Mar-Jul.	**No Potential.** The Study Area does not contain lower montane coniferous forest, or north coast coniferous forest to support this species.	**Not Present.** No further actions are recommended for this species.
Lyngbye's sedge *Carex lyngbyei*	Rank 2B.2	Marshes and swamps (brackish, freshwater). Elevation ranges from 0 to 35 feet (0 to 10 meters). Blooms Apr-Aug.	**No Potential.** The Study Area does not contain marshes or swamps to support this species.	**Not Present.** No further actions are recommended for this species.
Tiburon paintbrush *Castilleja affinis var. neglecta*	FE, ST, Rank 1B.2	Valley and foothill grassland (serpentine). Elevation ranges from 195 to 1310 feet (60 to 400 meters). Blooms Apr-Jun.	**No Potential.** The Study Area does not contain valley and foothill grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.
johnny-nip *Castilleja ambigua var. ambigua*	Rank 4.2	Coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, valley and foothill grassland, vernal pools (margins). Elevation ranges from 0 to 1425 feet (0 to 435 meters). Blooms Mar-Aug.	**No Potential.** The Study Area does not contain coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, valley and foothill grassland, or vernal pools to support this species.	**Not Present.** No further actions are recommended for this species.
Nicasio ceanothus *Ceanothus decornutus*	Rank 1B.2	Chaparral (maritime). Elevation ranges from 770 to 950 feet (235 to 290 meters). Blooms Mar-May.	**No Potential.** The Study Area does not contain chaparral to support this species.	**Not Present.** No further actions are recommended for this species.
glory brush *Ceanothus gloriosus var. exaltatus*	Rank 4.3	Chaparral. Elevation ranges from 100 to 2000 feet (30 to 610 meters). Blooms Mar-Jun(Aug).	**No Potential.** The Study Area does not contain chaparral to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
Point Reyes ceanothus *Ceanothus gloriosus var. gloriosus*	Rank 4.3	Closed-cone coniferous forest, coastal bluff scrub, coastal dunes, coastal scrub. Elevation ranges from 15 to 1705 feet (5 to 520 meters). Blooms Mar-May.	**No Potential.** The Study Area does not contain closed-cone coniferous forest, coastal bluff scrub, coastal dunes, or coastal scrub to support this species.	**Not Present.** No further actions are recommended for this species.
Mason's ceanothus *Ceanothus masonii*	SR, Rank 1B.2	Chaparral (openings, rocky, serpentine). Elevation ranges from 755 to 1640 feet (230 to 500 meters). Blooms Mar-Apr.	**No Potential.** The Study Area does not contain chaparral to support this species.	**Not Present.** No further actions are recommended for this species.
Kern ceanothus *Ceanothus pinetorum*	Rank 4.3	Lower montane coniferous forest, subalpine coniferous forest, upper montane coniferous forest. Elevation ranges from 3410 to 9005 feet (1040 to 2745 meters). Blooms May-Jul.	**No Potential.** The Study Area does not contain coniferous forest to support this species.	**Not Present.** No further actions are recommended for this species.
pappose tarplant *Centromadia parryi ssp. parryi*	Rank 1B.2	Chaparral, coastal prairie, marshes and swamps (coastal salt), meadows and seeps, valley and foothill grassland (vernally mesic). Elevation ranges from 0 to 1380 feet (0 to 420 meters). Blooms May-Nov.	**No Potential.** The Study Area does not contain chaparral, coastal prairie, marshes and swamps (coastal salt), meadows and seeps, or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
Point Reyes salty bird's-beak *Chloropyron maritimum ssp. palustre*	Rank 1B.2	Marshes and swamps (coastal salt). Elevation ranges from 0 to 35 feet (0 to 10 meters). Blooms Jun-Oct.	**No Potential.** The Study Area does not contain coastal marshes and swamps to support this species.	**Not Present.** No further actions are recommended for this species.
soft salty bird's-beak *Chloropyron molle ssp. molle*	FE, SR, Rank 1B.2	Marshes and swamps (coastal salt). Elevation ranges from 0 to 10 feet (0 to 3 meters). Blooms Jun-Nov.	**No Potential.** The Study Area does not contain coastal marshes and swamps to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
San Francisco Bay spineflower *Chorizanthe cuspidata var. cuspidata*	Rank 1B.2	Coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub. Elevation ranges from 10 to 705 feet (3 to 215 meters). Blooms Apr-Jul(Aug).	**No Potential.** The Study Area does not contain coastal bluff scrub, coastal dunes, coastal prairie, or coastal scrub to support this species.	**Not Present.** No further actions are recommended for this species.
Sonoma spineflower *Chorizanthe valida*	FE, SE, Rank 1B.1	Coastal prairie (sandy). Elevation ranges from 35 to 1000 feet (10 to 305 meters). Blooms Jun-Aug.	**No Potential.** The Study Area does not contain coastal prarie to support this species.	**Not Present.** No further actions are recommended for this species.
Mt. Tamalpais thistle *Cirsium hydrophilum var. vaseyi*	Rank 1B.2	Broadleafed upland forest, chaparral, meadows and seeps. Elevation ranges from 785 to 2035 feet (240 to 620 meters). Blooms May-Aug.	**No Potential.** The Study Area does not contain broadleafed upland forest, chaparral, or meadows and seeps. to support this species.	**Not Present.** No further actions are recommended for this species.
seaside cistanthe *Cistanthe maritima*	Rank 4.2	Coastal bluff scrub, coastal scrub, valley and foothill grassland. Elevation ranges from 15 to 985 feet (5 to 300 meters). Blooms (Feb)Mar-Jun(Aug).	**No Potential.** The Study Area does not contain coastal bluff scrub, coastal scrub, valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
round-headed collinsia *Collinsia corymbosa*	Rank 1B.2	Coastal dunes. Elevation ranges from 0 to 65 feet (0 to 20 meters). Blooms Apr-Jun.	**No Potential.** The Study Area does not contain coastal dunes to support this species.	**Not Present.** No further actions are recommended for this species.
serpentine collomia *Collomia diversifolia*	Rank 4.3	Chaparral, cismontane woodland. Elevation ranges from 655 to 1970 feet (200 to 600 meters). Blooms May-Jun.	**No Potential.** The Study Area does not contain chaparral or cismontane woodland to support this species.	**Not Present.** No further actions are recommended for this species.
California lady's-slipper *Cypripedium californicum*	Rank 4.2	Bogs and fens, lower montane coniferous forest. Elevation ranges from 100 to 9025 feet (30 to 2750 meters). Blooms Apr-Aug(Sep).	**No Potential.** The Study Area does not contain bogs and fens or lower montane coniferous forest to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
Baker's larkspur *Delphinium bakeri*	FE, SE, Rank 1B.1	Broadleafed upland forest, coastal scrub, valley and foothill grassland. Elevation ranges from 260 to 1000 feet (80 to 305 meters). Blooms Mar-May.	**No Potential.** The Study Area does not contain broadleafed upland forest, coastal scrub, or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
golden larkspur *Delphinium luteum*	FE, SR, Rank 1B.1	Chaparral, coastal prairie, coastal scrub. Elevation ranges from 0 to 330 feet (0 to 100 meters). Blooms Mar-May.	**No Potential.** The Study Area does not chaparral, coastal prairie, or coastal scrub to support this species.	**Not Present.** No further actions are recommended for this species.
silverskin lichen *Dermatocarpon meiophyllizum*	Rank 2B.3	Coastal prairie, lower montane coniferous forest, north coast coniferous forest, subalpine coniferous forest, upper montane coniferous forest. Elevation ranges from 970 to 11465 feet (295 to 3495 meters). Blooms .	**No Potential.** The Study Area does not contain prairie or forest habitat to support this species.	**Not Present.** No further actions are recommended for this species.
western dichondra *Dichondra occidentalis*	Rank 4.2	Chaparral, cismontane woodland, coastal scrub, valley and foothill grassland. Elevation ranges from 165 to 1640 feet (50 to 500 meters). Blooms (Jan)Mar-Jul.	**No Potential.** The Study Area does not contain chaparral, cismontane woodland, coastal scrub, valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
western leatherwood *Dirca occidentalis*	Rank 1B.2	Broadleafed upland forest, chaparral, cismontane woodland, closed-cone coniferous forest, north coast coniferous forest, riparian forest, riparian woodland. Elevation ranges from 80 to 1395 feet (25 to 425 meters). Blooms Jan-Mar(Apr).	**No Potential.** The Study Area does not contain forest or riparian woodland to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
dwarf downingia *Downingia pusilla*	Rank 2B.2	Valley and foothill grassland (mesic), vernal pools. Elevation ranges from 5 to 1460 feet (1 to 445 meters). Blooms Mar-May.	**No Potential.** The Study Area does not contain valley and foothill grassland or vernal pools to support this species.	**Not Present.** No further actions are recommended for this species.
small spikerush *Eleocharis parvula*	Rank 4.3	Marshes and swamps. Elevation ranges from 5 to 9910 feet (1 to 3020 meters). Blooms (Apr)Jun-Aug(Sep).	**No Potential.** The Study Area does not contain Marshes and swamps to support this species.	**Not Present.** No further actions are recommended for this species.
California bottle-brush grass *Elymus californicus*	Rank 4.3	Broadleafed upland forest, cismontane woodland, north coast coniferous forest, riparian woodland. Elevation ranges from 50 to 1540 feet (15 to 470 meters). Blooms May-Aug(Nov).	**No Potential.** The Study Area does not contain forest or riparian woodland to support this species.	**Not Present.** No further actions are recommended for this species.
Koch's cord moss *Entosthodon kochii*	Rank 1B.3	Cismontane woodland (soil). Elevation ranges from 590 to 3280 feet (180 to 1000 meters). Blooms .	**No Potential.** The Study Area does not contain woodland to support this species.	**Not Present.** No further actions are recommended for this species.
streamside daisy *Erigeron biolettii*	Rank 3	Broadleafed upland forest, cismontane woodland, north coast coniferous forest. Elevation ranges from 100 to 3610 feet (30 to 1100 meters). Blooms Jun-Oct.	**No Potential.** The Study Area does not contain forest or riparian woodland to support this species.	**Not Present.** No further actions are recommended for this species.
Tiburon buckwheat *Eriogonum luteolum var. caninum*	Rank 1B.2	Chaparral, cismontane woodland, coastal prairie, valley and foothill grassland. Elevation ranges from 0 to 2295 feet (0 to 700 meters). Blooms May-Sep.	**No Potential.** The Study Area does not contain chaparral, cismontane woodland, coastal prairie, or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
San Francisco wallflower *Erysimum franciscanum*	Rank 4.2	Chaparral, coastal dunes, coastal scrub, valley and foothill grassland. Elevation ranges from 0 to 1805 feet (0 to 550 meters). Blooms Mar-Jun.	**No Potential.** The Study Area does not contain chaparral, coastal dunes, coastal scrub, or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
bare monkeyflower *Erythranthe nudata*	Rank 4.3	Chaparral, cismontane woodland. Elevation ranges from 655 to 2295 feet (200 to 700 meters). Blooms May-Jun.	**No Potential.** The Study Area does not contain chaparral or cismontane woodland to support this species.	**Not Present.** No further actions are recommended for this species.
minute pocket moss *Fissidens pauperculus*	Rank 1B.2	North coast coniferous forest (damp coastal soil). Elevation ranges from 35 to 3360 feet (10 to 1024 meters). Blooms .	**No Potential.** The Study Area does not contain coniferous forest to support this species.	**Not Present.** No further actions are recommended for this species.
Marin checker lily *Fritillaria lanceolata var. tristulis*	Rank 1B.1	Coastal bluff scrub, coastal prairie, coastal scrub. Elevation ranges from 50 to 490 feet (15 to 150 meters). Blooms Feb-May.	**No Potential.** The Study Area does not contain coastal bluff scrub, coastal prairie, or coastal scrub to support this species.	**Not Present.** No further actions are recommended for this species.
fragrant fritillary *Fritillaria liliacea*	Rank 1B.2	Cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland. Elevation ranges from 10 to 1345 feet (3 to 410 meters). Blooms Feb-Apr.	**No Potential.** The Study Area does not contain cismontane woodland, coastal prairie, coastal scrub, or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
blue coast gilia *Gilia capitata ssp. chamissonis*	Rank 1B.1	Coastal dunes, coastal scrub. Elevation ranges from 5 to 655 feet (2 to 200 meters). Blooms Apr-Jul.	**No Potential.** The Study Area does not contain chaparral or cismontane woodland to support this species.	**Not Present.** No further actions are recommended for this species.
woolly-headed gilia *Gilia capitata ssp. tomentosa*	Rank 1B.1	Coastal bluff scrub, valley and foothill grassland. Elevation ranges from 35 to 720 feet (10 to 220 meters). Blooms May-Jul.	**No Potential.** The Study Area does not contain coastal dunes or coastal scrub to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
dark-eyed gilia *Gilia millefoliata*	Rank 1B.2	Coastal dunes. Elevation ranges from 5 to 100 feet (2 to 30 meters). Blooms Apr-Jul.	**No Potential.** The Study Area does not contain coastal dunes to support this species.	**Not Present.** No further actions are recommended for this species.
San Francisco gumplant *Grindelia hirsutula var. maritima*	Rank 3.2	Coastal bluff scrub, coastal scrub, valley and foothill grassland. Elevation ranges from 50 to 1310 feet (15 to 400 meters). Blooms Jun-Sep.	**No Potential.** The Study Area does not contain coastal scrub or foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
Diablo helianthella *Helianthella castanea*	Rank 1B.2	Broadleafed upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley and foothill grassland. Elevation ranges from 195 to 4265 feet (60 to 1300 meters). Blooms Mar-Jun.	**No Potential.** The Study Area does not contain broadleafed upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
congested-headed hayfield *tarplant* *Hemizonia congesta ssp. congesta*	Rank 1B.2	Valley and foothill grassland. Elevation ranges from 65 to 1835 feet (20 to 560 meters). Blooms Apr-Nov.	**No Potential.** The Study Area does not contain valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
Marin western flax *Hesperolinon congestum*	FT, ST, Rank 1B.1	Chaparral, valley and foothill grassland. Elevation ranges from 15 to 1215 feet (5 to 370 meters). Blooms Apr-Jul.	**No Potential.** The Study Area does not contain chaparral or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
Santa Cruz tarplant *Holocarpha macradenia*	FT, SE, Rank 1B.1	Coastal prairie, coastal scrub, valley and foothill grassland. Elevation ranges from 35 to 720 feet (10 to 220 meters). Blooms Jun-Oct.	**No Potential.** The Study Area does not contain coastal prairie, coastal scrub, or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
thin-lobed horkelia *Horkelia tenuiloba*	Rank 1B.2	Broadleafed upland forest, chaparral, valley and foothill grassland. Elevation ranges from 165 to 1640 feet (50 to 500 meters). Blooms May-Jul(Aug).	**No Potential.** The Study Area does not broadleafed upland forest, chaparral, or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
harlequin lotus *Hosackia gracilis*	Rank 4.2	Broadleafed upland forest, cismontane woodland, closed-cone coniferous forest, coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, meadows and seeps, north coast coniferous forest, valley and foothill grassland. Elevation ranges from 0 to 2295 feet (0 to 700 meters). Blooms Mar-Jul.	**No Potential.** The Study Area does not contain broadleafed upland forest, cismontane woodland, closed-cone coniferous forest, coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, meadows and seeps, north coast coniferous forest, or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
coast iris *Iris longipetala*	Rank 4.2	Coastal prairie, lower montane coniferous forest, meadows and seeps. Elevation ranges from 0 to 1970 feet (0 to 600 meters). Blooms Mar-May(Jun).	**No Potential.** The Study Area does not contain coastal prairie, lower montane coniferous forest, or meadows and seeps to support this species.	**Not Present.** No further actions are recommended for this species.
southwestern spiny rush *Juncus acutus ssp. leopoldii*	Rank 4.2	Coastal dunes (mesic), coastal scrub, marshes and swamps (coastal salt), meadows and seeps (alkaline seeps). Elevation ranges from 10 to 2955 feet (3 to 900 meters). Blooms (Mar)May-Jun.	**No Potential.** The Study Area does not contain coastal dunes, coastal scrub, marshes and swamps, or meadows and seeps to support this species.	**Not Present.** No further actions are recommended for this species.
small groundcone *Kopsiopsis hookeri*	Rank 2B.3	Lower montane coniferous forest, north coast coniferous forest, upper montane coniferous forest. Elevation ranges from 295 to 2905 feet (90 to 885 meters). Blooms Apr-Aug.	**No Potential.** The Study Area does not contain forest habitat to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
Contra Costa goldfields *Lasthenia conjugens*	FE, Rank 1B.1	Cismontane woodland, playas (alkaline), valley and foothill grassland, vernal pools. Elevation ranges from 0 to 1540 feet (0 to 470 meters). Blooms Mar-Jun.	**No Potential.** The Study Area does not cismontane woodland, playas (alkaline), valley and foothill grassland, or vernal pools to support this species.	**Not Present.** No further actions are recommended for this species.
bristly leptosiphon *Leptosiphon aureus*	Rank 4.2	Chaparral, cismontane woodland, coastal prairie, valley and foothill grassland. Elevation ranges from 180 to 4920 feet (55 to 1500 meters). Blooms Apr-Jul.	**No Potential.** The Study Area does not contain chaparral, cismontane woodland, coastal prairie, or valley and foothill grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.
large-flowered leptosiphon *Leptosiphon grandiflorus*	Rank 4.2	Cismontane woodland, closed-cone coniferous forest, coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub, valley and foothill grassland. Elevation ranges from 15 to 4005 feet (5 to 1220 meters). Blooms Apr-Aug.	**No Potential.** The Study Area does not contain cismontane woodland, closed-cone coniferous forest, coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub, or valley and foothill grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.
woolly-headed lessingia *Lessingia hololeuca*	Rank 3	Broadleafed upland forest, coastal scrub, lower montane coniferous forest, valley and foothill grassland. Elevation ranges from 50 to 1000 feet (15 to 305 meters). Blooms Jun-Oct.	**No Potential.** The Study Area does not contain broadleafed upland forest, coastal scrub, lower montane coniferous forest, or valley and foothill grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.
Tamalpais lessingia *Lessingia micradenia var. micradenia*	Rank 1B.2	Chaparral, valley and foothill grassland. Elevation ranges from 330 to 1640 feet (100 to 500 meters). Blooms (Jun)Jul-Oct.	**No Potential.** The Study Area does not contain chaparral or valley and foothill grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
Pitkin Marsh lily *Lilium pardalinum ssp. pitkinense*	FE, SE, Rank 1B.1	Cismontane woodland, marshes and swamps (freshwater), meadows and seeps. Elevation ranges from 115 to 215 feet (35 to 65 meters). Blooms Jun-Jul.	**No Potential.** The Study Area does not contain cismontane woodland, marshes and swamps, or meadows and seeps habitat to support this species.	**Not Present.** No further actions are recommended for this species.
Mt. Diablo cottonweed *Micropus amphibolus*	Rank 3.2	Broadleafed upland forest, chaparral, cismontane woodland, valley and foothill grassland. Elevation ranges from 150 to 2705 feet (45 to 825 meters). Blooms Mar-May.	**No Potential.** The Study Area does not contain broadleafed upland forest, chaparral, cismontane woodland, or valley and foothill grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.
marsh microseris *Microseris paludosa*	Rank 1B.2	Cismontane woodland, closed-cone coniferous forest, coastal scrub, valley and foothill grassland. Elevation ranges from 15 to 1165 feet (5 to 355 meters). Blooms Apr-Jun(Jul).	**No Potential.** The Study Area does not contain cismontane woodland, closed-cone coniferous forest, coastal scrub, or valley and foothill grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.
elongate copper moss *Mielichhoferia elongata*	Rank 4.3	Broadleafed upland forest, chaparral, cismontane woodland, coastal scrub, lower montane coniferous forest, meadows and seeps, subalpine coniferous forest. Elevation ranges from 0 to 6430 feet (0 to 1960 meters). Blooms .	**No Potential.** The Study Area does not contain broadleafed upland forest, chaparral, cismontane woodland, coastal scrub, lower montane coniferous forest, meadows and seeps, or subalpine coniferous forest habitat to support this species.	**Not Present.** No further actions are recommended for this species.
cotula navarretia *Navarretia cotulifolia*	Rank 4.2	Chaparral, cismontane woodland, valley and foothill grassland. Elevation ranges from 15 to 6005 feet (4 to 1830 meters). Blooms May-Jun.	**No Potential.** The Study Area does not contain chaparral, cismontane woodland, or valley and foothill grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
Baker's navarretia *Navarretia leucocephala ssp. bakeri*	Rank 1B.1	Cismontane woodland, lower montane coniferous forest, meadows and seeps, valley and foothill grassland, vernal pools. Elevation ranges from 15 to 5710 feet (5 to 1740 meters). Blooms Apr-Jul.	**No Potential.** The Study Area does not contain cismontane woodland, lower montane coniferous forest, meadows and seeps, valley and foothill grassland, or vernal pool habitat to support this species.	**Not Present.** No further actions are recommended for this species.
Marin County navarretia *Navarretia rosulata*	Rank 1B.2	Chaparral, closed-cone coniferous forest. Elevation ranges from 655 to 2085 feet (200 to 635 meters). Blooms May-Jul.	**No Potential.** The Study Area does not contain chaparral or forest habitat to support this species.	**Not Present.** No further actions are recommended for this species.
white-rayed pentachaeta *Pentachaeta bellidiflora*	FE, SE, Rank 1B.1	Cismontane woodland, valley and foothill grassland (often serpentine). Elevation ranges from 115 to 2035 feet (35 to 620 meters). Blooms Mar-May.	**No Potential.** The Study Area does not contain cismontane woodland or valley and foothill grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.
Gairdner's yampah *Perideridia gairdneri ssp. gairdneri*	Rank 4.2	Broadleafed upland forest, chaparral, coastal prairie, valley and foothill grassland, vernal pools. Elevation ranges from 0 to 2000 feet (0 to 610 meters). Blooms Jun-Oct.	**No Potential.** The Study Area does not contain broadleafed upland forest, chaparral, coastal prairie, valley and foothill grassland, or vernal pool habitat to support this species.	**Not Present.** No further actions are recommended for this species.
Michael's rein orchid *Piperia michaelii*	Rank 4.2	Chaparral, cismontane woodland, closed-cone coniferous forest, coastal bluff scrub, coastal scrub, lower montane coniferous forest. Elevation ranges from 10 to 3000 feet (3 to 915 meters). Blooms Apr-Aug.	**No Potential.** The Study Area does not contain chaparral, cismontane woodland, closed-cone coniferous forest, coastal bluff scrub, coastal scrub, or lower montane coniferous forest habitat to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
hairless popcornflower *Plagiobothrys glaber*	Rank 1A	Marshes and swamps (coastal salt), meadows and seeps (alkaline). Elevation ranges from 50 to 590 feet (15 to 180 meters). Blooms Mar-May.	**No Potential.** The Study Area does not marshes and swamps or meadows and seeps to support this species.	**Not Present.** No further actions are recommended for this species.
Petaluma popcornflower *Plagiobothrys mollis var. vestitus*	Rank 1A	Marshes and swamps (coastal salt), valley and foothill grassland (mesic). Elevation ranges from 35 to 165 feet (10 to 50 meters). Blooms Jun-Jul.	**No Potential.** The Study Area does not contain marshes and swamps or valley and foothill grassland habitat to support this species.	**Not Present.** No further actions are recommended for this species.
North Coast semaphore grass *Pleuropogon hooverianus*	ST, Rank 1B.1	Broadleafed upland forest, meadows and seeps, north coast coniferous forest. Elevation ranges from 35 to 2200 feet (10 to 671 meters). Blooms Apr-Jun.	**No Potential.** The Study Area does not contain forest or meadows and seeps to support this species.	**Not Present.** No further actions are recommended for this species.
nodding semaphore grass *Pleuropogon refractus*	Rank 4.2	Lower montane coniferous forest, meadows and seeps, north coast coniferous forest, riparian forest. Elevation ranges from 0 to 5250 feet (0 to 1600 meters). Blooms (Feb-Mar)Apr-Aug.	**No Potential.** The Study Area does not contain lower montane coniferous forest, meadows and seeps, north coast coniferous forest, or riparian forest habitat to support this species.	**Not Present.** No further actions are recommended for this species.
Marin knotweed *Polygonum marinense*	Rank 3.1	Marshes and swamps (brackish, coastal salt). Elevation ranges from 0 to 35 feet (0 to 10 meters). Blooms (Apr)May-Aug(Oct).	**No Potential.** The Study Area does not contain marshes and swamps to support this species.	**Not Present.** No further actions are recommended for this species.
Tamalpais oak *Quercus parvula var. tamalpaisensis*	Rank 1B.3	Lower montane coniferous forest. Elevation ranges from 330 to 2460 feet (100 to 750 meters). Blooms Mar-Apr.	**No Potential.** The Study Area does not contain coniferous forest to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
Lobb's aquatic buttercup *Ranunculus lobbii*	Rank 4.2	Cismontane woodland, north coast coniferous forest, valley and foothill grassland, vernal pools. Elevation ranges from 50 to 1540 feet (15 to 470 meters). Blooms Feb-May.	**No Potential.** The Study Area does not contain cismontane woodland, north coast coniferous forest, valley and foothill grassland, or vernal pools to support this species.	**Not Present.** No further actions are recommended for this species.
Sanford's arrowhead *Sagittaria sanfordii*	Rank 1B.2	Marshes and swamps (shallow freshwater). Elevation ranges from 0 to 2135 feet (0 to 650 meters). Blooms May-Oct(Nov).	**No Potential.** The Study Area does not contain marshes and swamps to support this species.	**Not Present.** No further actions are recommended for this species.
Point Reyes checkerbloom *Sidalcea calycosa ssp. rhizomata*	Rank 1B.2	Marshes and swamps (freshwater, near coast). Elevation ranges from 10 to 245 feet (3 to 75 meters). Blooms Apr-Sep.	**No Potential.** The Study Area does not contain marshes and swamps to support this species.	**Not Present.** No further actions are recommended for this species.
Marin checkerbloom *Sidalcea hickmanii ssp. viridis*	Rank 1B.1	Chaparral (serpentine). Elevation ranges from 165 to 1410 feet (50 to 430 meters). Blooms May-Jun.	**No Potential.** The Study Area does not contain chaparral to support this species.	**Not Present.** No further actions are recommended for this species.
long-styled sand-spurrey *Spergularia macrotheca var. longistyla*	Rank 1B.2	Marshes and swamps, meadows and seeps. Elevation ranges from 0 to 835 feet (0 to 255 meters). Blooms Feb-May.	**No Potential.** The Study Area does not contain marshes and swamps or meadows and seeps to support this species.	**Not Present.** No further actions are recommended for this species.
Santa Cruz microseris *Stebbinsoseris decipiens*	Rank 1B.2	Broadleafed upland forest, chaparral, closed-cone coniferous forest, coastal prairie, coastal scrub, valley and foothill grassland. Elevation ranges from 35 to 1640 feet (10 to 500 meters). Blooms Apr-May.	**No Potential.** The Study Area does not contain broadleafed upland forest, chaparral, closed-cone coniferous forest, coastal prairie, coastal scrub, or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
Mount Burdell jewelflower *Streptanthus anomalus*	Rank 1B.1	Cismontane woodland (openings). Elevation ranges from 165 to 490 feet (50 to 150 meters). Blooms May-Jun.	**No Potential.** The Study Area does not contain cismontane woodland to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
Tamalpais jewelflower *Streptanthus batrachopus*	Rank 1B.3	Chaparral, closed-cone coniferous forest. Elevation ranges from 1000 to 2135 feet (305 to 650 meters). Blooms Apr-Jul.	**No Potential.** The Study Area does not contain chaparral or closed-cone coniferous forest to support this species.	**Not Present.** No further actions are recommended for this species.
Tiburon jewelflower *Streptanthus glandulosus ssp. niger*	FE, SE, Rank 1B.1	Valley and foothill grassland (serpentine). Elevation ranges from 100 to 490 feet (30 to 150 meters). Blooms May-Jun.	**No Potential.** The Study Area does not contain valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
Mt. Tamalpais bristly jewelflower *Streptanthus glandulosus ssp. pulchellus*	Rank 1B.2	Chaparral, valley and foothill grassland. Elevation ranges from 490 to 2625 feet (150 to 800 meters). Blooms May-Jul(Aug).	**No Potential.** The Study Area does not contain chaparral or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
Suisun Marsh aster *Symphyotrichum lentum*	Rank 1B.2	Marshes and swamps (brackish, freshwater). Elevation ranges from 0 to 10 feet (0 to 3 meters). Blooms (Apr)May-Nov.	**No Potential.** The Study Area does not contain marshes and swamps to support this species.	**Not Present.** No further actions are recommended for this species.
marsh zigadenus *Toxicoscordion fontanum*	Rank 4.2	Chaparral, cismontane woodland, lower montane coniferous forest, marshes and swamps, meadows and seeps. Elevation ranges from 50 to 3280 feet (15 to 1000 meters). Blooms Apr-Jul.	**No Potential.** The Study Area does not contain chaparral, cismontane woodland, lower montane coniferous forest, marshes and swamps, or meadows and seeps. to support this species.	**Not Present.** No further actions are recommended for this species.
two-fork clover *Trifolium amoenum*	FE, Rank 1B.1	Coastal bluff scrub, valley and foothill grassland (sometimes serpentine). Elevation ranges from 15 to 1360 feet (5 to 415 meters). Blooms Apr-Jun.	**No Potential.** The Study Area does not contain coastal bluff scrub or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
saline clover *Trifolium hydrophilum*	Rank 1B.2	Marshes and swamps, valley and foothill grassland (mesic, alkaline), vernal pools. Elevation ranges from 0 to 985 feet (0 to 300 meters). Blooms Apr-Jun.	**No Potential.** The Study Area does not contain marshes and swamps, valley and foothill grassland (mesic, alkaline), or vernal pools to support this species.	**Not Present.** No further actions are recommended for this species.
Pacific Grove clover *Trifolium polyodon*	SR, Rank 1B.1	Closed-cone coniferous forest, coastal prairie, meadows and seeps, valley and foothill grassland. Elevation ranges from 15 to 1395 feet (5 to 425 meters). Blooms Apr-Jun(Jul).	**No Potential.** The Study Area does not contain closed-cone coniferous forest, coastal prairie, meadows and seeps, or valley and foothill grassland to support this species.	**Not Present.** No further actions are recommended for this species.
coastal triquetrella *Triquetrella californica*	Rank 1B.2	Coastal bluff scrub, coastal scrub. Elevation ranges from 35 to 330 feet (10 to 100 meters). Blooms .	**No Potential.** The Study Area does not contain coastal bluff scrub or coastal scrub to support this species.	**Not Present.** No further actions are recommended for this species.
oval-leaved viburnum *Viburnum ellipticum*	Rank 2B.3	Chaparral, cismontane woodland, lower montane coniferous forest. Elevation ranges from 705 to 4595 feet (215 to 1400 meters). Blooms May-Jun.	**No Potential.** The Study Area does not contain chaparral, cismontane woodland, or lower montane coniferous forest to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
WILDLIFES				
Mammals				
Antrozous pallidus pallid bat	SSC, WBWG High	Found in deserts, grasslands, shrublands, woodlands, and forests. Most common in open, forages along river channels. Roost sites include crevices in rocky outcrops and cliffs, caves, mines, trees and various manmade structures such as bridges, barns, and buildings (including occupied buildings). Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	**Unlikely.** The Study Area does not contain woodland, forest, or other suitable habitat or roosting substrate to support this species.	**Presumed Absent.** No further actions are recommended for this species.
Aplodontia rufa phaea Point Reyes mountain beaver	SSC	Known from the coastal areas of Point Reyes. Located in north-facing slopes of hills and gullies with seeps and springs nearby. Areas typically overgrown with vegetation such as sword fern (*Polystichum munitum*) and thimbleberry (*Rubus parviflorus*).	**No Potential. A**ll known populations are on the west side of Inverness Ridge (CDFW 2023).	**Not Present.** No further actions are recommended for this species.
Corynorhinus townsendii townsendii Townsend's western big-eared bat	SSC, WBWG High	Humid coastal regions of northern and central California. Roost in limestone caves, lava tubes, mines, buildings etc. Will only roost in the open, hanging from walls and ceilings. Roosting sites limiting. Extremely sensitive to disturbance	**Unlikely.** No caves, mines, or buildings or similar structures are present in the Study Area.	**Presumed Absent.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
hoary bat *Lasiurus cinereus*	WBWG Medium	Prefers open forested habitats or habitat mosaics, with access to trees for cover and open areas or habitat edges for feeding. Roosts in dense foliage of medium to large trees. Feeds primarily on moths.	**Unlikely.** The Study Area lacks large, broad-leaved riparian trees of the type typically used for roosting (maples, sycamores, etc.).	**Presumed Absent.** No further actions are recommended for this species.
San Pablo vole *Microtus californicus sanpabloensis*	SSC	Saltmarshes of San Pablo Creek, on the south shore of San Pablo Bay. Constructs burrow in soft soil. Feeds on grasses, sedges and herbs. Forms a network of runways leading from the burrow.	**No Potential.** The Study Area does not contain saltmarsh habitat to support this species.	**Not Present.** No further actions are recommended for this species.
salt marsh harvest mouse *Reithrodontomys raviventris*	FE, SE, CFP	Endemic to emergent salt and brackish wetlands of the San Francisco Bay Estuary. Pickleweed marshes are primary habitat; also occurs in various other wetland communities with dense vegetation. Does not burrow, builds loosely organized nests. Requires higher areas for dryland refugia during high tides.	**No Potential.** The Study Area does not contain saltmarsh habitat to support this species.	**Not Present.** No further actions are recommended for this species.
Suisun shrew *Sorex ornatus sinuosus*	SSC	Tidal marshes of the northern shores of San Pablo and Suisun Bays. Require dense low-lying cover and driftweed and other litter above the mean hightide line for nesting and foraging.	**No Potential.** The Study Area does not contain saltmarsh habitat to support this species.	**Not Present.** No further actions are recommended for this species.
salt-marsh wandering shrew *Sorex vagrans halicoetes*	SSC	Salt marshes of the south arm of San Francisco Bay. Medium high marsh 6 to 8 feet above sea level where abundant driftwood is scattered among *Salicornia*.	**No Potential.** The Study Area does not contain saltmarsh habitat to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
American badger *Taxidea taxus*	SSC	Most abundant in drier open stages of most shrub, woodland, and herbaceous vegetation types. Requires friable soils and open, uncultivated ground. Preys on burrowing rodents.	**No Potential.** The Study Area is primarily developed or landscaped and is surrounded by development. The Study Area lacks open areas with herbaceous vegetation, and no burrows characteristic of this species or other indicators of presence were observed during the site visit.	**Not Present.** No further actions are recommended for this species.
Birds				
tricolored blackbird *Agelaius tricolor*	ST, SSC	Nearly endemic to California, where it is most numerous in the Central Valley and vicinity. Highly colonial, nesting in dense aggregations over or near freshwater in emergent growth or riparian thickets. Also uses flooded agricultural fields. Abundant insect prey near breeding areas essential.	**No Potential.** The Study Area does not provide vegetated ponds or emergent marsh suitable for nesting.	**Not Present.** No further actions are recommended for this species.
grasshopper sparrow *Ammodramus savannarum*	SSC	Summer resident. Breeds in open grasslands in lowlands and foothills, generally with low- to moderate-height grasses and scattered shrubs. Well-hidden nests are placed on the ground.	**No Potential.** The Study Area lacks large expanses of open grassland.	**Not Present.** No further actions are recommended for this species.
golden eagle *Aquila chrysaetos*	BGEPA, CFP	Occurs year-round in rolling foothills, mountain areas, sage-juniper flats, and deserts. Cliff-walled canyons provide nesting habitat in most parts of range; also nests in large trees, usually within otherwise open areas.	**No Potential.** The Study Area does not provide large cliffs or typical large trees for nesting.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
great egret *Ardea alba*	no status (breeding sites protected by CDFW)	Year-round resident. Nests colonially or semi-colonially, usually in trees, occasionally on the ground or elevated platforms. Breeding sites usually in close proximity to foraging areas: marshes, lake margins, tidal flats, and rivers. Forages primarily on fishes and other aquatic prey, also smaller terrestrial vertebrates.	**Unlikely.** The Study Area is not within close proximity to documented Marin County breeding sites as per Shuford (1993); no indication of nesting (e.g., old stick nests) or presence observed during site visit.	**Presumed Absent.** No further actions are recommended for this species.
great blue heron *Ardea herodias*	non-status (breeding sites protected by CDFW)	Year-round resident. Nests colonially or semi-colonially in tall trees and cliffs, also sequestered terrestrial substrates. Breeding sites usually in close proximity to foraging areas: marshes, lake margins, tidal flats, and rivers. Forages primarily on fishes and other aquatic prey, also smaller terrestrial vertebrates.	**Unlikely.** The Study Area is not within close proximity to documented Marin County breeding sites as per Shuford (1993); no indication of nesting (e.g., old stick nests) or presence observed during site visit.	**Presumed Absent.** No further actions are recommended for this species.
short-eared owl *Asio flammeus*	SSC	Occurs year-round, but primarily as a winter visitor; breeding very restricted in most of California. Found in open, treeless areas (e.g., marshes, grasslands) with elevated sites for foraging perches and dense herbaceous vegetation for roosting and nesting. Preys mostly on small mammals, particularly voles.	**No Potential.** The Study Area does not provide marshland, expanses of grassland, or similar open habitats suitable for wintering.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
long-eared owl *Asio otus*	SSC	Occurs year-round in California. Nests in trees in a variety of woodland habitats, including oak and riparian, as well as tree groves. Requires adjacent open land with rodents for foraging, and the presence of old nests of larger birds (hawks, crows, magpies) for breeding.	**No Potential.** The Study Area does not provide suitable woodland or riparian habitat.	**Not Present.** No further actions are recommended for this species.
burrowing owl *Athene cunicularia*	SSC	Year-round resident and winter visitor. Occurs in open, dry grasslands and scrub habitats with low-growing vegetation, perches, and abundant mammal burrows. Preys upon insects and small vertebrates. Nests and roosts in old mammal burrows, most commonly those of ground squirrels.	**Unlikely.** The Study Area lacks expanses of open habitat, and ground squirrel burrows for refuge; breeding distribution in Marin County restricted to eastern Baylands.	**Presumed Absent.** No further actions are recommended for this species.
Swainson's hawk *Buteo swainsoni*	ST, BCC	Summer resident in California's Central Valley and limited portions of the southern California interior. Nests in tree groves and isolated trees in riparian and agricultural areas, including near buildings. Forages in grasslands and scrub habitats as well as agricultural fields, especially alfalfa. Preys on arthropods year-round as well as smaller vertebrates during the breeding season.	**Unlikely.** The Study Area does not provide nesting or foraging habitat for this species.	**Presumed Absent.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
western snowy plover *Charadrius alexandrines nivosus*	FT, SSC	Federal listing applies only to the Pacific coastal population. Year-round resident and winter visitor. Occurs on sandy beaches, salt pond levees, and the shores of large alkali lakes. Nests on the ground, requiring sandy, gravelly or friable soils.	**No Potential.** The Study Area does not contain zoned beaches, open mudflats, or other suitable barren habitat near water.	**Not Present.** No further actions are recommended for this species.
northern harrier *Circus cyaneus*	SSC	Year-round resident and winter visitor. Found in open habitats including grasslands, prairies, marshes and agricultural areas. Nests on the ground in dense vegetation, typically near water or otherwise moist areas. Preys on small vertebrates.	**No Potential.** The Study Area is within this species' local nesting range (Shuford 1993), but areas of open grassland are small in area and adjacent to development.	**Not Present.** No further actions are recommended for this species.
black swift *Cypseloides niger*	SSC	Summer resident with a fragmented breeding distribution; most occupied areas in California either montane or coastal. Breeds in small colonies on cliffs behind or adjacent to waterfalls, in deep canyons, and sea-bluffs above surf. Forages aerially over wide areas. No modern nesting records in Napa County.	**No Potential.** The Study Area does not contain waterfalls; there are no modern breeding records for Marin County (Shuford 1993). May occur in the vicinity occasionally during migration.	**Not Present.** No further actions are recommended for this species.
snowy egret *Egretta thula*	no status (breeding sites protected by CDFW)	Year-round resident. Nests colonially, usually in trees, at times in sequestered beds of dense emergent vegetation (e.g., tules). Rookery sites usually situated close to foraging areas: marshes, tidal-flats, streams, wet meadows, and borders of lakes.	**Unlikely.** The Study Area is not within close proximity to documented Marin County breeding sites as per Shuford (1993); no indication of nesting (e.g., old stick nests) or presence observed during site visit.	**Presumed Absent.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
white-tailed kite *Elanus leucurus*	CFP	Year-round resident in coastal and valley lowlands with scattered trees and large shrubs, including grasslands, woodlands, marshes and agricultural areas. Nests in trees, of which the type and setting are highly variable. Preys on small mammals and other vertebrates.	**Unlikely.** The Study Area does not contain grassland or woodland to support this species. This species may occasionally fly through the Study Area.	**Presumed Absent.** No further actions are recommended for this species.
San Francisco (saltmarsh) common yellowthroat *Geothlypis trichas sinuosa*	SSC	Resident of the San Francisco Bay region, in both fresh and salt marshes. Requires thick, continuous cover down to water surface for foraging; tall grasses, tule patches, willows for nesting.	**No Potential.** No marsh or dense vegetation is present within the Study Area.	**Not Present.** No further actions are recommended for this species.
bald eagle *Haliaeetus leucocephalus*	BGEPA, SE, CFP	Occurs year-round in California, but primarily a winter visitor; breeding population is growing. Nests in large trees in the vicinity of larger lakes, reservoirs, and rivers. Wintering habitat somewhat more variable but usually features large concentrations of waterfowl or fish.	**No Potential.** No typical nest trees are present in the Study Area nor was any indication of presence observed (e.g., large stick nests) during site visits.	**Not Present.** No further actions are recommended for this species.
yellow-breasted chat *Icteria virens*	SSC	Summer resident, occurring in riparian areas with an open canopy, very dense understory, and trees for song perches. Nests in thickets of willow (*Salix* ssp.), blackberry (*Rubus* spp.), and California grape (*Vitis californicus*).	**Unlikely.** The Study Area does not contain stands of dense riparian understory favored by this species for nesting. There are no recent observations in the vicinity (eBIrd 2023).	**Presumed Absent.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
loggerhead shrike *Lanius ludovicianus*	SSC	Year-round resident in open woodland, grasslands, savannah, and scrub. Prefers areas with sparse shrubs, trees, posts, and other suitable perches for foraging. Preys upon large insects and small vertebrates. Nests are well-concealed in densely-foliaged shrubs or trees.	**Unlikely.** The Study Area does not provide suitable open habitat to support this species.	**Presumed Absent.** No further actions are recommended for this species.
California black rail *Laterallus jamaicensis coturniculus*	ST, CFP	Year-round resident in marshes (saline to freshwater) with dense vegetation within four inches of the ground. Prefers larger, undisturbed marshes that have an extensive upper zone and are close to a major water source. Extremely secretive and cryptic.	**No Potential.** The Study Area lacks extensive tidal or brackish marsh.	**Not Present.** No further actions are recommended for this species.
Alameda song sparrow *Melospiza melodia pusillula*	BCC, SSC	Year-round resident of salt marshes bordering the south arm of San Francisco Bay. Inhabits primarily pickleweed marshes; nests placed in marsh vegetation, typically shrubs such as gumplant.	**No Potential.** The Study Area lacks salt marsh.	**Not Present.** No further actions are recommended for this species.
San Pablo song sparrow *Melospiza melodia samuelis*	SSC	Year-round resident of tidal marshes along the north side of San Francisco and San Pablo Bays. Typical habitat is dominated by halophytic wetland plants, including with shrubs in the upper marsh zone (favored for nesting). May forage in areas adjacent to marshes.	**No Potential.** The Study Area contains no tidal or brackish marsh.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
black-crowned night heron *Nycticorax nycticorax*	no status (breeding sites protected by CDFW)	Year-round resident. Nests colonially, usually in trees but also in patches of emergent vegetation. Rookery sites are often on islands and usually located adjacent to foraging areas: margins of lakes and bays.	**Unlikely.** The Study Area is not within close proximity to documented Marin County breeding sites as per Shuford (1993); no indication of nesting (e.g., old stick nests) or presence observed during site visit.	**Presumed Absent.** No further actions are recommended for this species.
Bryant's savannah sparrow *Passerculus sandwichensis alaudinus*	SSC	Year-round resident associated with the coastal fog belt, primarily between Humboldt and northern Monterey Counties. Occupies low tidally influenced habitats and adjacent areas, including grasslands. Also uses drier, more upland coastal grasslands. Nests near the ground in taller vegetation, including along levees and canals.	**Unlikely.** The Study Area lacks large expanses of open grassland or upper tidal marsh areas.	**Presumed Absent.** No further actions are recommended for this species.
California Ridgway's (clapper) rail *Rallus obsoletus obsoletus*	FE, SE, CFP	Year-round resident in tidal marshes of the San Francisco Bay estuary. Requires tidal sloughs and intertidal mud flats for foraging, and dense marsh vegetation for nesting and cover. Typical habitat features abundant growth of cordgrass and pickleweed. Feeds primarily on mollusks and crustaceans.	**No Potential.** The Study Area does not contain tidal or brackish marsh and it outside of this species' local range.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
bank swallow *Riparia riparia*	ST	Summer resident in riparian and other lowland habitats near rivers, lakes and the ocean in northern California. Nests colonially in excavated burrows on vertical cliffs and bank cuts (natural and manmade) with fine-textured soils. Historical nesting range in southern and central areas of California has been eliminated by habitat loss. Currently known to breed in Siskiyou, Shasta, and Lassen Cos., portions of the north coast, and along Sacramento River from Shasta Co. south to Yolo Co.	**No Potential.** The Study Area does not contain cliff or bank cuts to support this species.	**Not Present.** No further actions are recommended for this species.
California least tern *Sternula antillarum browni*	FE, SE, CFP	Summer resident along the coast from San Francisco Bay south to northern Baja California; inland breeding also very rarely occurs. Nests colonially on barren or sparsely vegetated areas with sandy or gravelly substrates near water, including beaches, islands, and gravel bars. In San Francisco Bay, has also nested on salt pond margins.	**No Potential.** The Study Area does not contain barren or gravelly substrate to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
northern spotted owl *Strix occidentalis caurina*	FT, ST, SSC	Year-round resident in dense, structurally complex forests, primarily those with stands of mature conifers. In Napa County, uses both coniferous and mixed (coniferous-hardwood) forests. Nests on platform-like substrates in the forest canopy, including in tree cavities. Preys on mammals.	**No Potential.** The Study Area does not contain forest habitat to support this species.	**Not Present.** No further actions are recommended for this species.
Reptiles and Amphibians				
California tiger salamander *Ambystoma californiense*	FE/FT, ST, RP	Populations in Santa Barbara and Sonoma counties currently listed as endangered; threatened in remainder of range. Inhabits grassland, oak woodland, and open ruderal habitats. Adults are fossorial and utilize mammal burrows and other subterranean refugia. Breeding occurs in vernal pools and other seasonal water features.	**No Potential.** The Study Area does not contain vernal pools or other seasonal water features to support breeding, and is not within dispersal distance of documented breeding occurrences.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
California giant salamander *Dicamptodon ensatus*	SSC	Occurs in the north-central Coast Ranges. Moist coniferous and mixed forests are typical habitat; also uses woodland and chaparral. Adults are terrestrial and fossorial, breeding in cold, permanent or semi-permanent streams. Larvae usually remain aquatic for over a year.	**No Potential.** The Study Area does not contain stream habitat to support this species.	**Not Present.** No further actions are recommended for this species.
western pond turtle *Emys marmorata*	SSC	A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches with aquatic vegetation. Require basking sites such as partially submerged logs, vegetation mats, or open mud banks, and suitable upland habitat (sandy banks or grassy open fields) for egg-laying.	**Unlikely.** The Study Area does not provide aquatic habitat or suitable upland habitat to support this species.	**Presumed Absent.** No further recommendations for this species.
foothill yellow-legged frog *Rana boylii*	SSC	Found in or near rocky streams in a variety of habitats; highly aquatic. Prefers partially-sunlit, shallow streams and riffles with a rocky substrate; requires at least some cobble-sized substrate for egg-laying. Needs at least 15 weeks to attain metamorphosis. Feeds on invertebrates (aquatic and terrestrial).	**No Potential.** The Study Area does not provide aquatic habitat to support this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
California red-legged frog *Rana draytonii*	FT, SSC	Lowlands and foothills in or near permanent or semi-permanent sources of deep water with dense emergent and/or overhanging riparian vegetation. Favors perennial to intermittent ponds, marshes, and stream pools. Requires 11 to 20 weeks of continuous inundation for larval development. Disperses through upland habitats during and after rains.	**Unlikely.** The Study Area does not provide aquatic habitat or suitable upland habitat to support this species.	**Presumed Absent.** No further recommendations for this species.
red-bellied newt *Taricha rivularis*	SSC	Inhabits coastal forests from southern Sonoma County northward, with an isolated population in Santa Clara County. Redwood forest provides typical habitat, though other forest types (e.g., hardwood) are also occupied. Adults are terrestrial and fossorial. Breeding occurs in streams, usually with relatively strong flow.	**Unlikely.** The Study Area does not provide forested habitat or aquatic habitat to support this species.	**Presumed Absent.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
Fishes				
green sturgeon *Acipenser medirostris*	FT, SSC	Spawns in the Sacramento River and Klamath Rivers, at temperatures between 8 and 14 degrees Celsius. Preferred spawning substrate is large cobble, but can range from clean sand to bedrock.	**No Potential.** The Study Area does not contain aquatic habitat to support this species.	**Not Present.** No further actions are recommended for this species.
tidewater goby *Eucyclogobius newberryi*	FE, SSC	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River. Found in shallow lagoons and lower stream reaches. Requires fairly still but not stagnant water and high oxygen levels.	**No Potential.** The Study Area does not contain aquatic habitat to support this species.	**Not Present.** No further actions are recommended for this species.
southern coastal roach *Hesperoleucus venustus subditus*	SSC	Southern Coastal Roach are restricted to the drainages of Tomales Bay/northern SF Bay in the north and Monterey Bay in the south. There are no records of Roach being present in watersheds between these two systems (Baumsteiger and Moyle 2019).	**No Potential.** The Study Area does not contain aquatic habitat to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
coho salmon – central CA coast ESU *Oncorhynchus kisutch*	FE, SE	Occurs in inland and coastal rivers, and marine waters. Requires beds of loose, silt-free, coarse gravel for spawning. Also requires riparian cover to contribute to cool, well-aerated water. Federal listing applies to populations between Punta Gorda and San Lorenzo River. State listing applies populations south of San Francisco Bay only.	**No Potential.** The Study Area does not contain aquatic habitat to support this species.	**Not Present.** No further actions are recommended for this species.
steelhead - central CA coast DPS *Oncorhynchus mykiss irideus*	FT	Occurs from the Russian River south to Soquel Creek and Pajaro River. Also in San Francisco and San Pablo Bay Basins. Adults migrate upstream to spawn in cool, clear, well-oxygenated streams. Juveniles remain in fresh water for 1 or more years before migrating downstream to the ocean.	**No Potential.** The Study Area does not contain aquatic habitat to support this species.	**Not Present.** No further actions are recommended for this species.
Sacramento splittail *Pogonichthys macrolepidotus*	SSC, RP	Formerly endemic to the lakes and rivers of the Central Valley, but now confined to the Sacramento Delta, Suisun Bay and associated marshes. Occurs in slow-moving river sections and dead-end sloughs. Requires flooded vegetation for spawning and foraging for young. A freshwater species, but tolerant of moderate salinity (10-18 parts per thousand).	**No Potential.** The Study Area does not contain aquatic habitat to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
longfin smelt *Spirinchus thaleichthys*	FC, ST, SSC	Euryhaline, nektonic and anadromous. Found in open waters of estuaries, mostly in middle or bottom of water column. Prefer salinities of 15 to 30 ppt, but can be found in completely freshwater to almost pure seawater.	**No Potential.** The Study Area does not contain aquatic habitat to support this species.	**Not Present.** No further actions are recommended for this species.
eulachon – Southern DPS *Thaleichthys pacificus*	FT, SSC	Found in Klamath River, Mad River, Redwood Creek and in small numbers in Smith River and Humboldt Bay tributaries. Spawn in lower reaches of coastal rivers with moderate water velocities and bottom of pea-sized gravel, sand and woody debris.	**No Potential.** The Study Area does not contain aquatic habitat to support this species.	**Not Present.** No further actions are recommended for this species.
Invertebrates				
Crotch bumblebee *Bombus crotchii*	SC	Range largely restricted to California, favoring grassland and scrub habitats. Typical of bumble bees, nests are usually constructed underground.	**Unlikely.** The Study Area is primarily developed or landscaped and does not provide suitable nesting or foraging habitat for this species.	**Presumed Absent.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE STUDY AREA	RESULTS AND RECOMMENDATIONS
western bumblebee *Bombus occidentalis*	SC	Formerly common throughout much of western North America; populations from southern British Columbia to central California have nearly disappeared (Xerces 2015). Occurs in a wide variety of habitat types. Nests are constructed annually in pre-existing cavities, usually on the ground (e.g., mammal burrows). Many plants are visited and pollinated.	**Unlikely.** This species is historically known from the vicinity historically, with a CNDDB occurrence from 1962 located within 2 miles of the Study Area (CDFW 2023). However, this species is currently considered extirpated from the region (Xerces Society (2018).	**Presumed Absent.** No further recommendations for this species.
monarch butterfly *Danaus plexippus*	FC, roosting sites protected by CDFW	Winter roost sites along the coast from Baja California north to Mendocino County. Roosts are wind-protected tree groves, typically of eucalyptus (*Eucalyptus* spp.), Monterey cypress (*Hesperocyparis macrocarpa*), and Monterey pine (*Pinus radiata*).	**Unlikely.** Non-native tree species typically used for winter roosting are not present. There are no nearby documented winter roosts (CDFW 2023).	**Presumed Absent.** No further recommendations for this species.
California freshwater shrimp *Syncaris pacifica*	FE, SE	Endemic to Marin, Napa, and Sonoma counties. Found in low elevation, low gradient streams where riparian cover is moderate to heavy. Shallow pools away from main stream flow. Winter: undercut banks with exposed roots. Summer: leafy branches touching water.	**No Potential.** The Study Area does not contain aquatic habitat to support this species.	**Not Present.** No further actions are recommended for this species.

***Key to status codes:**

FC	Federal Candidate for Listing
FE	Federal Endangered
BGEPA	Bald and Golden Eagle Protection Act Species
FT	Federal Threatened
SC (E/T)	State Candidate for Listing (Endangered/Threatened)
SE	State Endangered
CFP	California Fully Protected Animal
SR	State Rare
SSC	State Species of Special Concern
ST	State Threatened
CRPR 1A	CNPS CRPR 1A: Plants presumed extinct in California
CRPR 1B	CNPS CRPR 1B: Plants rare, threatened or endangered in California and elsewhere
CRPR 2A	CNPS CRPR 2A: Plants presumed extirpated in California, but more common elsewhere
CRPR 2B	CNPS CRPR 2B: Plants rare, threatened, or endangered in California, but more common elsewhere
CRPR 3	CNPS CRPR 3: Plants about which CNPS needs more information (a review list)
CRPR 4	CNPS CRPR 4: Plants of limited distribution (a watch list)
WBWG	Western Bat Working Group High or Medium-high Priority Species

Potential to Occur:

No Potential: Habitat on and adjacent to the site is clearly unsuitable for the species requirements (cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).

Unlikely: Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found on the site.

Moderate Potential: Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.

High Potential: All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.

Results and Recommendations:

Present: Species was observed on the site or has been recorded (i.e. CNDDB, other reports) on the site recently.

Assumed Present: Species is assumed to be present on-site based on the presence of key habitat components.

Assumed Present without Impact: Species assumed present; however, project activities will not have an impact on the species.

Presumed Absent: Species is presumed to not be present due to a lack of key habitat components.

Not Present: Species is considered not present due to a clear lack of any suitable habitat and/or local range limitations.

Not Observed: Species was not observed during dedicated/formal surveys.

Presence Unknown: Species has the potential to be present, but no dedicated surveys to determine absence/presence were performed.

Presence Unknown, No Impact: Species has the potential to be present; however, project activities will not have an impact on the species.

APPENDIX E

Geotechnical Desktop Study

CE&G
A division of Haley & Aldrich

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January 12, 2024

Camille Bandy, PE, QSD/P
Freyer & Laurerta, Inc.
150 Executive Park Blvd., Suite 4200
San Francisco, CA 94134

Subject: Revised Geotechnical Desktop Study
Northern Marin Water District – Lynwood Pump Station Project
Novato, California

Dear Ms. Bandy:

Cal Engineering & Geology, Inc. (CE&G), a division of Haley & Aldrich, is pleased to submit this Revised Geotechnical Desktop Study to support the Lynwood Pump Station Project in Novato, California. The revision was made to add Sites 4 and 5 to our initial Geotechnical Desktop Study Memorandum, dated April 13th, 2023. Our study included reviewing available geotechnical data and preparing this memorandum.

CE&G appreciates the opportunity to submit this report. If there are questions concerning the information provided herein, please do not hesitate to contact us.

Sincerely,

CAL ENGINEERING & GEOLOGY, a division of Haley & Aldrich

Christian Rodil, EIT
Project Engineer

Kevin Loeb, PG, CEG
Engineering Geologist

CERTIFIED ENGINEERING GEOLOGIST
KEVIN P. LOEB
No. 2763
STATE OF CALIFORNIA

Reviewed by:

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Principal Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
DANIEL J. PELUSO
GE 2367
GEOTECHNICAL
STATE OF CALIFORNIA

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1. Introduction

1.1 General

Cal Engineering & Geology, Inc. (CE&G), a division of Haley & Aldrich, has provided preliminary geotechnical design services to Freyer & Laureta, Inc. (Freyer & Laureta) for the Lynwood Pump Station Project, located in Novato, California. The work has been completed to provide regional geologic and soil engineering data and preliminary geotechnical recommendations for the siting and design of the new Lynwood Pump Station.

1.2 Project and Site Descriptions

The proposed Lynwood Pump Station Project sites are located on the north peninsula of the San Francisco Bay Area in Novato, California, as shown in Figure 1. The project includes siting and the design of a new pump station for the Northern Marin Water District. We understand the pump station will be completely in-ground and will consist of two to four pumps, each with a capacity of 2,000 gallons per minute (gpm). It is anticipated that the pump station will be installed at a maximum depth of 10 feet below the finished grade. CE&G is supporting Freyer & Laureta in their continuing efforts by reviewing geologic conditions for each site and providing preliminary guidance with respect to geotechnical design considerations.

Site descriptions for the five alternative site locations are described in the following sections. Elevations noted in this report are referenced to the North American Vertical Datum 1988 **(NAVD88).**

Site 1: Sunset Parkway

The first alternative site (Site 1) is located on the median along Sunset Parkway between Cambridge Street and Monte Maria Avenue, within a residential neighborhood, and is approximately 0.5 miles southwest of U.S. Route 101 (Figure 2A). The site is gently sloping to the northeast, with site elevations ranging from approximately 19 to 23 feet above sea level. The island median is oriented northeast-southwest and is approximately 240 feet by 35 feet in dimension. The site is landscaped with grass, small trees, and shrubs.

The proposed layout of the pump station at this site was not provided. However, we understand the pump station at this location would have four pumps, each with a capacity of 2,000 gpm.

Site 2: Ignacio Boulevard

The second alternative site (Site 2) is located just southwest of the intersection of Ignacio Boulevard and Palmer Drive, within a residential area of Novato, approximately 0.7 miles west of U.S. Route 101 (Figure 2B). The site consists of a landscaped area with small to medium trees and some shrubs. The site is bounded on the north by a sidewalk that parallels Ignacio Boulevard and to the south by the east-west trending Arroyo Jan Jose Creek. The landscaped area is relatively flat, with elevations ranging from approximately 57 to 59 feet above sea level. However, the proposed pump station location is approximately 35 feet northeast of the Arroyo Jan Jose Creek bank, which slopes to the southwest and drops in elevation from about 56 to 40 feet above sea level.

The proposed layout of the pump station at this site was not provided. However, we understand the pump station at this location would have four pumps, each with a capacity of 2,000 gpm.

Site 3: Bolling Circle

The third alternative site (Site 3) is located on a southwest-facing slope on the east side of Bolling Circle between Bolling Drive and Crissy Plaza in Novato, California (Figure 2C). The site is located downslope of Clark A Blasdel Park within a residential area, approximately 0.2 miles east of U.S. Route 101. The site consists of a grassy slope that slopes southwest towards Bolling Circle. Elevations at the site range from approximately 83 to 91 feet above sea level. The site is moderately landscaped with grass, small trees, and some shrubs.

The proposed layout of the pump station at this site was not provided. However, we understand the pump station at this location would have two pumps, each with a capacity of 2,000 gpm.

Site 4: Main Gate Road

The fourth alternative site (Site 4) is located on the south side of Main Gate Road, approximately 200 ft west of the intersection of C street and Main Gate Road, in Novato, California (Figure 2D). The site is located about 50 ft south of Main Gate Road in a relatively flat area with an approximate elevation of 46 feet above sea level. The site is occupied by a park that is moderately landscaped with grass, trees, and some shrubs.

Site 5: C Street

The alternative Site 5 is located on the northeast corner of the intersection of C Street and Main Gate Road in Novato, California (Figure 2E). The site is currently occupied by a baseball field with an approximate elevation of 47 feet above sea level. The baseball field at this location is currently fenced off from the adjacent sidewalk areas.

1.3 Purpose and Scope of Services

The purpose of this revised memorandum is to summarize the geotechnical data reviewed for our desktop study and to provide preliminary geotechnical design guidance for the proposed Lynwood Pump Station.

The scope of work completed for this preliminary geotechnical design memorandum included the following:

1. Completion of an office study of available and relevant geologic and geotechnical information for the sites, including published geologic maps, soil maps, and fault maps.

2. Provide recommendations for additional geotechnical studies to provide design-level recommendations.

3. Preparation of this geotechnical desktop study memorandum.

2. Geologic Setting

2.1 Regional Setting

The proposed Lynwood Pump Station Project sites are located on the northern peninsula of the San Francisco Bay Area, which is within the Coast Ranges geomorphic province of California. This province is characterized by northwest-southeast trending mountain ranges such as the Marin Hills and intervening valleys such as that occupied by San Francisco Bay. The Marin Hills mark a mountain-range scale regional uplift centered on the San Andreas fault. The City of Novato is situated in a northwest-trending valley to the northeast of these mountains. The mountains surrounding this valley shed erosional debris toward San Francisco Bay, resulting in relatively thick accumulations of alluvial sediment across the valley floor. Various active river systems, such as Arroyo San Jose Creek, continue to flow from the surrounding mountain ranges and through Novato and are responsible for the active incision of older alluvium and deposition of younger alluvium across the valley floor.

2.2 Site Geology

The geologic setting is shown on Figure 3. The distribution of geologic materials in the site vicinity has much to do with the local river systems and nearby hill slopes.

The general vicinity of the proposed sites has been mapped several times, with geologic mapping having different emphases by Knudsen and others (2000), Graymer and others (2006), and Witter and others (2006).

Site 1: Sunset Parkway

The proposed location at Sunset Parkway is mapped as being underlain by early to late Pleistocene-aged alluvial deposits (Qoa), which are described as unconsolidated, fine to medium sand with silt and clay (Witter and others, 2006). Deposits mapped within this unit can include alluvial fan, stream terrace, basin, and channel deposits (Witter and others, 2006). Bedrock underlying these alluvial deposits likely consists of Franciscan Complex sedimentary rock (Graymer and others, 2006).

Site 2: Ignacio Boulevard

The northeast portion of the proposed location at Ignacio Boulevard is mapped as being underlain by Holocene-aged alluvial deposits (Qha), which are described as poorly to moderately sorted sand, silt, and gravel (Witter and others, 2006). The southwest portion of the proposed location is mapped as being underlain by Historical stream channel deposits (Qhc), which are

described as loose, unconsolidated, poorly to well sorted sand, gravel, and cobbles, with minor silt and clay (Witter and others, 2006). Bedrock underlying these alluvial deposits likely consists of Franciscan Complex sedimentary rock (Graymer and others, 2006).

Site 3: Bolling Circle

The proposed location at Bolling Circle is mapped along a geological contact between Franciscan sedimentary rock (Cretaceous) and Franciscan Complex Mélange (Eocene, Paleocene, and/or Late Cretaceous) (Graymer and others, 2006).

Sites 4 and 5: Main Gate Road and C Street

The proposed locations along Main Gate Road and C Street are mapped as being underlain by Holocene-aged alluvial deposits (Qha), which are described as poorly to moderately sorted sand, silt, and gravel (Witter and others, 2006). Alluvial deposits in these areas are generally underlain by Franciscan Complex sedimentary bedrock (Grayer and others, 2006).

2.3 Surficial Soils

The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Soil Survey was reviewed for the project area. The soil survey identifies general shallow soil materials that may be encountered within the upper few feet. The attached Figure 4 shows the NRCS soil survey map for the project sites. Soil descriptions for each site are listed below, and additional information on site soils is included in Attachment A.

Sites 1 and 2: Sunset Parkway and Ignacio Boulevard

The Sunset Parkway and Ignacio Boulevard sites are shown on the NRCS soil map as being underlain by Xerorthents urban land complex soils (ID No. 204), which generally extend to depths of about 80 inches below grade.

Sites 3, 4, and 5: Bolling Circle, Main Gate Road, and C Street

The Bolling Circle site and Main Gate Road sites are shown on the NRCS soil map as being underlain by Saurin urban land Bonnydoon complex soils (ID No. 166), which generally extend to depths of about 37 inches below grade. This unit is classified as being well drained, has a high runoff class, and has a low (about 6.0 inches) available water storage in its profile. The capacity of the most limiting layer of this unit to transmit water (Ksat) is considered moderately high to high (0.57 to 1.98 inches/hour).

2.4 Regional Groundwater

The California Department of Water Resources identifies the sites as lying within the Novato Valley Groundwater Basin. The Valley is drained by Novato Creek, which flows along the north end of the valley and into San Pablo Bay.

Site 1: Sunset Parkway

Groundwater data from an investigation by Conestoga-Rovers & Associates (2007) and Environmental Resolutions, Inc. (2007) showed groundwater levels between 1 and 7 feet below grade, approximately 1,500 feet north (downgradient) of this proposed location. We did not find site-specific groundwater level data for the Sunset Parkway site.

Site 2: Ignacio Boulevard

Groundwater data from an investigation by Delta Consultants (2008) showed groundwater levels between 3 and 10 feet below grade approximately 2,000 feet east (downgradient) of this proposed location. We did not find site-specific groundwater level data for the Ignacio Boulevard site.

Site 3: Bolling Circle

We did not find site-specific groundwater level data for the Bolling Circle site. Groundwater within the hillslope areas encompassing the Bolling Circle location is likely variable, with the water table commonly sloping downhill toward the closest drainage axis.

Sites 4 and 5: Main Gate Road and C Street

Groundwater data from an investigation by Battelle (2016) for a project site located on the vacant lot just northwest of the intersection of Main Gate Road and C Street showed groundwater levels between 10 and 14 feet below grade. We did not find site-specific groundwater level data for the sites.

2.5 Seismicity

The project sites are located within the greater San Francisco Bay Area, which is recognized as one of California's more seismically active regions. The seismic activity in this region results from the complex movements along the transform boundary between the Pacific Plate and the North American Plate. Along this transform boundary, the Pacific Plate is slowly moving to the northwest relative to the more stable North American Plate at approximately 40 mm/yr in the Bay Area (Page, 1992). The differential movements between the two crustal plates caused the formation of a series of active fault systems within the transform boundary. The transform

boundary between the two plates extends across a broad zone of the North American Plate, within which right-lateral strike-slip faulting predominates. In this broad transform boundary, the San Andreas fault accommodates less than half of the average total relative plate motion. Much of the remainder of the motion in the North Bay Area is distributed across faults such as the Rodgers Creek, Hayward, and West Napa fault zones.

Due to the sites being located in the seismically active San Francisco Bay Area, they will likely experience strong ground shaking from a large (Moment Magnitude [Mw] 6.7) or greater earthquake along with one or more of the nearby active faults during the design lifetime of the project (WGCEP, 2003). It should be noted that the third Uniform California Earthquake Rupture Forecast (UCERF3) time-independent model supports a magnitude-dependent methodology that accounts for historic open intervals on faults without a date of last event constraint. The exact factors influencing differences between UCERF2 and UCERF3 vary throughout the region and depend on evaluating specific seismogenic sources. For example, with the 30 yr M≥6.7 probabilities, the most significant changes from UCERF2 are a threefold increase on the Calaveras fault and a threefold decrease on the San Jacinto fault. The model also suggests that the average time between 6.7 Mw or larger events has increased. The UCERF3 model indicates that M≥6.7 probabilities may not represent other hazard or loss measures. The applicability of UCERF3 should be evaluated on a case-by-case basis if required during site-specific ground motion analyses or at the behest of the regulatory agencies (WGCEP, 2014).

Some contributors to seismic risk for the project include the San Andreas, Hayward, Rodgers Creek, West Napa, and Green Valley fault zones. A large-magnitude earthquake on any of these fault systems has the potential to cause significant ground shaking in the vicinity of the sites. The intensity of ground shaking likely to occur in the area generally depends upon the earthquake's magnitude and the distance to the epicenter.

2.6 Geohazard Mapping

2.6.1 Active Faulting and Fault Rupture

According to CGS (2018), a Holocene-active fault is defined as a fault that has had surface displacement within Holocene time (the last 11,700 years), and a pre-Holocene fault is defined as a fault whose recency of past movement is older than 11,700 years. The Alquist-Priolo Earthquake Fault Zoning Act only addresses the hazard of surface fault rupture for Holocene-active faults. However, pre-Holocene-active faults may also have the potential for future surface fault rupture (CGS, 2018). The Alquist-Priolo Earthquake Fault Zoning Act's primary purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. Before a new project is permitted, cities and counties require a geologic investigation to demonstrate that proposed buildings will not be constructed on active faults. According to the

California Geological Survey (CGS) (2006), the project site is not located within an Alquist-Priolo Earthquake Fault Zone.

According to the United States Geological Survey's (USGS) Quaternary fault and fold database, no active faults are mapped as crossing the project sites (Figure 5).

2.6.2 Liquefaction Hazards

Witter and others (2006) have generated a map showing liquefaction susceptibility for the San Francisco Bay Area with a 5-class scale that includes very low (essentially bedrock areas), low, moderate, high, and very high liquefaction susceptibility classes (See Figure 6).

Site 1: Sunset Parkway

Witter and others (2006) show the Sunset Parkway site as having a very low liquefaction susceptibility (Figure 6).

Site 2: Ignacio Boulevard

Witter and others (2006) show the Ignacio Boulevard site as having moderate liquefaction susceptibility, with the exception of the soils along the Arroyo Jan Jose stream, which are shown to have a very high liquefaction susceptibility (Figure 6).

Site 3: Bolling Circle

Witter and others (2006) show the Bolling Circle site as having a very low liquefaction susceptibility (Figure 6).

Sites 4 and 5: Main Gate Road and C Street

Witter and others (2006) show the Main Gate Road and C Street sites as having moderate liquefaction susceptibility. (Figure 6).

2.6.3 Landslide Hazards

According to the California Geological Survey's landslide inventory map, there are no mapped landslides within the proposed project site locations.

Site 1: Sunset Parkway

Due to the relatively flat topography at the Sunset Parkway site, landsliding for this site is unlikely to occur.

Site 2: Ignacio Boulevard

The relatively flat lying areas of the Ignacio Boulevard site are unlikely to experience landsliding; however, shallow landsliding may occur along the Arroyo Jan Jose Creek bank to the southwest.

Site 3: Bolling Circle

The Bolling Circle site is located on a moderately sloping (approximately 7°) hillside, which is likely underlain by shallow bedrock. Although shallow sliding of surface soils is possible, negative impacts to the proposed pump station due to landsliding at this site are unlikely.

Sites 4 and 5: Main Gate Road and C Street

Due to the relatively flat topography at the Main Gate Road site, landsliding for this site is unlikely to occur.

3. Discussion, Conclusions, and Recommendations

3.1 General

The new pump station design has not yet been completed. The primary geologic and geotechnical issues to be considered in the design of the pump station and associated structures include the following:

- Excavatability of subsurface materials
- Shoring and dewatering
- Unknown groundwater conditions and Buoyancy uplift
- Settlement
- Effects of seismic loading and anticipated ground motions on the design and performance of the new pipeline
- Corrosion Potential.

3.2 Excavatability

The excavation for the pump station will extend to depths between approximately 6 and 15 feet below grade. Based on our review of available regional geologic maps, we anticipate that an appropriately sized backhoe and/or excavator will be capable of excavating within the mapped alluvial soils. However, increased effort to excavate due to the presence of shallow Franciscan Complex bedrock may be required, especially for the Bolling Circle site (Site 3).

3.3 Shoring Design and Dewatering

The sides of the excavations are anticipated to be shored. Conventional shoring systems will be required. If high groundwater is encountered, especially during the Winter and Spring seasons, the excavation may need to be dewatered for construction and compaction of trench backfill materials. The impact of elevated groundwater conditions on temporary shoring can be mitigated by implementing contractor-designed dewatering measures and designing the shoring to be watertight and to account for the loading imposed by the groundwater. For shoring design, the Caltrans Trenching and Shoring Manual and FHWA GEC No. 4 should be used.

3.4 Buoyancy Uplift

Based on the likelihood of shallow groundwater at the sites, the potential for buoyancy uplift should be considered during the design of the pump station. The risk of encountering groundwater within the area is greatest during the Winter and Spring seasons, especially following higher than normal rainfall years. Without site-specific groundwater elevation data, it is difficult to pinpoint areas with greater buoyancy uplift concerns. For open-cut construction, careful consideration by the contractor for shoring and dewatering design and construction will be required to mitigate buoyancy uplift.

The presence of high groundwater could also impact the maintenance of the pump station should excavations be needed to complete repairs. The impact of high groundwater on future maintenance activities can be mitigated by including a discussion of appropriate preventative measures in the operations and maintenance manuals.

3.5 Settlement of Structures

Settlement of the pump station and engineered fill depends on several factors, including construction vibrations, consolidation of compressible materials below the structures, and relative compaction of backfill placed within excavations. The potential for settlement of proposed improvements should be assessed during a site-specific geotechnical investigation of the project.

3.6 Liquefaction Potential and Seismic Loading

Soil liquefaction is a phenomenon in which saturated, cohesionless soils (generally sands) lose their strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. Soils most susceptible to liquefaction are saturated, clean, loose, fine-grained sands and silts. The primary factors affecting soil liquefaction include: 1) intensity and duration of seismic shaking; 2) soil type and relative density; 3) overburden pressure; and 4) depth to groundwater.

New structures must consider the effects of strong ground shaking due to major earthquakes in the final design.

3.7 Corrosion

Corrosion testing is recommended if metal or concrete material will be used.

4. Geotechnical Investigation

Once the final site location for the pump station is selected, a site-specific geotechnical investigation is recommended to address the above-listed geological and geotechnical concerns. The recommended subsurface exploration scope was included as an optional task in our original proposal, dated July 15th, 2022, and included the following:

- One exploratory boring drilled up to approximately 25 feet below the ground surface to characterize subsurface materials and confirm the depth of groundwater in the vicinity of the proposed pump station.

- Perform laboratory testing on selected soil samples for engineering properties and corrosion potential.

- Engineering analysis of the information obtained during the subsurface exploration program to assess liquefaction potential and possible resulting settlement and establish the foundation design parameters for the planned improvements. Recommendations for uplift resistance for the pump station due to buoyancy would also be provided.

- Prepare a geotechnical design report to provide geotechnical design recommendations for the design and construction of the planned pump station.

5. Limitations

The findings and conclusions of this report are based upon information provided to us regarding the proposed site locations, subsurface conditions represented in the references cited, the interpretation and analysis of the available information, and professional judgment.

The evaluation or identification of the potential presence of contaminated soil or groundwater at the sites was not requested and was beyond the scope of this desktop study.

6. References

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Working Group on California Earthquake Probabilities (WGCEP), 2014, Long-Term Time-Dependent Probabilities for the Third Uniform California Earthquake Rupture Forecast (UCERF3): Bulletin of the Seismology Society of America.

FIGURES

BASEMAP REFERENCE

1. STREET CENTERLINES FROM CALTRANS CALIFORNIA ROAD SYSTEM, DOWNLOADED ON 18 FEB 2020.
2. ORTHOIMAGERY FROM ESRI (MAXAR), 2019.

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LYNWOOD PUMP STATION PROJECT
SUNSET PARKWAY., IGNACIO BOULEVARD., AND BOLLING CIRCLE
NOVATO, CALIFORNIA

SITE LOCATION MAP

0208191	JANUARY 2024	FIGURE 1

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BASEMAP REFERENCE

1. COUNTY PARCEL DATA ACCESSED ONLINE, 2020.
2. CONTOURS CALCULATED FROM DATA DERIVED FROM USGS, 2020. CONTOUR INTERVAL = 1FT.
3. ORTHOIMAGERY FROM ESRI (MAXAR), 2019.

MAP UNIT DESCRIPTION

APPROXIMATE SITE BOUNDARY

0 15 30 60
FEET

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LYNWOOD PUMP STATION PROJECT
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NOVATO, CALIFORNIA

ALTERNATIVE 1 - SUNSET PARKWAY

0208191	January 2024	FIGURE 2A

BASEMAP REFERENCE

1. COUNTY PARCEL DATA ACCESSED ONLINE, 2020.
2. CONTOURS CALCULATED FROM DATA DERIVED FROM USGS, 2020. CONTOUR INTERVAL = 1FT.
3. ORTHOIMAGERY FROM ESRI (MAXAR), 2019.

MAP UNIT DESCRIPTION

APPROXIMATE SITE BOUNDARY

N

0 20 40 80
FEET

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LYNWOOD PUMP STATION PROJECT
IGNACIO BOULEVARD
NOVATO, CALIFORNIA

ALTERNATIVE 2 - IGNACIO BOULEVARD

0208191	JANUARY 2024	FIGURE 2B

BASEMAP REFERENCE

1. COUNTY PARCEL DATA ACCESSED ONLINE, 2020.
2. CONTOURS CALCULATED FROM DATA DERIVED FROM USGS, 2020. CONTOUR INTERVAL = 1FT.
3. ORTHOIMAGERY FROM ESRI (MAXAR), 2019.

MAP UNIT DESCRIPTION

APPROXIMATE SITE BOUNDARY

0 15 30 60
FEET

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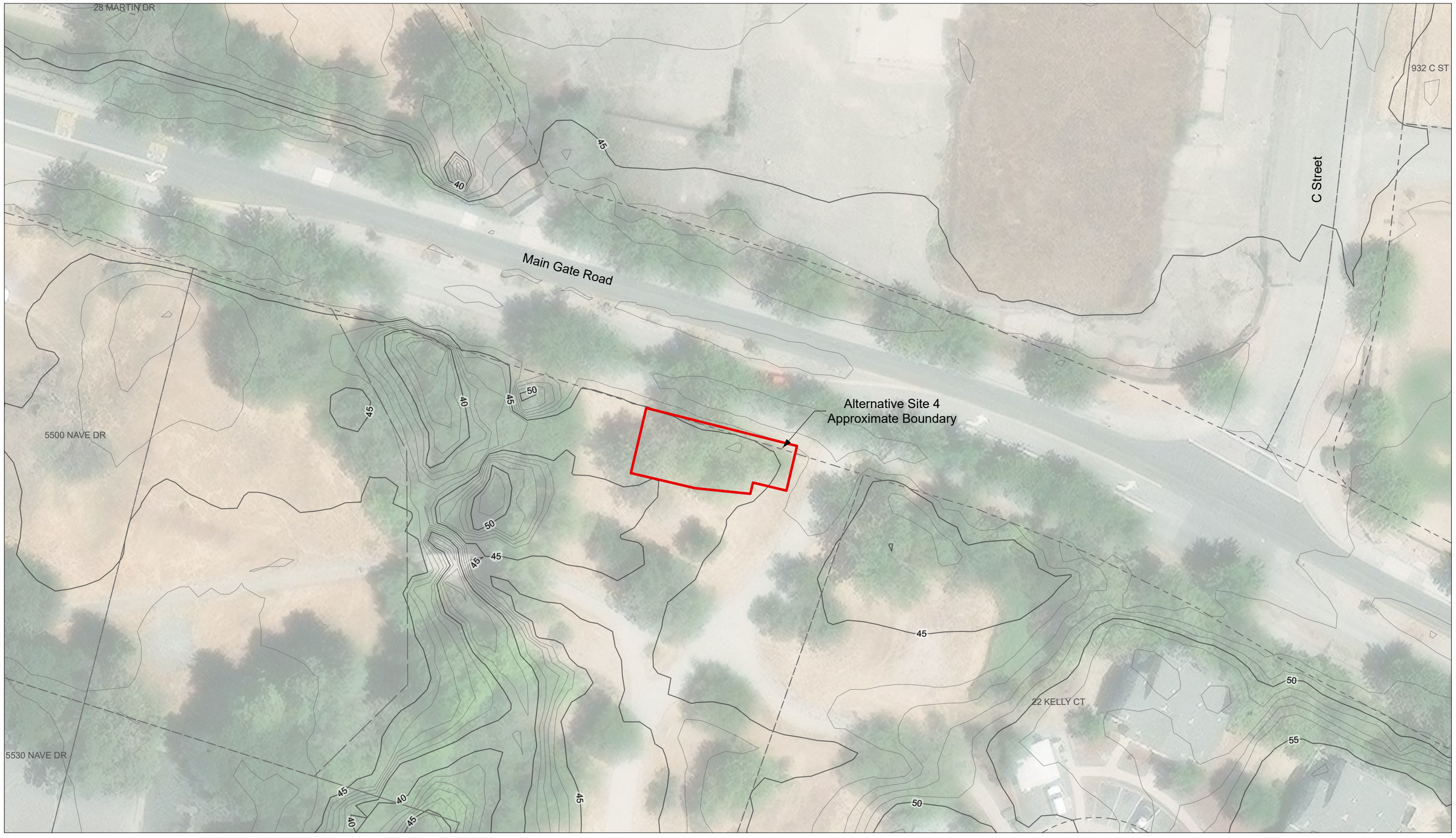
LYNWOOD PUMP STATION PROJECT
BOLLING CIRCLE
NOVATO, CALIFORNIA

ALTERNATIVE 3 - BOLLING CIRCLE

0208191	JANUARY 2024	FIGURE 2C

\\haleyaldrich.com\share\granite\2023\0208191-NMWD-LynwoodPumpStation-Freyer&Laureta\GIS\ArcGIS\0208191-LynwoodPumpStation.aprx; 4/12/2023; kdrozynska



BASEMAP REFERENCE

1. COUNTY PARCEL DATA ACCESSED ONLINE, 2020.
2. CONTOURS CALCULATED FROM DATA DERIVED FROM USGS, 2020. CONTOUR INTERVAL = 1FT.
3. ORTHOIMAGERY FROM ESRI (MAXAR), 2019.

MAP UNIT DESCRIPTION

APPROXIMATE SITE BOUNDARY

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0 20 40 80
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LYNWOOD PUMP STATION PROJECT
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NOVATO, CALIFORNIA

SITE 4 - MAIN GATE ROAD

0208191	JANUARY 2024	FIGURE 2D

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BASEMAP REFERENCE

1. COUNTY PARCEL DATA ACCESSED ONLINE, 2020.
2. CONTOURS CALCULATED FROM DATA DERIVED FROM USGS, 2020. CONTOUR INTERVAL = 1FT.
3. ORTHOIMAGERY FROM ESRI (MAXAR), 2019.

MAP UNIT DESCRIPTION

APPROXIMATE SITE BOUNDARY

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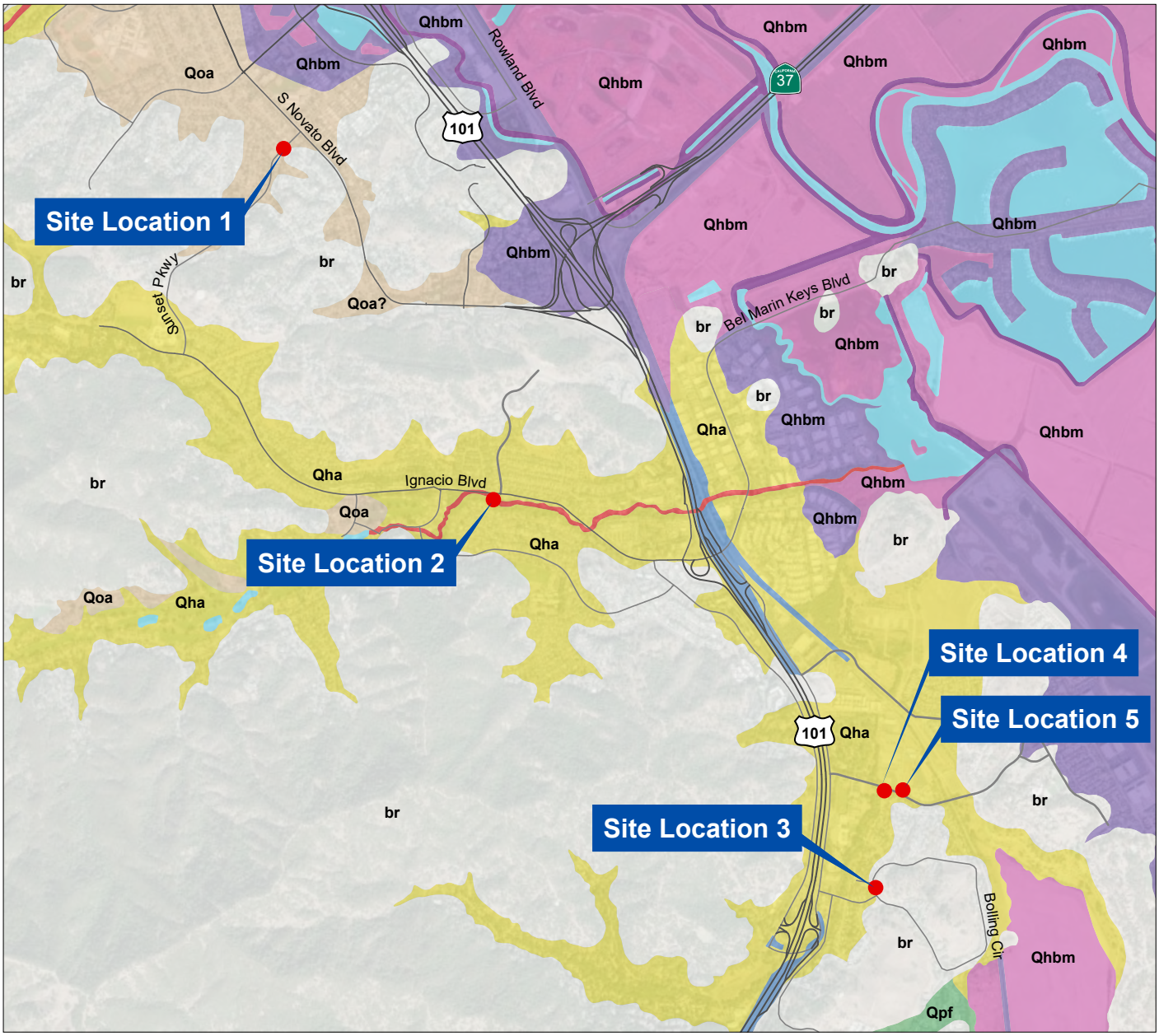
LYNWOOD PUMP STATION PROJECT
SUNSET PARKWAY
NOVATO, CALIFORNIA

SITE 5 - MAIN GATE ROAD

0208191	JANUARY 2024	FIGURE 2E



BASEMAP REFERENCE

1. REGIONAL GEOLOGY FROM WITTER ET AL., 2006.

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MAP UNIT DESCRIPTION

af	ARTIFICIAL FILL (HISTORICAL)	Qpf	ALLUVIAL FAN DEPOSITS (LATEST PLEISTOCENE)
afem	ARTIFICIAL STREAM CHANNEL (HISTORICAL)	Qoa	ALLUVIAL DEPOSITS, UNDIFFERENTIATED (EARLY TO LATE PLEISTOCENE)
alf	ARTIFICIAL LEVEE FILL (HISTORICAL)	Qoa?	ALLUVIAL DEPOSITS, UNDIFFERENTIATED (EARLY TO LATE PLEISTOCENE)
Qhc	HISTORICAL STREAM CHANNEL DEPOSITS (HISTORICAL)	br	OLDER DEPOSIT AND BEDROCK (EARLY QUATERNARY AND OLDER)
Qhbm	SAN FRANCISCO BAY MUD (HOLOCENE)	H2O	WATER
Qha	ALLUVIAL DEPOSITS, UNDIFFERENTIATED (HOLOCENE)		

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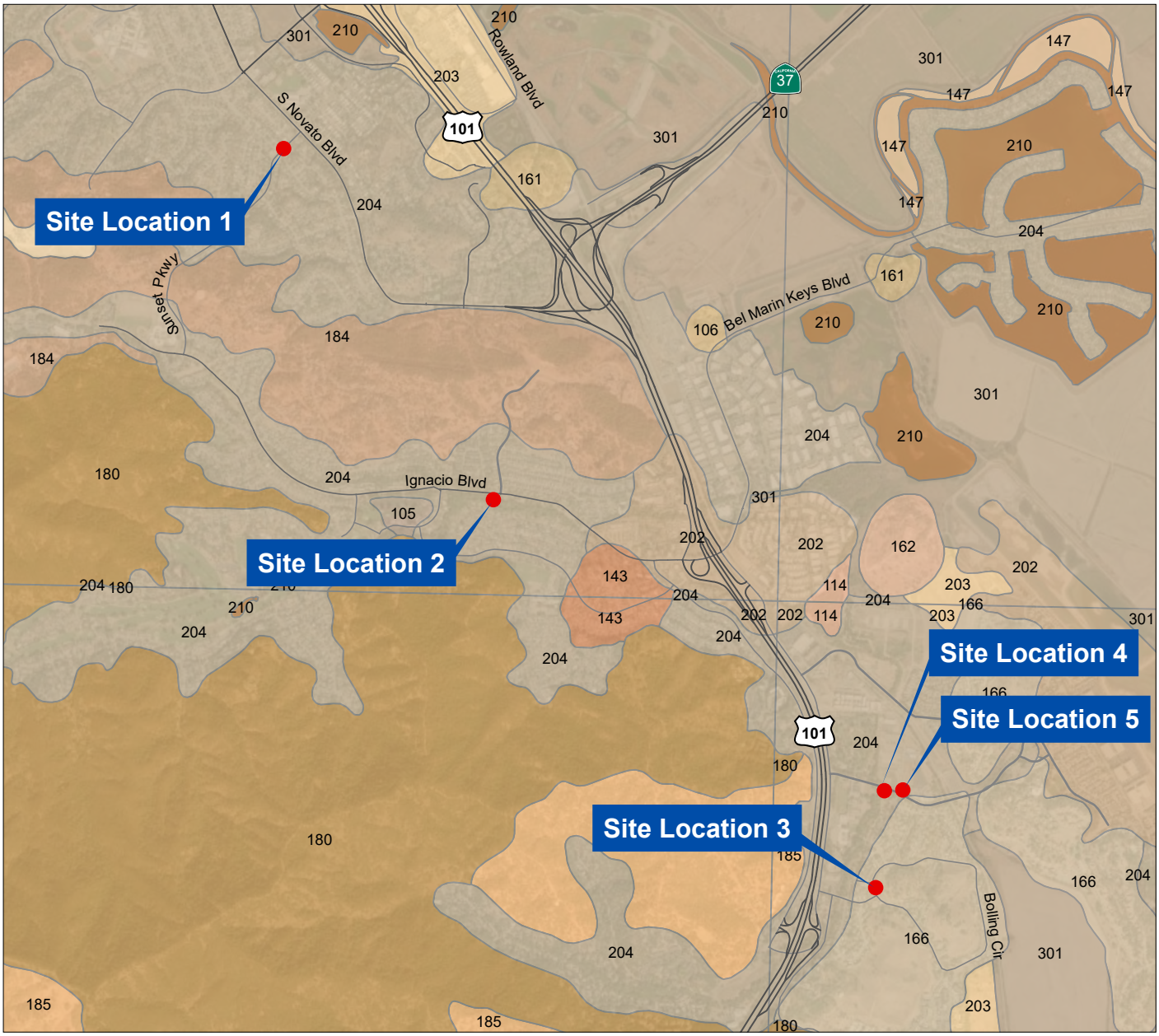
LYNWOOD PUMP STATION PROJECT
SUNSET PARKWAY., IGNACIO BOULEVARD., AND BOLLING CIRCLE
NOVATO, CALIFORNIA

REGIONAL GEOLOGY MAP

0208191	JANUARY 2024	FIGURE 3



BASEMAP REFERENCE

1. SOIL DATA DERIVED FROM NATURAL RESOURCES CONSERVATION SERVICE, US DEPARTMENT OF AGRICULTURE; WEB SOIL SURVEY, ACCESSED ONLINE ON 6/29/2020.

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MAP UNIT DESCRIPTION

105	BLUCHER-COLE COMPLEX, 2 TO 5 PERCENT SLOPES	162	SAURIN-BONNYDOON COMPLEX, 15 TO 30 PERCENT SLOPES	202	URBAN LAND-XERORTHENTS COMPLEX, 0 TO 9 PERCENT SLOPES
106	BONNYDOON GRAVELLY LOAM, 15 TO 30 PERCENT SLOPES	163	SAURIN-BONNYDOON COMPLEX, 30 TO 50 PERCENT SLOPES	203	XERORTHENTS, FILL
114	CORTINA GRAVELLY SANDY LOAM, 0 TO 6 PERCENT SLOPES, COOL, MLRA 15	166	SAURIN-BONNYDOON COMPLEX, 30 TO 50 PERCENT SLOPES	204	XERORTHENTS-URBAN LAND COMPLEX, 0 TO 9 PERCENT SLOPES
143	LOS OSOS-URBAN LAND-BONNYDOON COMPLEX, 15 TO 30 PERCENT SLOPES	180	TOCALOMA-MCMULLIN COMPLEX, 50 TO 75 SLOPES	210	XERORTHENTS-URBAN LAND COMPLEX, 0 TO 9 PERCENT SLOPES
147	NOVATO CLAY, 0 TO 1 PERCENT SLOPES	184	TOCALOMA-SAURIN ASSOCIATION, VERY STEEP	301	REYES CLAY, 0 TO 2 PERCENT SLOPES
161	SAURIN-BONNYDOON COMPLEX, 2 TO 15 PERCENT SLOPES	185	TOCALOMA-SAURIN ASSOCIATION, EXTREMELY STEEP		

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LYNWOOD PUMP STATION PROJECT
SUNSET PARKWAY., IGNACIO BOULEVARD., AND BOLLING CIRCLE
NOVATO, CALIFORNIA

NRCS SOIL MAP

0208191	JANUARY 2024	FIGURE 4

BASEMAP REFERENCE

1. FAULT LOCATIONS FROM US GEOLOGICAL SURVEY QUATERNARY FAULTS AND FOLDS DATABASE, ACCESSED ONLINE ON 30 JULY 2021.

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MAP UNIT DESCRIPTION

- Inferred,class B
- historical (<150 years), moderately constrained location
- historical (<150 years), inferred location
- latest Quaternary (<15,000 years), well constrained location
- latest Quaternary (<15,000 years), moderately constrained location
- latest Quaternary (<15,000 years), inferred location
- Inferred,unspecified
- Moderately Constrained,class B
- undifferentiated Quaternary(<1.6 million years), well constrained location
- undifferentiated Quaternary(<1.6 million years), moderately constrained location
- undifferentiated Quaternary(<1.6 million years), inferred location

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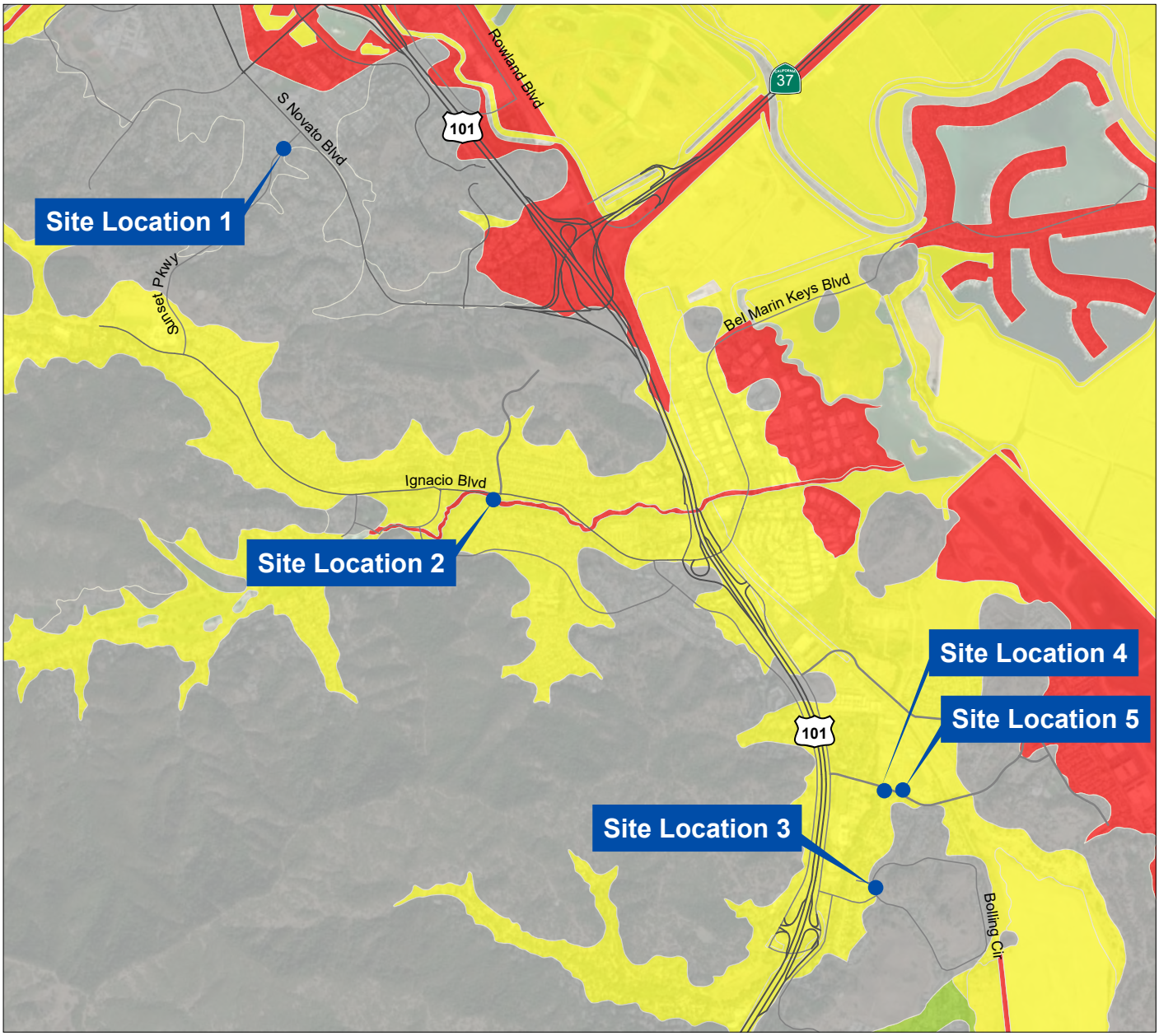
GEOTECHNICAL DESKTOP STUDY
SUNSET PARKWAY., IGNACIO BOULEVARD., AND BOLLING CIRCLE
NOVATO, CALIFORNIA

FAULT ACTIVITY MAP

0208191	JANUARY 2024	FIGURE 5



BASEMAP REFERENCE

1. RELATIVE LIQUEFACTION SUSCEPTIBILITY FROM WITTER (2006).

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MAP UNIT DESCRIPTION

- VERY HIGH
- HIGH
- MODERATE
- LOW
- VERY LOW
- NOT MAPPED

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GEOTECHNICAL DESKTOP STUDY
SUNSET PARKWAY., IGNACIO BOULEVARD., AND BOLLING CIRCLE
NOVATO, CALIFORNIA

LIQUEFACTION SUSCEPTIBILITY MAP

0208191	JANUARY 2024	FIGURE 6

APPENDIX A

Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named, soils that are similar to the named components, and some minor components that differ in use and management from the major soils.

Most of the soils similar to the major components have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Some minor components, however, have properties and behavior characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Marin County, California

166—Saurin-Urban land-Bonnydoon complex, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hf37
Elevation: 50 to 1,500 feet
Mean annual precipitation: 25 to 40 inches
Mean annual air temperature: 57 to 63 degrees F

Frost-free period: 270 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Saurin and similar soils: 30 percent
Urban land: 25 percent
Bonnydoon and similar soils: 20 percent
Minor components: 21 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saurin

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 10 inches: clay loam
H2 - 10 to 33 inches: clay loam
H3 - 33 to 37 inches: bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R015XY009CA - Hills 20-40"ppt
Hydric soil rating: No

Description of Urban Land

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear

Interpretive groups

Land capability classification (irrigated): 8
Land capability classification (nonirrigated): 8
Ecological site: R015XY009CA - Hills 20-40"ppt
Hydric soil rating: No

Description of Bonnydoon

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 11 inches: gravelly loam
H2 - 11 to 15 inches: bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R015XY009CA - Hills 20-40"ppt
Hydric soil rating: No

Minor Components

Tocaloma

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed, shallow

Percent of map unit: 5 percent
Hydric soil rating: No

Xerorthents

Percent of map unit: 5 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent

Hydric soil rating: No

Los osos

Percent of map unit: 2 percent
Hydric soil rating: No

Slumps

Percent of map unit: 2 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: Marin County, California
Survey Area Data: Version 16, Sep 13, 2022

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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Marin County, California

204—Xerorthents-Urban land complex, 0 to 9 percent slopes

Map Unit Setting

National map unit symbol: hf4g
Elevation: 0 to 500 feet
Mean annual precipitation: 20 to 30 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 270 to 350 days

Farmland classification: Not prime farmland

Map Unit Composition

Xerorthents and similar soils: 45 percent
Urban land: 40 percent
Minor components: 14 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Xerorthents

Setting

Landform: Tidal flats, valley floors
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Earth spread deposits

Properties and qualities

Slope: 0 to 9 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): 8s
Land capability classification (nonirrigated): 8s
Ecological site: R015XY003CA - Loamy Bottom
Hydric soil rating: No

Description of Urban Land

Setting

Landform: Valley floors, tidal flats
Landform position (two-dimensional): Backslope

Interpretive groups

Land capability classification (irrigated): 8
Land capability classification (nonirrigated): 8
Ecological site: R015XY003CA - Loamy Bottom
Hydric soil rating: No

Minor Components

Ballard

Percent of map unit: 2 percent
Hydric soil rating: No

Blucher

Percent of map unit: 2 percent
Hydric soil rating: No

Cole
Percent of map unit: 2 percent
Hydric soil rating: No

Slopes more than 9 percent
Percent of map unit: 2 percent
Hydric soil rating: No

Hydraquents
Percent of map unit: 2 percent
Landform: Tidal flats
Landform position (two-dimensional): Backslope
Hydric soil rating: Yes

Unnamed, briefly flooded soils
Percent of map unit: 2 percent
Hydric soil rating: No

Reyes
Percent of map unit: 1 percent
Landform: Salt marshes
Landform position (two-dimensional): Backslope
Hydric soil rating: Yes

Novato
Percent of map unit: 1 percent
Landform: Salt marshes
Landform position (two-dimensional): Backslope
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Marin County, California
Survey Area Data: Version 16, Sep 13, 2022

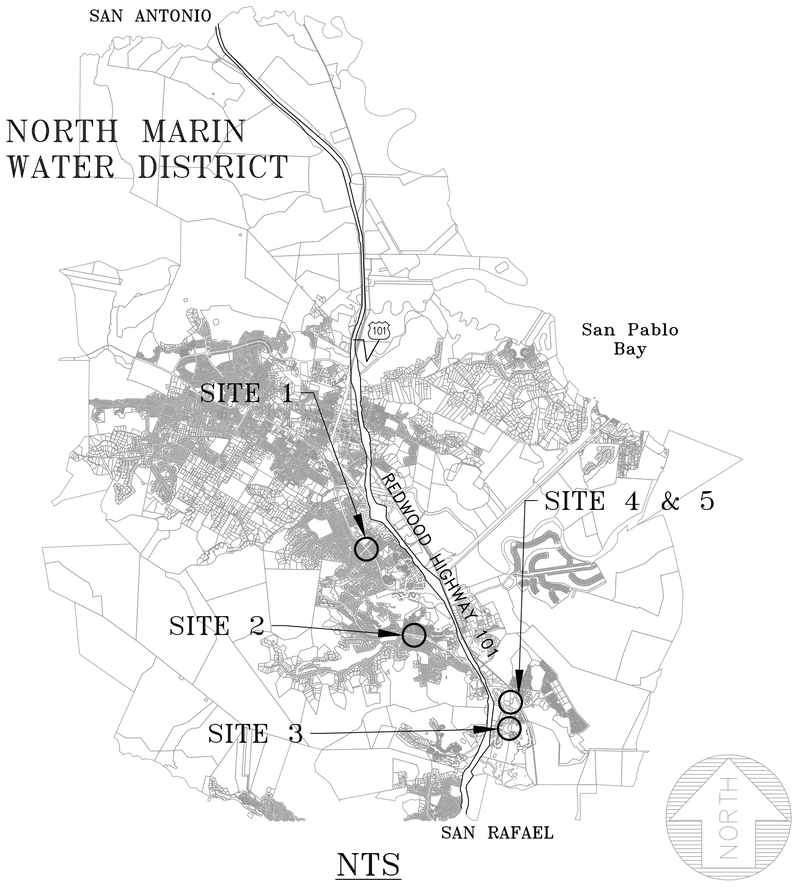
APPENDIX F

Conceptual Improvement Drawings

NORTH MARIN WATER DISTRICT

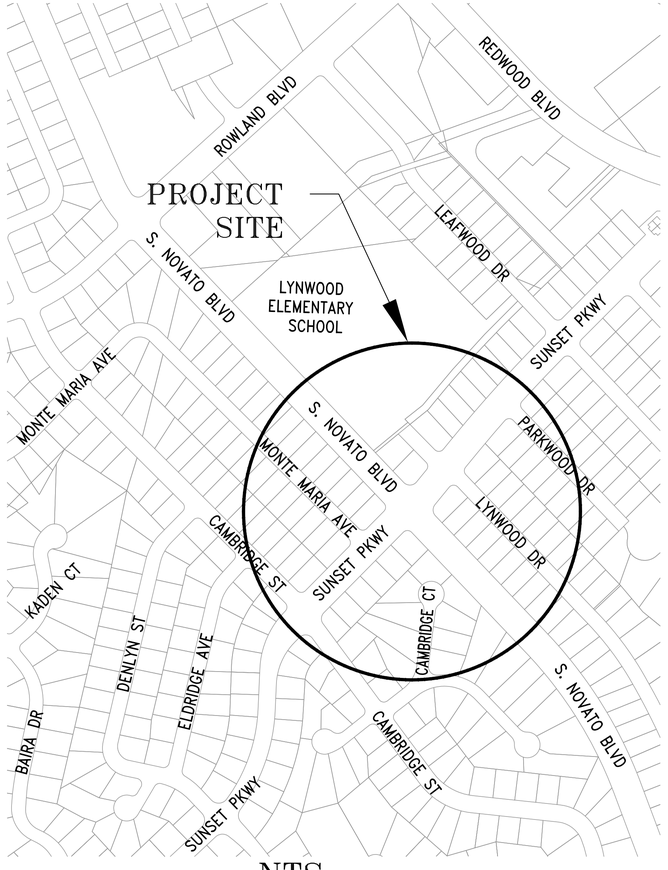
LYNWOOD PUMP STATION REPLACEMENT PROJECT

LOCATION MAP



NTS

EXISTING PUMP STATION SITE LOCATION



NTS

INDEX OF DRAWINGS

SHEET NO.	DRAWING NO.	SHEET CONTENT
1	G1	TITLE SHEET
2	G2	SYMBOLS, ABBREVIATIONS AND GENERAL NOTES
3	G3	GENERAL NOTES (CONT.)
4	C1	EXISTING CONDITIONS
5	C2	DEMOLITION PLAN
6	C3	SITE 1 ALTERNATIVE A
7	C4	SITE 2 ALTERNATIVE B, C, D, AND E
8	C5	SITE 3 ALTERNATIVE C
9	C6	SITE 4 ALTERNATIVE D
10	C7	SITE 5 ALTERNATIVE E
11	C8	PRESSURE REDUCING VALVE LOCATION MAP
12	M1	PUMP STATION SITE 1 ALTERNATIVE A
13	M2	PUMP STATION SITE 2 ALTERNATIVE B
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15	M4	PUMP STATION SITE 4 ALTERNATIVE D
16	M5	PUMP STATION SITE 3 AND 5 ALTERNATIVE C AND E
17	M6	DETAILS
18	E011	LYNWOOD PUMP STATION – OPTION "1" SINGLE LINE DIAGRAM
19	E012	LYNWOOD PUMP STATION – OPTION "2" SINGLE LINE DIAGRAM
20	E013	LYNWOOD PUMP STATION – OPTION "3" SINGLE LINE DIAGRAM

NO.	DATE	REVISION	BY	APP.
	01/17/2024	CONCEPTUAL DESIGN		

NORTH MARIN WATER DISTRICT
NOVATO, CALIFORNIA

LYNWOOD PUMP STATION REPLACEMENT PROJECT

TITLE SHEET

FREYER & LAURETA, INC.
CIVIL ENGINEERS • SURVEYORS • CONSTRUCTION MANAGERS
350 Executive Park Blvd • Suite 4200 • San Francisco, CA 94134
(415) 534-7070 • www.freyerlaureta.com

DES	DR	CH	SCALE : AS NOTED
			DATE : 01/17/2024
APPROVED: CHIEF ENGINEER			SHEET NO. : 1 OF 20 SHEETS
R.E. C78430			SERVICE AREA / JOB.NO. / NO. G1

SYMBOLS

EXISTING	PROPOSED	
		LIMIT OF WORK
		PROPERTY LINE
SS		SANITARY SEWER LINE
GAS		GAS LINE
W	W	WATER LINE
E	E	ELECTRICAL LINE
SD		STORM DRAIN
		CHAIN LINK FENCE
		EASEMENT
111		ADDRESS NUMBER
		WATER VALVE
157.7		SPOT ELEVATION
FH	FH	FIRE HYDRANT
		POST OR BOLLARD
		POT HOLE
		BUILDING
102		MAJOR CONTOUR AND ELEVATION
102		MINOR CONTOUR AND ELEVATION
	1 / C4.5	DETAIL & SHEET NOTATION
		BACKFLOW PREVENTOR
		FLEX-TEND FORCED BALANCED FLEXIBLE EXPANSION JOINTS
		MANHOLE
		ELECTRICAL POLE
SS		SANITARY SEWER MANHOLE

NOTES:

1. SYMBOLS ON THIS SHEET APPLY ONLY TO THE CIVIL DRAWINGS.
2. THIS IS A STANDARD SYMBOLS SHEET, THEREFORE, SOME SYMBOLS AND ABBREVIATIONS MAY APPEAR ON THIS SHEET AND MAY NOT BE UTILIZED ON THIS PROJECT.

ABBREVIATIONS

A	ASBESTOS CEMENT
ABND	ABANDON OR ABANDONED
@	AT
AB	AGGREGATE BASE
AC	ASPHALT CONCRETE
APPROX	APPROXIMATE
AP	ANGLE POINT
APVD	APPROVED
ARCH	ARCHITECTURAL
ARV	AIR RELEASE VALVE
AUTO.	AUTOMATIC
AUX	AUXILIARY
AWWA	AMERICAN WATER WORKS ASSOCIATION
B	"BITUMASTIC"-ASPHALTIC, COAL TAR, ETC. AWWA C203
BFV	BUTTERFLY VALVE
BV	BALL VALVE
BM	"B" WITH "M" OVER IT
C	CAST IRON
CARV	COMBINATION AIR RELEASE VALVE
CATV	CABLE TELEVISION
CB	CATCH BASIN
CI	CAST IRON
CIMJ	CAST IRON MECHANICAL JOINT
CIP	CAST IRON PIPE
CIRJ	CAST IRON RESTRAINED JOINT
CISP	CAST IRON SOIL PIPE
CL	CENTERLINE
CLDIP	CEMENT-LINED DUCTILE IRON PIPE
CLR	CLEAR, CLASS
CMP	CORRUGATED METAL PIPE
CO	CLEANOUT
CONC	CONCRETE
CONN	CONNECTION
CONT	CONTINUOUS, CONTINUATION
COORD	COORDINATE
COP.	COPPER
CPLG	COUPLING
CTE	CONNECT TO EXISTING
CV	CHECK VALVE
DI	DROP INLET
DIMJ	DUCTILE IRON MECHANICAL JOINT
DIP	DUCTILE IRON PIPE
DN	DOWN
DR	DRAIN
(E),EX,EXIST	EXISTING
E	EPOXY, LIQUID-AWWA C210 OR FUSION BONDED - AWWA C213
EP	EDGE OF PAVEMENT
EQPT	EQUIPMENT
EX	EXISTING
EXP	EXPOSED, EXPANSION
F	FUSED PVC
FCO	FLOOR CLEAN OUT
FD	FLOOR DRAIN
FDA	FLOOR DRAIN W/INTEGRAL TRAP
FDN	FOUNDATION
FF	FINISH FLOOR
FG	FINISH GRADE
FH	FIRE HYDRANT
FIG.	FIGURE
FLG	FLANGE
FL	FLOW LINE
FNSH	FINISH
FO	FIBER OPTICS
FOC	FACE OF CONCRETE
FP	FINISH PAVEMENT
FT	FOOT OR FEET
FTG	FOOTING
FW	FIRE WATER
°F	DEGREE FAHRENHEIT
G	GAS
GAL	GALLON
GALV	GALVANIZED
GB	GRADE BREAK
GPM	GALLONS PER MINUTE
GR	GRATE, GROUND
GRTG	GRATING
GS	GALVANIZED STEEL
GV	GATE VALVE
H	HIGH DENSITY POLYETHYLENE
HGL	HYDRAULIC GRADE LINE
HORIZ	HORIZONTAL
HP	HIGH POINT, HINGE POINT
HPG	HIGH PRESSURE GAS
HPW	HIGH PRESSURE WATER
ID	INSIDE DIAMETER
IF.	INSIDE FACE
IN.	INCH
INV	INVERT
L, R, T OR P	RENFORCED CONCRETE
LF	LINEAR FEET
L.O.W.	LIMIT OF WORK
M	MORAR OR CEMENT AWWA C205
MB	"M" WITH "B" OVER IT
N	PLASTIC
(N)	NEW
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
(OH)	OVERHEAD
OC	ON CENTER
OD	OUTSIDE DIAMETER, OVERFLOW DRAIN
OG	ORIGINAL GROUND
PAE	PUBLIC ACCESS EASEMENT
P	PLASTIC TAPE WRAP, AWWA C214, OR EXTRUDED - AWWA C215 OR C216
PL	PROPERTY LINE
POC	POINT OF CONNECTION
PREFAB	PREFABRICATED
PROP	PROPOSED
PSI	POUNDS PER SQUARE INCH
PSF	POUNDS PER SQUARE FOOT
PSIG	POUNDS PER SQUARE INCH, GAUGE
PSI	POUNDS PER SQUARE INCH
PSF	POUNDS PER SQUARE FOOT
PSIG	POUNDS PER SQUARE INCH, GAUGE
PUE	PUBLIC UTILITY EASEMENT
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PVT	PRIVATE
R, RAD	RADIUS
RC	REINFORCED CONCRETE
RCP	REINFORCED CONCRETE PIPE
RCW	RECLAIMED WATER
RD	ROAD, ROOF DRAIN
RDCR	REDUCER
REINF	REINFORCED, REINFORCING, REINFORCE
REQD	REQUIRED
RJ	RESTRAINED JOINT
RMV	REMOVE
ROW	RIGHT-OF-WAY
RST	REINFORCING STEEL
RWL	RECLAIMED WATER LINE
S	STEEL
SD	STORM DRAIN
SDI	STORM DRAIN INLET
SEC	SECTION
SPEC	SPECIFICATIONS
SQ	SQUARE
SQ FT	SQUARE FOOT
SQ IN	SQUARE INCH
SS	SANITARY SEWER
SSMH	SANITARY SEWER MANHOLE
SST	STAINLESS STEEL
ST	STREET
STA	STATION
STD	STANDARD
S/W, SW	SIDEWALK
U	UNLINED
UON	UNLESS OTHERWISE NOTED
VIF	VERIFY IN FIELD
W/	WITH
W	WATER, WEST
WM	WATER METER
WS	WATER SURFACE, WATER STOP
WSP	WELDED STEEL PIPE

GENERAL NOTES

GR GENERAL REQUIREMENTS

GR-1) AS USED IN THESE GENERAL NOTES:
"DRAWINGS" MEANS THE LATEST DRAWINGS, UON.
"SPECIFICATIONS" MEANS THE LATEST PROJECT SPECIFICATIONS, UON.
"CONTRACT DOCUMENTS" IS DEFINED AS THE ENGINEER OF RECORD FOR THE FINAL CONDITION.
"DESIGN PROFESSIONALS" IS DEFINED AS THE OWNER'S CIVIL ENGINEER AND SER.
"MEP" INCLUDES, BUT IS NOT LIMITED TO MECHNIAL, ELECTRICAL, PLUMBING.

"CONTRACTOR" IS DEFINED TO INCLUDE ANY OF THE FOLLOWING: GENERAL CONTRACTOR AND THEIR SUBCONTRACTORS, CONSTRUCTION MANAGER AND THEIR SUBCONTRACTORS.

GR-2) THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF THE PROJECT WORK WITH THE CIVIL, MEP CONTRACT DOCUMENTS, AS WELL AS ANY OTHER APPLICABLE TRADES.

GR-3) THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE UNTIL THE CONSTRUCTION OF THE STRUCTURE REACHES ITS FINAL CONDITION.

GR-4) THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE INSTALLATION, AND REMOVAL OF TEMPORARY BRACING AND OTHER REQUIRED CONSTRUCTION SUPPORTS, FOR NEW AND EXISTING STRUCTURES, AS NECESSARY TO COMPLETE THE PROJECT. NO PORTION OF THE PROJECT WHILE UNDER CONSTRUCTION IS INTENDED TO BE STABLE IN THE ABSENCE OF THE TEMPORARY SUPPORTS AND BRACES. CONTRACTOR SHALL RETAIN A STRUCTURAL ENGINEER LICENSED IN THE STATE IN WHICH THE PROJECT IS LOCATED TO ASSIST TEMPORARY BRACING INSTALLATION AND REMOVAL AND OTHER CONSTRUCTION SUPPORTS.

GR-5) THE SPECIFICATIONS ARE AN INTEGRAL PART OF THE CONTRACT DOCUMENTS AND SHALL BE USED IN CONJUNCTION WITH THE DRAWINGS.

GR-6) IN CASES OF CONFLICT BETWEEN DRAWINGS AND/OR SPECIFICATIONS AND OTHER DISCIPLINES OR EXISTING CONDITIONS, CONTRACTOR SHALL NOTIFY THE DESIGN PROFESSIONALS AND OBTAIN CLARIFICATION PRIOR TO BIDDING AND PROCEEDING WITH WORK.

GR-7) APPLY DETAILS, SECTIONS, AND NOTES ON THE DRAWINGS WHERE CONDITIONS ARE SIMILAR TO THOSE INDICATED BY DETAIL, DETAIL TITLE OR NOTE.

GR-8) ONLY USE DIMENSIONS INDICATED ON THE DRAWINGS. DO NOT SCALE DRAWINGS.

GR-9) ASSUME EQUAL SPACING BETWEEN ESTABLISHED DIMENSIONS, IF NOT INDICATED ON DRAWINGS.

GR-10) THE CONTRACTOR SHALL PROTECT EXISTING FACILITIES, STRUCTURES AND UTILITIES FROM DAMAGE, UON.

GR-11) THE CONTRACTOR SHALL VERIFY THAT CONSTRUCTION LOADS DO NOT EXCEED THE CAPACITY OF THE STRUCTURE AT THE TIME THE LOAD IS APPLIED.

GR-12) ELEVATIONS INDICATED ON DRAWINGS ARE BASED ON A PROJECT DATUM INDICATED ON THE CIVIL DRAWINGS.

CM CONCRETE MATERIALS

CM-1) CONCRETE STRENGTHS AND WEIGHT (SEE SPECIFICATION SECTION FOR ADDITIONAL CONCRETE PROPERTIES):

LOCATION	MIN COMPRESSIVE STRENGTH (PSI)	MAX WEIGHT (PCF)
ALL OTHER CONC NOT SPECIFICALLY SPECIFIED	4000 PSI @ 28 DAYS	145

CM-2) ALL CONCRETE SHALL BE THOROUGHLY CONSOLIDATED.

CM-3) THE USE OF CALCIUM CHLORIDE AND OTHER CHLORIDE CONTAINING AGENTS IS PROHIBITED. THE USE OF RECYCLED CONCRETE IS PROHIBITED. PLACEMENT WITHIN AND CONTACT BETWEEN ALUMINUM ITEMS, INCLUDING ALUMINUM CONDUIT, AND CONCRETE IS PROHIBITED.

RE CONCRETE REINFORCEMENT

RE-1) ALL CONCRETE SHALL INCLUDE REINFORCEMENT. IF REINFORCEMENT IS NOT SPECIFICALLY INDICATED ON THE DRAWINGS, VERIFY WITH THE ENGINEER BEFORE PROCEEDING WITH WORK.

RE-2) REINFORCEMENT SHALL CONFORM TO THE FOLLOWING STANDARDS AND MATERIAL PROPERTIES:

DEFORMED BARS:	ASTM A615, GRADE 60, UON
WELDABLE DEFORMED BARS:	ASTM A706, GRADE 60, UON
WELDED BAR ANCHORS:	NELSON D2L DEFORMED BAR ANCHORS (ICC-ES REPORT ER-5217)

RE CONCRETE REINFORCEMENT (CONT)

RE-3) DETAIL REINFORCEMENT BASED ON THE PROJECT REQUIREMENTS, ACI-318 AND ACI-315, UON.

RE-4) WHERE A 90-DEG, 135 -DEG OR 180-DEG HOOK IS GRAPHICALLY INDICATED, PROVIDE CORRESPONDING ACI STANDARD HOOKS, UON.

RE-5) DOWELS SHALL MATCH SIZE AND SPACING OF MAIN REINFORCEMENT, UON.

RE-6) REINFORCEMENT SHALL HAVE CONCRETE PROTECTION (CLEAR COVER) PER ACI 318 UNLESS OTHERWISE INDICATED ON THE DRAWINGS.

RE-7) LAP REINFORCEMENT AS SPECIFICALLY DETAILED ON THE DRAWINGS.

RE-8) UNLESS OTHERWISE NOTED ALL LAP SPLICES ARE TO BE CLASS "B" SPLICES.

RE-9) PROVIDE MECHANICAL SPLICES FOR BARS LARGER THAN #11 OR WHERE INDICATED. PROVIDE TENSILE, PRE-QUALIFIED, WELDED OR THREADED MECHANICAL SPLICES UON.

RE-10) TERMINATION OF REINFORCEMENT, UON:

A. TERMINATE ALL BARS IN LAPS, 90 DEGREE BENDS, OR WITH DOWELS INTO EXISTING CONCRETE.
B. BEND TOP MAT OR FOOTING BARS DOWN TO BOTTOM BARS AT ENDS.
C. BEND BOTTOM MAT OR FOOTING BARS UP WITH STANDARD 90 DEGREE BENDS.
D. PROVIDE DOWELS FROM FOOTINGS AND SLABS INTO WALLS AND COLUMNS TO MATCH SIZE AND SPACING OF VERTICAL REINFORCEMENT.

SP STRUCTURAL PRECAST CONCRETE

SP-1) TYPICAL DETAILS INDICATE GENERAL CRITERIA FOR DESIGN AND DETAILING OF PRECAST CONCRETE. PROVIDE DESIGNS THAT MEET INDICATED CRITERIA BELOW AND LISTED CODES AND STANDARDS AND ICC-ES EVALUATION REPORT ESR-2660.

SP-2) PROVIDE CAMBER TO LIMIT DEFLECTION SUCH THAT NO POINT OF THE DEFLECTED STRUCTURE EXCEEDS' BELOW THE STATED ELEVATION. CAMBER DESIGN SHALL INCLUDE EFFECTS OF LONG-TERM DEFLECTION, SHRINKAGE, CREEP, AND MAXIMUM ALLOWABLE CONSTRUCTION TOLERANCES.

SP-3) DO NOT USE POWER-DRIVEN ANCHORS OR ANCHORS WHICH REQUIRE DRILLING AT PRESTRESSED UNITS. SUBMIT PROPOSED ANCHOR PROCEDURES FOR PRECAST UNITS TO THE DESIGN PROFESSIONALS AND PRECAST SUPPLIER FOR REVIEW.

PA POST-INSTALLED ANCHORS

PA-1) POST-INSTALLED ANCHORS INCLUDE EXPANSION ANCHORS, EPOXY ANCHORS/DOWELS, AND POWDER-ACTUATED FASTENERS.

PA-2) INSTALL POST-INSTALLED ANCHORS IN ACCORDANCE WITH THE APPLICABLE ICC-ES REPORT AND THE MANUFACTURER'S RECOMMENDATIONS.

PA-3) USE SCANNING EQUIPMENT OR OTHER MEANS TO LOCATE AND AVOID CUTTING OR DAMAGING REINFORCING BARS. EOR APPROVAL IS REQUIRED PRIOR TO CUTTING OR DAMAGING REINFORCING.

PA-4) SPECIAL INSPECTION IS REQUIRED FOR ALL POST-INSTALLED ANCHOR INSTALLATIONS, UON.

PA-5) FIELD TESTING OF POST-INSTALLED ANCHORS IS REQUIRED, UON. TEST INSTALLED ANCHORS IN ACCORDANCE WITH THE FOLLOWING:

A. TEST 100% OF ANCHORS AT ALL STRUCTURAL APPLICATIONS, UON.
B. TEST 50% OF ANCHORS AT ALL NON-STRUCTURAL APPLICATIONS (SUCH AS EQUIPMENT ANCHORAGE), UON.
C. TEST 10% OF ANCHORS AT SILL PLATE BOLTING APPLICATIONS, UON.
D. IF ANY ANCHOR FAILS TESTING, TEST ALL ANCHORS OF THE SAME TYPE NOT PREVIOUSLY TESTED UNTIL 20 CONSECUTIVE ANCHORS PASS.
E. FIELD TESTS SHALL BE EITHER TENSION TESTS OR TORQUE TESTS, AS REQUIRED FOR THE SPECIFIC ANCHOR TYPE.

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NORTH MARIN WATER DISTRICT
NOVATO, CALIFORNIA

LYNWOOD PUMP STATION REPLACEMENT PROJECT

SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES

DES	DR	CH	SCALE : AS NOTED	
			DATE : 01/17/2024	
APPROVED: CHIEF ENGINEER			SHEET NO. : 2 OF 20 SHEETS	
R.E. C78430			SERVICE AREA	JOB.NO. NO. G2

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GENERAL NOTES (CONT.)

PA POST-INSTALLED ANCHORS (CONT)

F. TENSION TESTS: APPLY TEST LOADS TO ANCHORS WITHOUT REMOVING THE NUT IF POSSIBLE. IF NOT, REMOVE NUT AND INSTALL A THREADED COUPLER TO THE SAME TIGHTNESS AS THE ORIGINAL NUT USING A TORQUE WRENCH. REACTION LOADS FROM TEST FIXTURES MAY BE APPLIED CLOSE TO THE ANCHOR BEING TESTED, PROVIDED THE ANCHOR IS NOT RESTRAINED FROM WITHDRAWING BY THE FIXTURES. TO BE ACCEPTABLE, ANCHORS SHALL HAVE NO OBSERVABLE MOVEMENT AT THE APPLICABLE TEST LOAD (OBSERVABLE MOVEMENT IS DEFINED AS THE WASHER UNDER THE NUT BECOMING LOOSE).

G. TORQUE TESTS: TO BE ACCEPTABLE, THE APPLICABLE TEST TORQUE MUST BE REACHED WITHIN ONE-HALF TURN OF THE NUT.

H. TEST EQUIPMENT IS TO BE CALIBRATED BY AN APPROVED TESTING LABORATORY IN ACCORDANCE WITH STANDARD RECOGNIZED PROCEDURES.

I. FIELD TESTING SHALL BE DONE IN THE PRESENCE OF THE PROJECT INSPECTOR.

J. TESTING SHOULD OCCUR A MINIMUM OF 24 HOURS AFTER INSTALLATION OF THE SUBJECT ANCHOR.

PA-6) EXPANSION ANCHORS

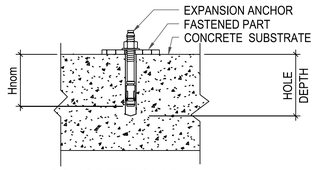
A. EXPANSION ANCHORS SHALL BE EITHER ONE OF THE FOLLOWING, UON:

HILTI KWIK BOLT TZ
(ICC-ES REPORT ESR-1917)

SIMPSON STRONG-BOLT 2
(ICC-ES REPORT ESR-3037)

USE OF CARBON STEEL EXPANSION ANCHORS IS LIMITED TO DRY, INTERIOR LOCATIONS. USE STAINLESS STEEL EXPANSION ANCHORS AT EXTERIOR, WEATHER-EXPOSED, OR DAMP LOCATIONS. USE OF EXPANSION ANCHOR INSIDE OF THE BASIN IS NOT ALLOWED.

B. ANCHOR EMBEDMENTS BELOW ARE TO BE USED WHEN EXPLICITLY SPECIFIED IN THE STRUCTURAL DRAWINGS. FOR LOCATIONS WHERE TENSION TEST VALUES ARE NOT SPECIFIED IN THE DRAWINGS, CONSULT WITH THE EOR.



CONCRETE SLAB

HILTI KWIK BOLT TZ IN NORMAL-WEIGHT CONCRETE			
ANCHOR DIAMETER	Hnom	MINIMUM HOLE DEPTH	TORQUE TEST VALUE (FT-LBS)
3/8"	2 5/16"	2 5/8"	25
1/2"	2 3/8"	2 5/8"	40
5/8"	4 7/16"	4 3/4"	60
3/4"	5 9/16"	5 3/4"	110

SIMPSON STRONG-BOLT 2 IN NORMAL-WEIGHT CONCRETE			
ANCHOR DIAMETER	Hnom	MINIMUM HOLE DEPTH	TORQUE TEST VALUE (FT-LBS)
3/8"	1 7/8"	2"	30
1/2"	2 3/4"	3"	60
5/8"	5 1/8"	6"	90
3/4"	5 3/4"	5 3/8"	150

C. Hnom IS MEASURED FROM FACE OF CONCRETE SUBSTRATE TO THE END OF THE BOLT.

D. CONTRACTOR SHALL PROVIDE ANCHORS WITH SUFFICIENT TOTAL LENGTH FOR THE SPECIFIED EMBEDMENT LENGTH, THICKNESS OF FASTENED PART, WASHER AND NUT.

PA-7) EPOXY ANCHORS AND DOWELS

A. EPOXY SHALL BE EITHER ONE OF THE FOLLOWING, UON:

HILTI HIT-HY 200 (ICC-ES REPORT ESR-3187)

HILTI HIT-RE 500-SD (ICC-ES REPORT ESR-2322)

SIMPSON SET-XP (ICC-ES REPORT ESR-2508)

PA POST-INSTALLED ANCHORS (CONT.)

B. RODS EMBEDDED IN EPOXY SHALL BE STAINLESS (ASTM 593,A316) STEEL THREADED RODS PER MANUFACTURER'S ICC-ES REPORT.

C. REINFORCING STEEL BARS EMBEDDED IN EPOXY SHALL BE ASTM A615, GRADE 60, UON.

D. ANCHOR EMBEDMENT AND TENSION TEST VALUES BELOW ARE TO BE USED WHEN EXPLICITLY SPECIFIED IN THE DRAWINGS. FOR LOCATIONS WHERE TENSION TEST VALUES ARE NOT SPECIFIED IN THE DRAWINGS, CONSULT WITH THE SER.

EPOXY ANCHORS IN NORMAL-WEIGHT CONCRETE (3000 PSI MIN)				
REBAR SIZE	EMBEDMENT (IN)	TENSION TEST VALUE (LBS)		
		HILTI HIT-HY 200	HILTI HIT-RE 500-SD	SIMPSON SET-XP
#3	3	2900	940	1040
#4	4	5180	1670	3740
#5	5	8130	2600	5260
#6	6	11120	3750	6740
#7	7	12260	4320	8020
* LISTED EPOXY ADHESIVE MAY NOT BE USED WITH NOTED REBAR SIZES				

EPOXY ANCHORS IN NORMAL-WEIGHT CONCRETE (3000 PSI MIN)				
THREADED ROD DIAMETER (IN)	EMBEDMENT (IN)	TENSION TEST VALUE (LBS)		
		HILTI HIT-HY 200	HILTI HIT-RE 500-SD	SIMPSON SET-XP
3/8	3	2500	1230	1700
1/2	4	4480	2110	2600
5/8	5	7030	3170	3450
3/4	6	10180	4450	4440
7/8	7	11710	4720	5540

E. TESTING OF EPOXY DOWELS AT JOINTS BETWEEN NEW AND EXISTING SLABS-ON-GRADE IS NOT REQUIRED.

F. TESTING SHALL OCCUR AFTER EPOXY HAS CURED, AS PER MANUFACTURER'S RECOMMENDATIONS.

G. OVERHEAD AND/OR CONSTANT TENSION EPOXY ANCHOR INSTALLATIONS NOT SHOWN ON THE DRAWINGS SHALL NOT BE PERMITTED UNLESS EACH CONDITION IS REVIEWED AND APPROVED IN WRITTING BY SER.

H. EPOXY ANCHORS SHALL BE INSTALLED IN CONCRETE HAVING A MINIMUM AGE OF 21 DAYS AT TIME OF ANCHOR INSTALLATION.

I. INSTALLATION AND INSPECTION OF EPOXY ANCHORS SHALL COMPLY WITH ACI 318-11 APPENDIX D SECTIONS D.9.2.2 AND D.9.2.4.

J. FOR USES OF EPOXY DOWELS NOT EXPLICITLY SPECIFIED IN THE STRUCTURAL DRAWINGS, CONTACT THE SER.

SU SUBMITTALS

SU-1) THE CONTRACTOR IS TO REVIEW EACH SUBMITTAL PRIOR TO FORWARDING TO CIVIL ENGINEER. THE CONTRACTOR IS TO STAMP EACH SUBMITTAL VERIFYING THAT THE FOLLOWING IS ADDRESSED:

1. THE SHOP DRAWING IS REQUESTED.
2. THE SHOP DRAWING IS BASED ON THE LATEST DESIGN.
3. THE CIVIL ENGINEER'S COMMENTS FROM ANY PREVIOUS SUBMITTALS ARE ADDRESSED.
4. THE WORK IS COORDINATED AMONG ALL CONSTRUCTION TRADES.
5. REVISIONS FROM PREVIOUS SUBMITTALS ARE CLEARLY MARKED BY CIRCLING OR CLOUDS.
6. SUBMITTAL IS COMPLETE.
7. SUBMITTAL DOES NOT INCLUDE SUBSTITUTION REQUEST
8. SUBMITTAL SHALL INCLUDE A STAMP INDICATING PROJECT NAME AND LOCATION, SUBMITTAL NUMBER, SPECIFICATION SECTION NUMBER.

THE CIVIL ENGINEER SHALL RETURN, WITHOUT COMMENT, SUBMITTALS WHICH THE CONTRACTOR HAS NOT STAMPED OR WHICH DO NOT MEET THE ABOVE REQUIREMENTS. THE CIVIL ENGINEER'S REVIEW OF SUBMITTALS SHALL BE FOR GENERAL CONFORMANCE WITH THE DESIGN INTENT. NO WORK SHALL BE STARTED WITHOUT SUCH REVIEW.

SU-2) FOR COMPONENTS THAT REQUIRE ENGINEERING BY THE CONTRACTOR, PROVIDE A NOTE ON EACH SHOP DRAWING, WRITTEN AND SIGNED BY THE SUPPLIER' S ENGINEER, INDICATING THAT THE SHOP DRAWING IS IN CONFORMANCE WITH THE CALCULATIONS OF THE CONTRACTOR'S ENGINEER.

SU-3) THE FOLLOWING ITEMS REQUIRE SUBMITTALS FOR REVIEW AS OUTLINED IN THE SPECIFICATIONS:

S = SHOP DRAWINGS AND/OR PRODUCT DATA REQUIRED

CALC = SUPPORTING CALCULATIONS REQUIRED, SIGNED AND SEALED BY A LICENSED [PROFESSIONAL] ENGINEER IN THE STATE IN WHICH THE PROJECT IS LOCATED.

THE ITEMS IN THIS SECTION REQUIRE SHOP DRAWINGS, SUBMITTED FOR REVIEW OF INTERACTION WITH THE BASE BUILDING STRUCTURE.

SU SUBMITTAL (CONT.)

SU-4) DEFERRED SUBMITTALS SHALL FIRST BE SUBMITTED TO THE PROJECT CIVIL ENGINEER AND/OR THE ENGINEER OF RECORD FOR REVIEW AND COORDINATION. FOLLOWING THE COMPLETION OF THE CIVIL ENGINEER OR ENGINEER'S REVIEW, A SUBMITTAL TO THE PLAN CHECK AUTHORITY SHALL BE MADE FOR REVIEW AND APPROVAL. THIS SUBMITTAL SHALL BE PROCESSED IN ACCORDANCE WITH CBC APPENDIX CHAPTER 1, SECTION 106.3.4.2. FOR A LIST OF DEFERRED ITEMS, SEE CIVIL ENGINEER DRAWINGS.

PI PERFORMANCE ITEMS

PI-1) THE CONTRACTOR SHALL EMPLOY OR RETAIN A LICENSED STRUCTURAL ENGINEER IN THE STATE IN WHICH THIS PROJECT IS LOCATED TO DESIGN AND DETAIL PERFORMANCE ITEMS AS PART OF THE BASE BUILDING STRUCTURE INDICATED IN THE CONTRACT DOCUMENTS INCLUDING BUT NOT LIMITED TO:

1. TO BE DETERMINED IN DETAIL DESIGN PHASE.

SI SPECIAL INSPECTIONS AND STRUCTURAL TESTING

S1-1) SPECIAL INSPECTIONS SHALL BE PERFORMED BY A SPECIAL INSPECTOR PER CBC SECTIONS 1704 AND 1705. THE SPECIAL INSPECTOR SHALL BE EMPLOYED BY THE OWNER AND NOT BY THE CONTRACTOR OR ANY OTHER PERSON RESPONSIBLE FOR THE THE CONTRACTOR SHALL COMPLETE AND SUBMIT THE CITY OF PACIFICA'S SPECIAL INSPECTION AND TESTING AGREEMENT WORK. FORM. THE FORM MUST BE SUBMITTED PRIOR TO PERMIT ISSUANCE. ENSURE THAT ALL REQUIRED SIGNATURES ARE PROVIDED AND THE AREA OF SPECIAL INSPECTION IS CLEARLY INDICATED ON THE FORM AND ON THE COVDER SHEET OF THE PLANS.

S1-2) THE SPECIAL INSPECTOR SHALL BE A QUALIFIED (LICENSED) PERSON WHO SHALL PROVIDE WRITTEN DOCUMENTATION TO THE BUILDING OFFICIAL DEMONSTRATING HIS OR HER COMPETENCE AND RELEVANT TRAINING OR EXPERIENCE TO THE SATISFACTION OF THE BUILDING OFFICIAL. EXPERIENCE SHALL BE FOR SPECIAL INSPECTION OF THE PARTICULAR TYPE OF CONSTRUCTION OR OPERATION REQUIRING SPECIAL INSPECTION.

SI-3) THE CONTRACTOR SHALL SUBMIT A WRITTEN STATEMENT OF RESPONSIBILITY PER CBC SECTION 1704.4 TO THE BUILDING OFFICIAL AND THE OWNER PRIOR TO THE COMMENCEMENT OF WORK WHEN RESPONSIBLE FOR THE CONSTRUCTION OF A MAIN WIND FORCE OR SEISMIC FORCE RESISTING SYSTEM. THE STATEMENT OF RESPONSIBILITY SHALL CONTAIN ACKNOWLEDGEMENT OF AWARENESS OF THE SPECIAL REQUIREMENTS CONTAINED IN THE STATEMENT OF SPECIAL INSPECTION.

SI-4) THE FOLLOWING WORK REQUIRES STRUCTURAL TESTS. FOR SPECIFIC REQUIREMENTS OF STRUCTURAL TESTS, SEE THE SPECIFICATIONS AND GENERAL NOTES.

1. CONCRETE REINFORCEMENT
2. CAST-IN-PLACE CONCRETE
3. POST-INSTALLED ANCHORS
4. GROUTED DOWELS
5. WELDING: STRUCTURAL STEEL AND REINFORCING STEEL

SI-5) THE FOLLOWING ITEMS SHALL RECEIVE SPECIAL INSPECTION BY A CERTIFIED SPECIAL INSPECTOR IN ACCORDANCE WITH CBC 1704 AND 1705:

1. TBD

SPECIAL INSPECTIONS LIST (TO BE DETERMINED IN DETAIL DESIGN PHASE)				
VERIFICATION AND INSPECTION TASK	CONTINUOUS	PERIODIC	REFERENCED STANDARD	

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NORTH MARIN WATER DISTRICT
NOVATO, CALIFORNIA

LYNWOOD PUMP STATION REPLACEMENT PROJECT

GENERAL NOTES (CONT.)

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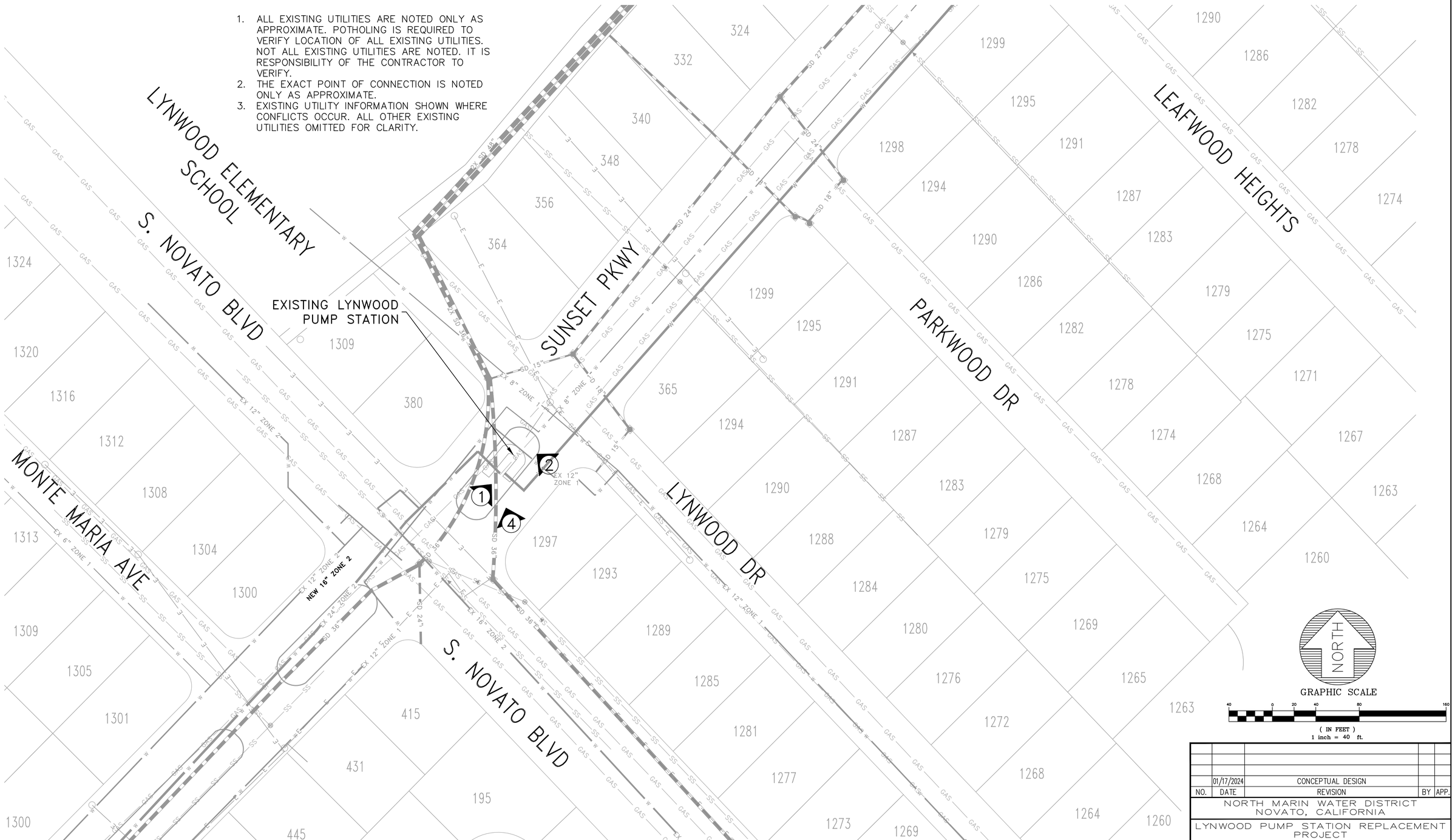
DES	DR	CH	SCALE : AS NOTED	
			DATE : 01/17/2024	
APPROVED: CHIEF ENGINEER			SHEET NO. : 3 OF 20 SHEETS	
R.E. C78430			SERVICE AREA	JOB.NO. NO. G3

1. ALL EXISTING UTILITIES ARE NOTED ONLY AS APPROXIMATE. POTHOLING IS REQUIRED TO VERIFY LOCATION OF ALL EXISTING UTILITIES. NOT ALL EXISTING UTILITIES ARE NOTED. IT IS RESPONSIBILITY OF THE CONTRACTOR TO VERIFY.
2. THE EXACT POINT OF CONNECTION IS NOTED ONLY AS APPROXIMATE.
3. EXISTING UTILITY INFORMATION SHOWN WHERE CONFLICTS OCCUR. ALL OTHER EXISTING UTILITIES OMITTED FOR CLARITY.



NORTH

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

NO.	DATE	REVISION	BY	APP.
	01/17/2024	CONCEPTUAL DESIGN		

NORTH MARIN WATER DISTRICT
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LYNWOOD PUMP STATION REPLACEMENT PROJECT

EXISTING CONDITIONS

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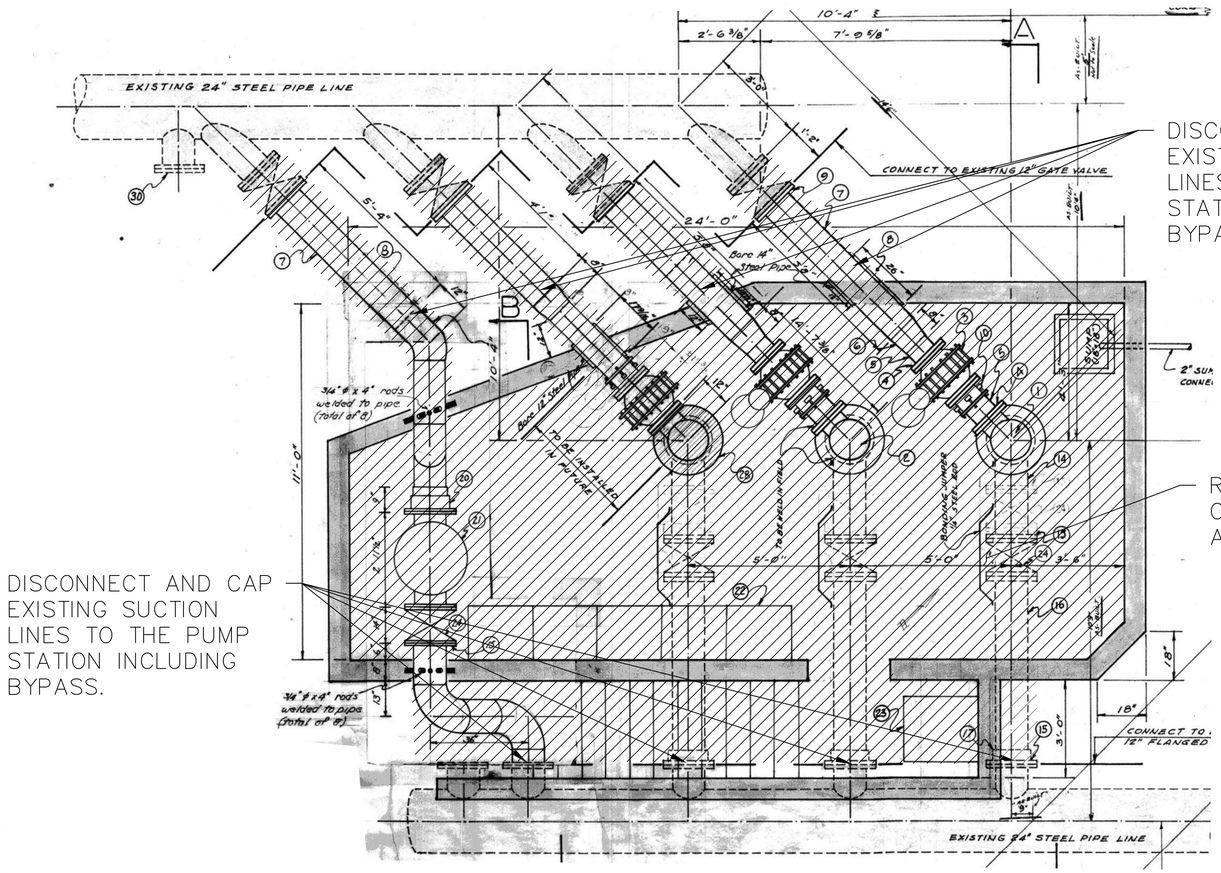
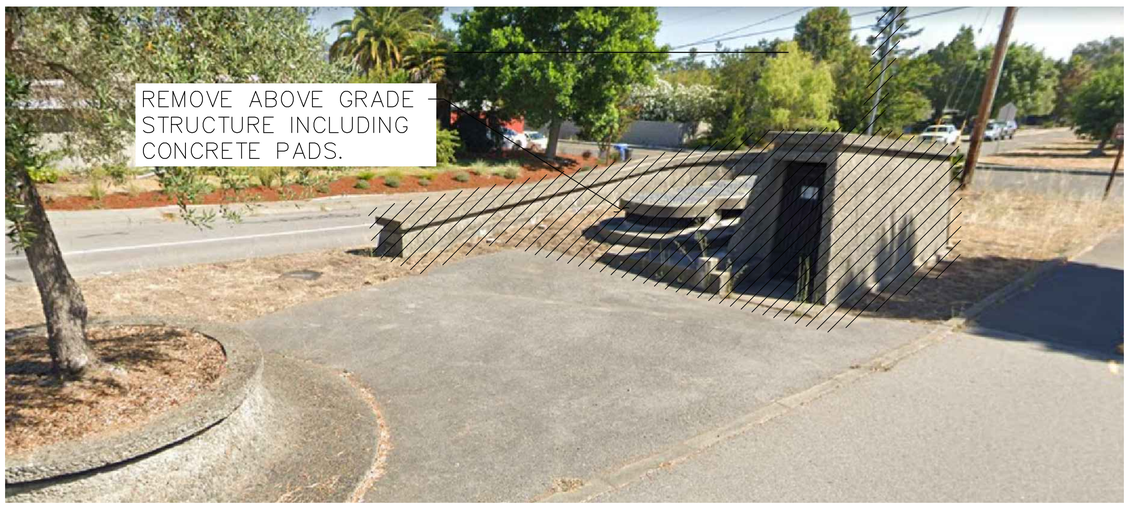
DES	DR	CH	SCALE : AS NOTED
			DATE : 01/17/2024
APPROVED: CHIEF ENGINEER			SHEET NO. : 4 OF 20 SHEETS
R.E. C78430			SERVICE AREA / JOB.NO. / NO. C1

1 – EXISTING LYNWOOD PUMP STATION EXTERNAL BUILDING
SCALE : NO SCALE



3 – EXISTING LYNWOOD PUMP STATION PLAN VIEW
SCALE : NO SCALE

2 – EXISTING LYNWOOD PUMP STATION EXTERNAL POWER
SCALE : NO SCALE



4 – EXISTING LYNWOOD PUMP STATION LOCATION
SCALE : NO SCALE

NO.	DATE	REVISION	BY	APP.
	01/17/2024	CONCEPTUAL DESIGN		

NORTH MARIN WATER DISTRICT
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LYNWOOD PUMP STATION REPLACEMENT PROJECT

DEMOLITION PLAN

DES	DR	CH	SCALE : AS NOTED
			DATE : 01/17/2024
APPROVED: CHIEF ENGINEER			SHEET NO. : 5 OF 20 SHEETS
R.E. C78430			SERVICE AREA / JOB.NO. / NO. C2

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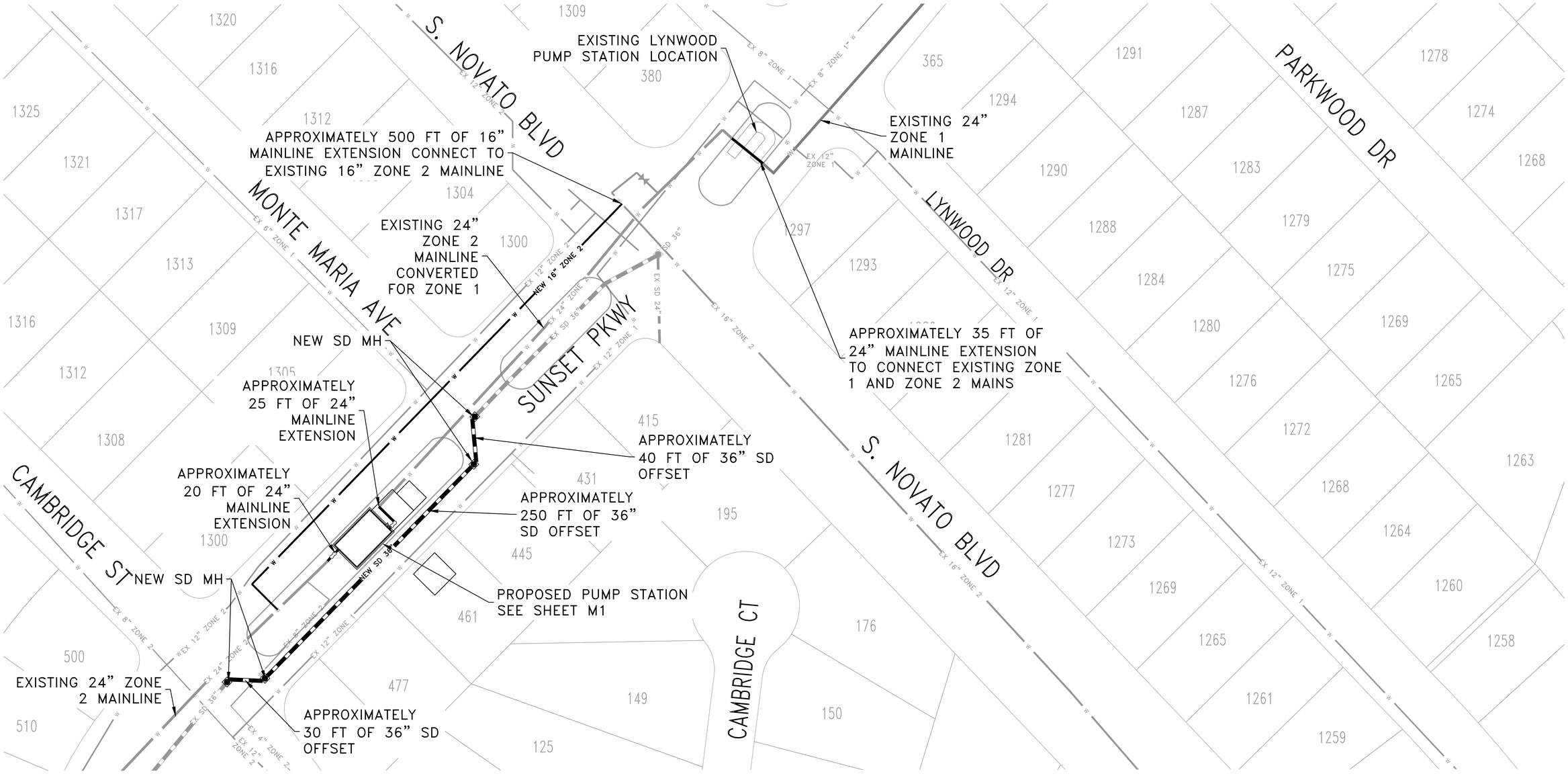

NOTES:

1. *ALL EXISTING UTILITIES ARE NOTED ONLY AS APPROXIMATE. POTHOLING IS REQUIRED TO VERIFY LOCATION OF ALL EXISTING UTILITIES. NOT ALL EXISTING UTILITIES ARE NOTED. IT IS RESPONSIBILITY OF THE CONTRACTOR TO VERIFY.*
2. *THE EXACT POINT OF CONNECTION IS NOTED ONLY AS APPROXIMATE.*
3. *EXISTING UTILITY INFORMATION SHOWN WHERE CONFLICTS OCCUR. ALL OTHER EXISTING UTILITIES OMITTED FOR CLARITY.*
4. *THIS SITE PLAN DEPICTS THE PUMP STATION SITE PLAN FOR ALTERNATIVE 1*

NORTH

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

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NORTH MARIN WATER DISTRICT
NOVATO, CALIFORNIA

LYNWOOD PUMP STATION REPLACEMENT PROJECT

SITE 1
ALTERNATIVE A

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			DATE : 01/17/2024
APPROVED: CHIEF ENGINEER			SHEET NO. : 6 OF 20 SHEETS
R.E. C78430			SERVICE AREA / JOB.NO. / NO. C3

NOTES:

1. *ALL EXISTING UTILITIES ARE NOTED ONLY AS APPROXIMATE. POTHOLING IS REQUIRED TO VERIFY LOCATION OF ALL EXISTING UTILITIES. NOT ALL EXISTING UTILITIES ARE NOTED. IT IS RESPONSIBILITY OF THE CONTRACTOR TO VERIFY.*
2. *THE EXACT POINT OF CONNECTION IS NOTED ONLY AS APPROXIMATE.*
3. *EXISTING UTILITY INFORMATION SHOWN WHERE CONFLICTS OCCUR. ALL OTHER EXISTING UTILITIES OMITTED FOR CLARITY.*
4. *THIS SITE PLAN DEPICTS THE PUMP STATION SITE PLAN FOR ALTERNATIVE 2, AND ONE PUMP STATION SITE FOR ALTERNATIVES 3, 4, AND 5.*

NORTH

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)

1 inch = 40 ft.

NO.	DATE	REVISION	BY	APP.
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NORTH MARIN WATER DISTRICT
NOVATO, CALIFORNIA

LYNWOOD PUMP STATION REPLACEMENT PROJECT

SITE 2

ALTERNATIVE B, C, D, AND E

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			DATE : 01/17/2024	
APPROVED: CHIEF ENGINEER			SHEET NO. : 7 OF 20 SHEETS	
R.E. C78430			SERVICE AREA	JOB.NO. NO. C4

NOTES:

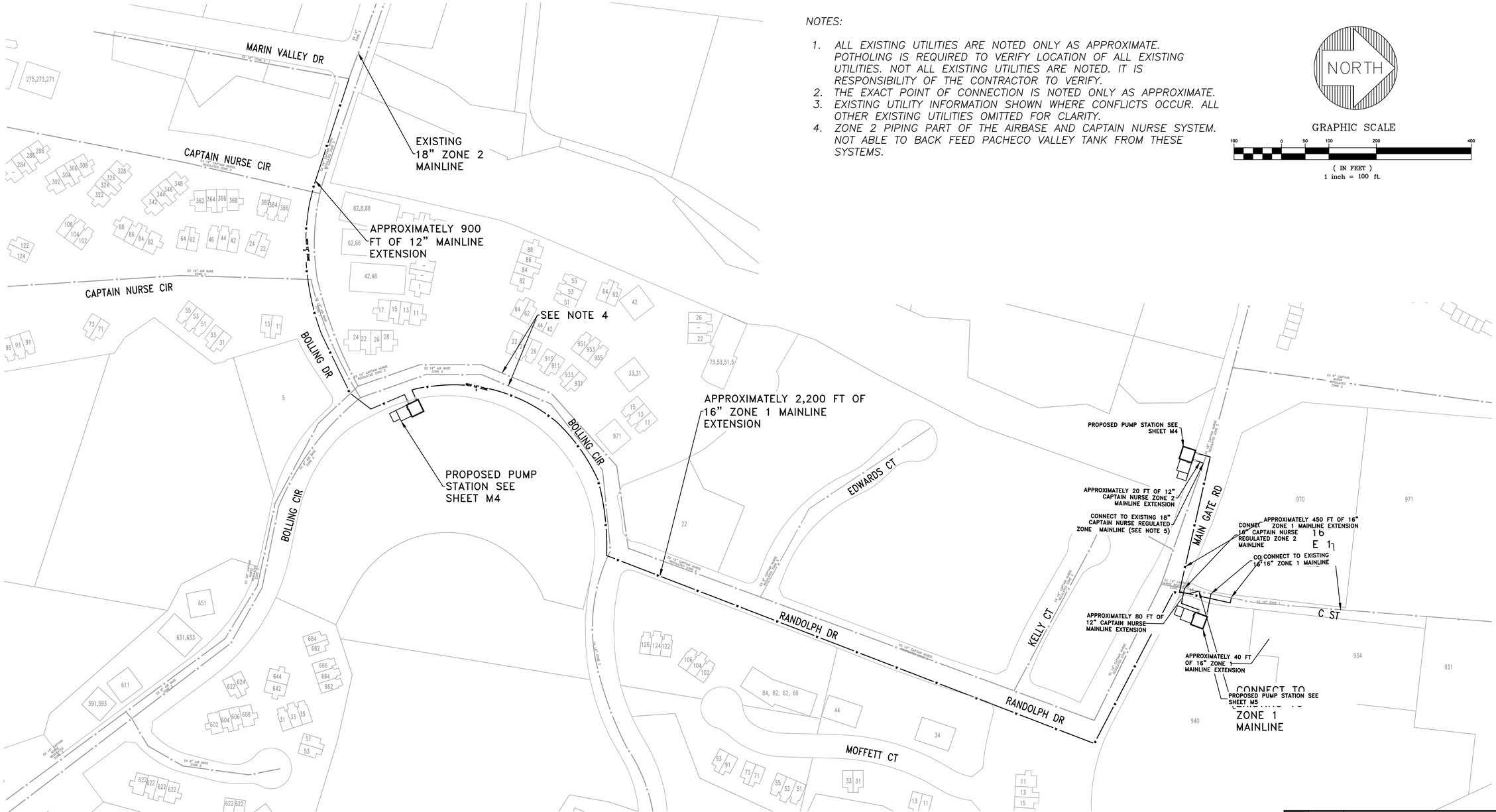
1. *ALL EXISTING UTILITIES ARE NOTED ONLY AS APPROXIMATE. POTHOLING IS REQUIRED TO VERIFY LOCATION OF ALL EXISTING UTILITIES. NOT ALL EXISTING UTILITIES ARE NOTED. IT IS RESPONSIBILITY OF THE CONTRACTOR TO VERIFY.*
2. *THE EXACT POINT OF CONNECTION IS NOTED ONLY AS APPROXIMATE.*
3. *EXISTING UTILITY INFORMATION SHOWN WHERE CONFLICTS OCCUR. ALL OTHER EXISTING UTILITIES OMITTED FOR CLARITY.*
4. *ZONE 2 PIPING PART OF THE AIRBASE AND CAPTAIN NURSE SYSTEM. NOT ABLE TO BACK FEED PACHECO VALLEY TANK FROM THESE SYSTEMS.*

NORTH

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.



NO.	DATE	REVISION	BY	APP.
	01/17/2024	CONCEPTUAL DESIGN		

NORTH MARIN WATER DISTRICT
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LYNWOOD PUMP STATION REPLACEMENT PROJECT

SITE 3

ALTERNATIVE C

DES	DR	CH	SCALE : AS NOTED
			DATE : 01/17/2024
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R.E. C78430			SERVICE AREA / JOB.NO. / NO. C5

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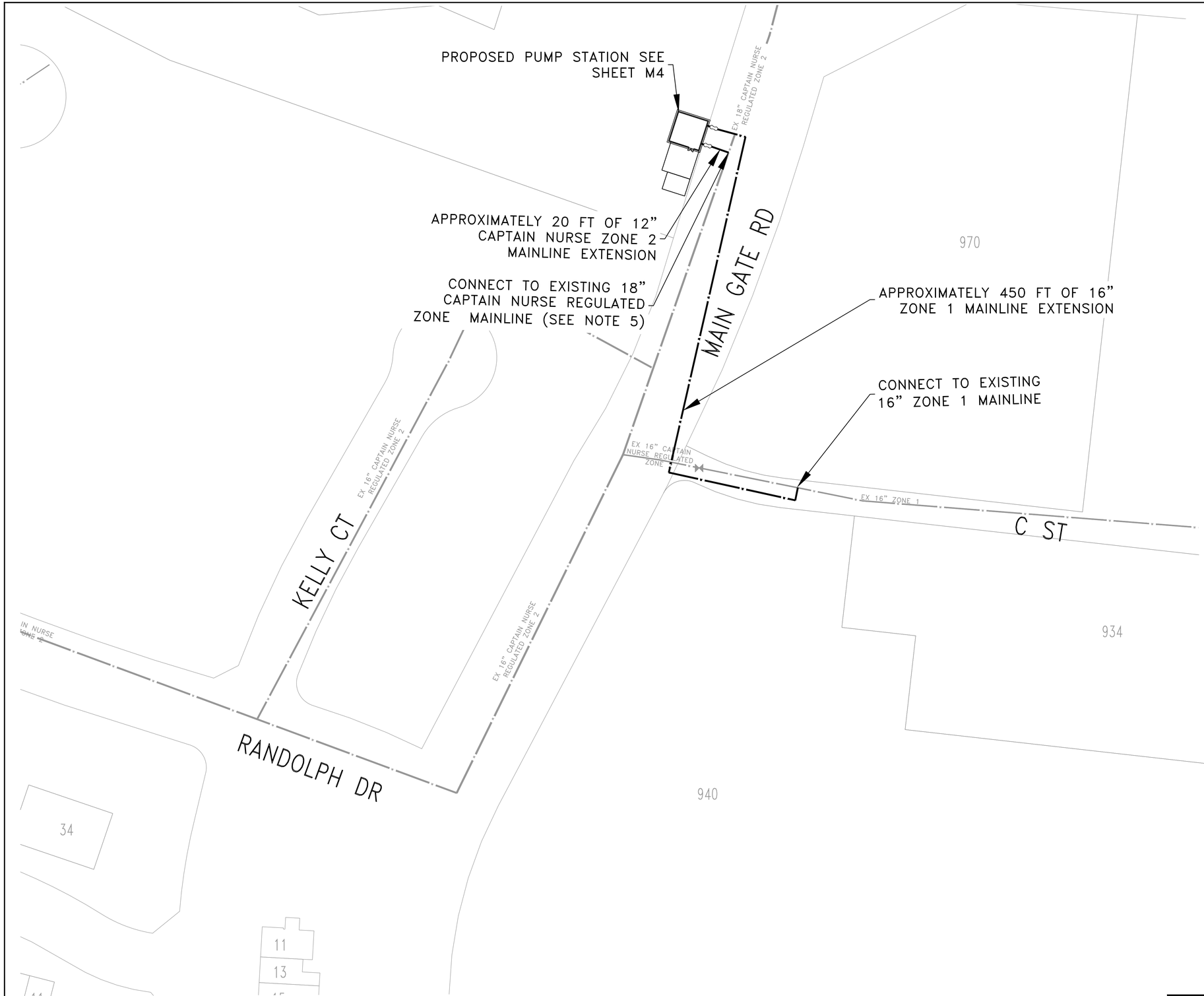

NORTH

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

NOTES:

1. *ALL EXISTING UTILITIES ARE NOTED ONLY AS APPROXIMATE. POTHOLING IS REQUIRED TO VERIFY LOCATION OF ALL EXISTING UTILITIES. NOT ALL EXISTING UTILITIES ARE NOTED. IT IS RESPONSIBILITY OF THE CONTRACTOR TO VERIFY.*
2. *THE EXACT POINT OF CONNECTION IS NOTED ONLY AS APPROXIMATE.*
3. *EXISTING UTILITY INFORMATION SHOWN WHERE CONFLICTS OCCUR. ALL OTHER EXISTING UTILITIES OMITTED FOR CLARITY.*
4. *THE AIRBASE AND CAPTAIN NURSE ZONE 2 SYSTEMS ARE NOT ABLE TO BACK FEED THROUGH AIR BASE TANK TO PACHECO VALLEY TANK. PROPOSED PIPE MODIFICATIONS ISOLATE AN EXISTING CAPTAIN NURSE REGULATED ZONE 2 PIPING AND CONVERTS IT TO PRIMARY ZONE 2 TO FILL PACHECO VALLEY TANK.*
5. *THIS SITE LOCATION REQUIRES THE INSTALLATION OF PRESSURE REDUCING VALVES ALONG THE CAPTAIN NURSE REGULATED ZONE 2 ALONG MAIN GATE AND NAVE DRIVE. PLEASE SEE SHEET C8 FOR APPROXIMATE LOCATIONS.*

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NORTH MARIN WATER DISTRICT
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LYNWOOD PUMP STATION REPLACEMENT PROJECT

SITE 4
ALTERNATIVE D

DES	DR	CH	SCALE : AS NOTED	
			DATE : 01/17/2024	
APPROVED: CHIEF ENGINEER			SHEET NO. : 9 OF 20	SHEETS
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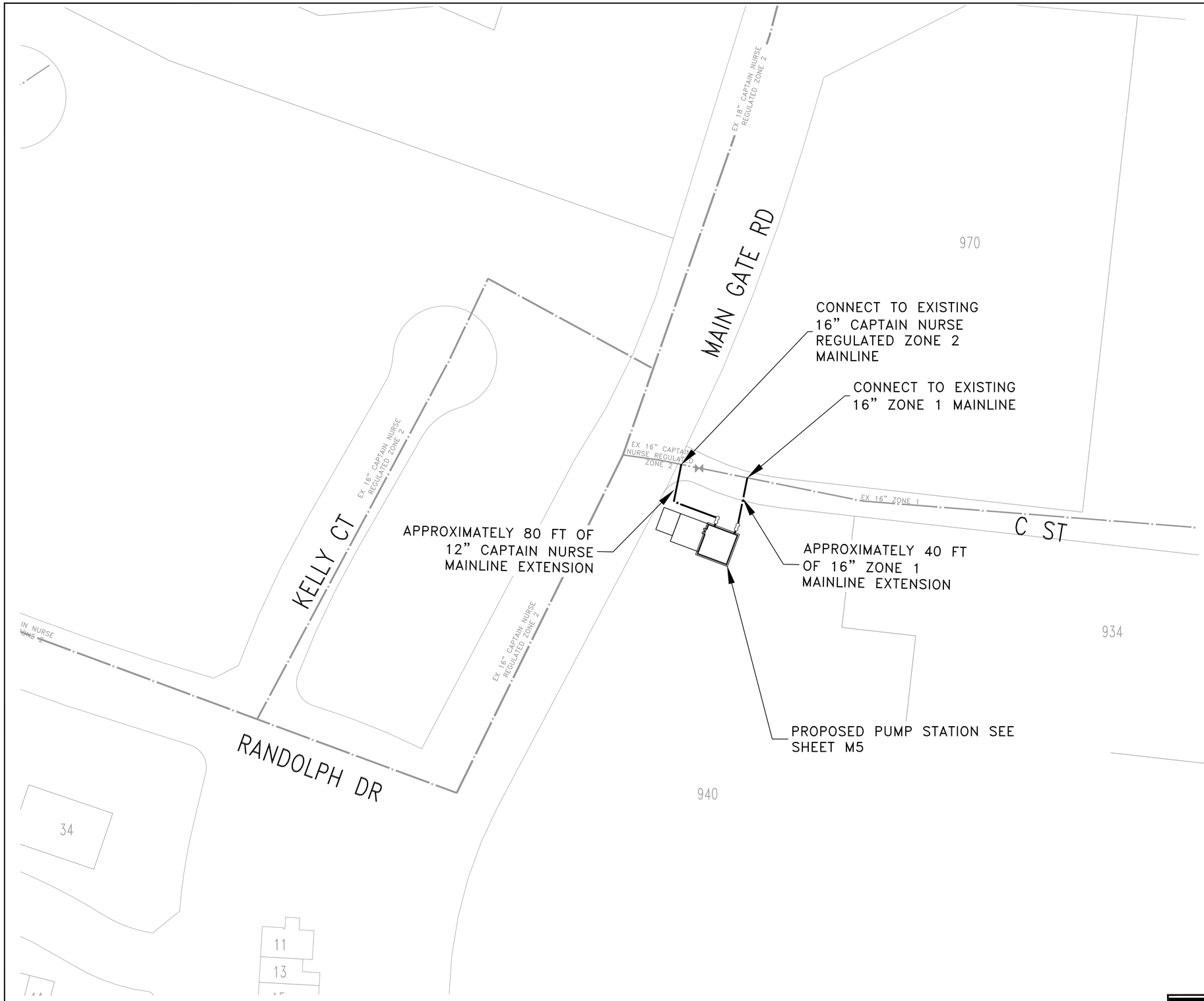

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

NOTES:

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2. *THE EXACT POINT OF CONNECTION IS NOTED ONLY AS APPROXIMATE.*
3. *EXISTING UTILITY INFORMATION SHOWN WHERE CONFLICTS OCCUR. ALL OTHER EXISTING UTILITIES OMITTED FOR CLARITY.*
4. *THE AIRBASE AND CAPTAIN NURSE ZONE 2 SYSTEMS ARE NOT ABLE TO BACK FEED THROUGH AIR BASE TANK TO PACHECO VALLEY TANK. PROPOSED PIPE MODIFICATIONS ISOLATE AN EXISTING CAPTAIN NURSE REGULATED ZONE 2 PIPING AND CONVERTS IT TO PRIMARY ZONE 2 TO FILL PACHECO VALLEY TANK.*
5. *THIS SITE LOCATION REQUIRES THE INSTALLATION OF PRESSURE REDUCING VALVES ALONG THE CAPTAIN NURSE REGULATED ZONE 2 ALONG MAIN GATE AND NAVE DRIVE. PLEASE SEE SHEET C8 FOR APPROXIMATE LOCATIONS.*

NO.	DATE	REVISION	BY	APP.
	01/17/2024	CONCEPTUAL DESIGN		

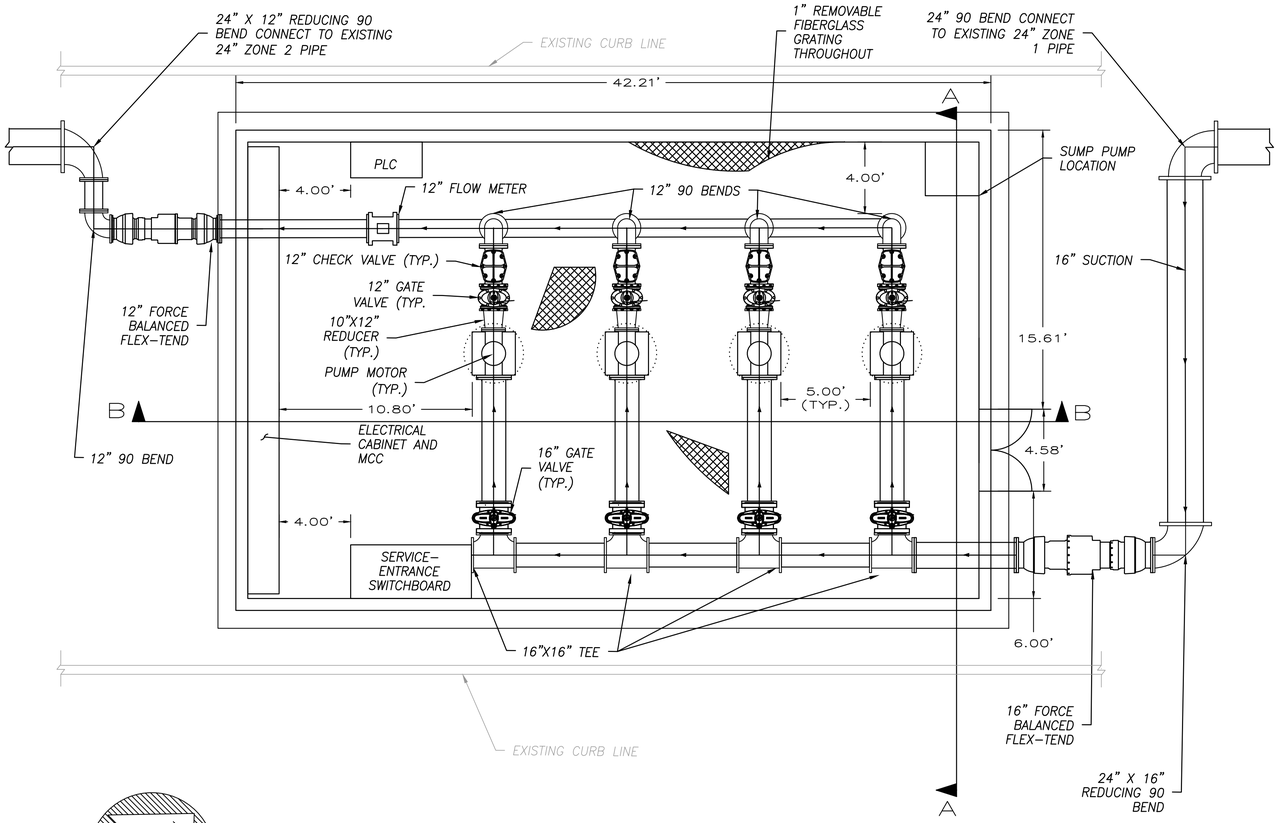
NORTH MARIN WATER DISTRICT
NOVATO, CALIFORNIA

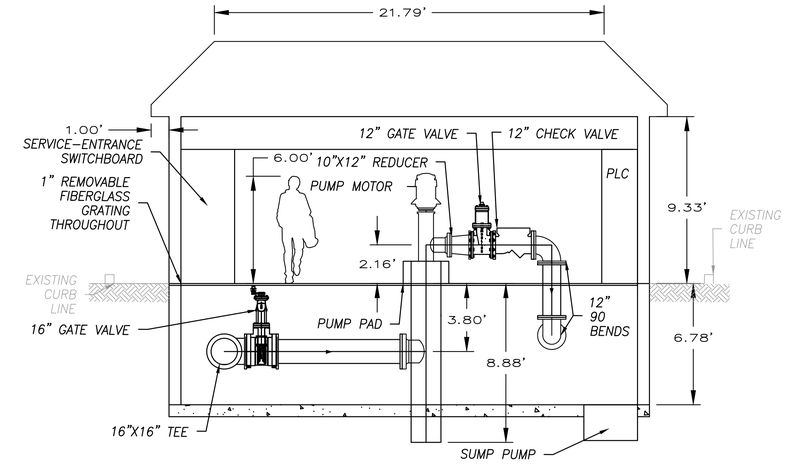
LYNWOOD PUMP STATION REPLACEMENT PROJECT

SITE 5
ALTERNATIVE E

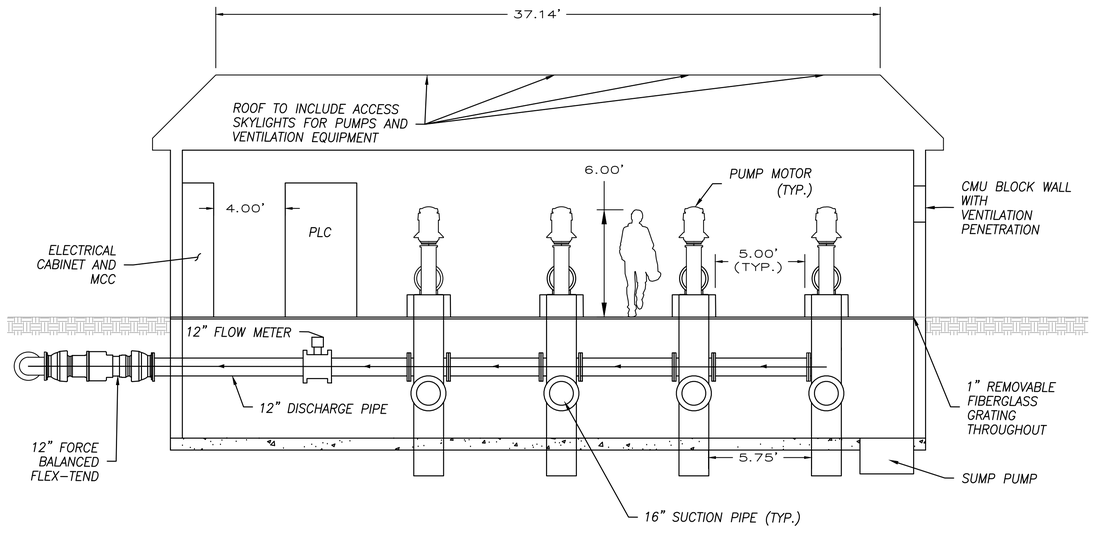
FREYER & LAURETA, INC.
CIVIL ENGINEERS • SURVEYORS • CONSTRUCTION MANAGERS
50 Executive Park Blvd • Suite 4200 • San Francisco, CA 94134
(415) 534-7070 • www.freyerlaureta.com

DES	DR	CH	SCALE : AS NOTED
			DATE : 01/17/2024
APPROVED: CHIEF ENGINEER			SHEET NO. : 10 OF 20 SHEETS
R.E. C78430			SERVICE AREA / JOB.NO. / NO. C7

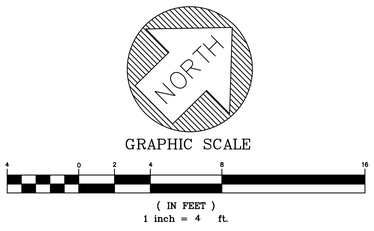




A-A
PUMP HOUSE SECTION VIEW
SCALE: 1" = 4'



B-B
PUMP HOUSE SECTION VIEW
SCALE: 1" = 4'



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4. PER HYDRAULIC INSTITUTE GUIDELINES THERE MUST BE 5 PIPE DIAMETERS OF STRAIGHT PIPE BETWEEN ANY FLANGE AND THE SUCTION FLANGE.
5. ALL ELECTRICAL CABINETS SHALL HAVE 4 FOOT CLEAR SPACE IN FRONT.

NO.	DATE	REVISION	BY	APP.
	01/17/2024	CONCEPTUAL DESIGN		

NORTH MARIN WATER DISTRICT
NOVATO, CALIFORNIA

LYNWOOD PUMP STATION REPLACEMENT PROJECT

PUMP STATION SITE 1 ALTERNATIVE A

DES	DR	CH	SCALE : AS NOTED
			DATE : 01/17/2024
APPROVED: CHIEF ENGINEER			SHEET NO. : 12 OF 20 SHEETS
R.E. C78430			SERVICE AREA / JOB.NO. / NO. M1

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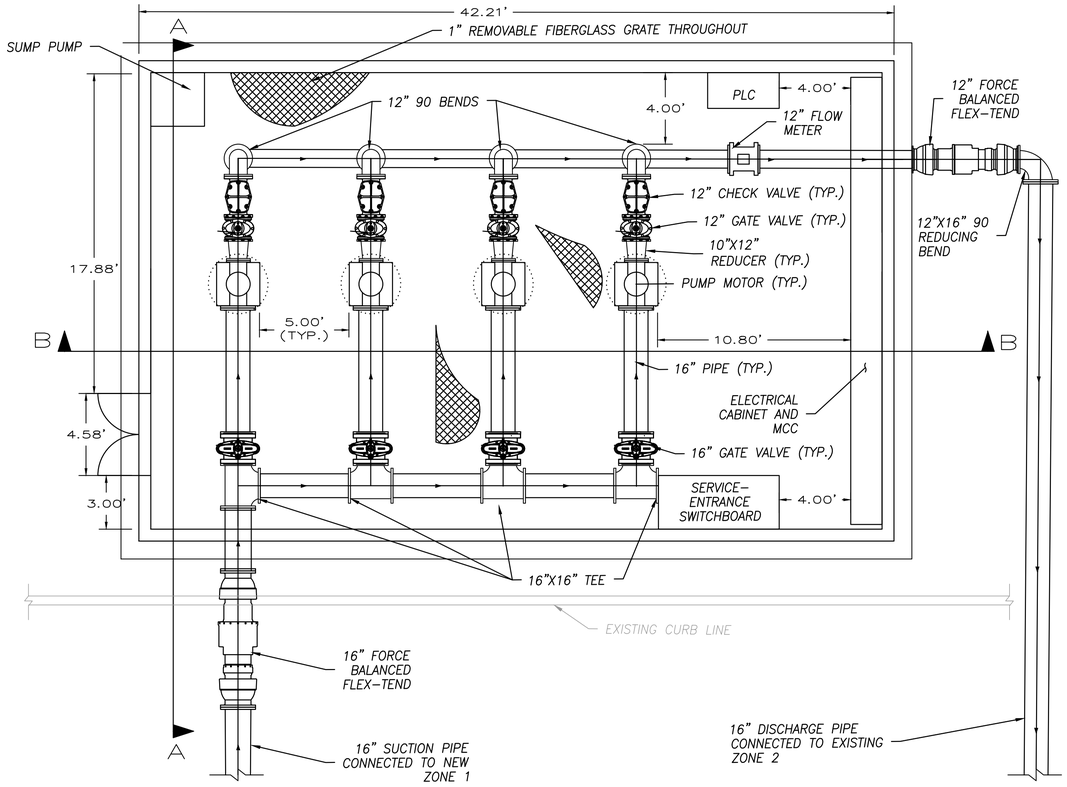
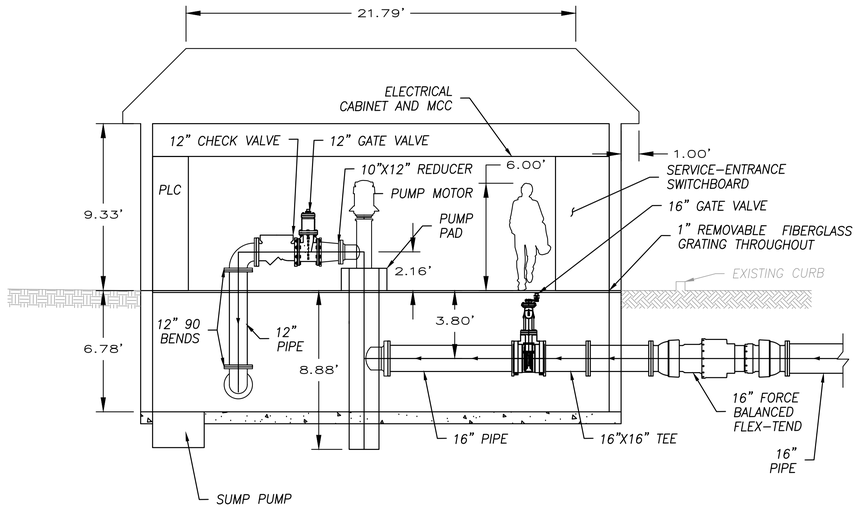
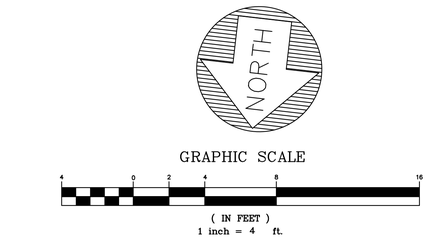


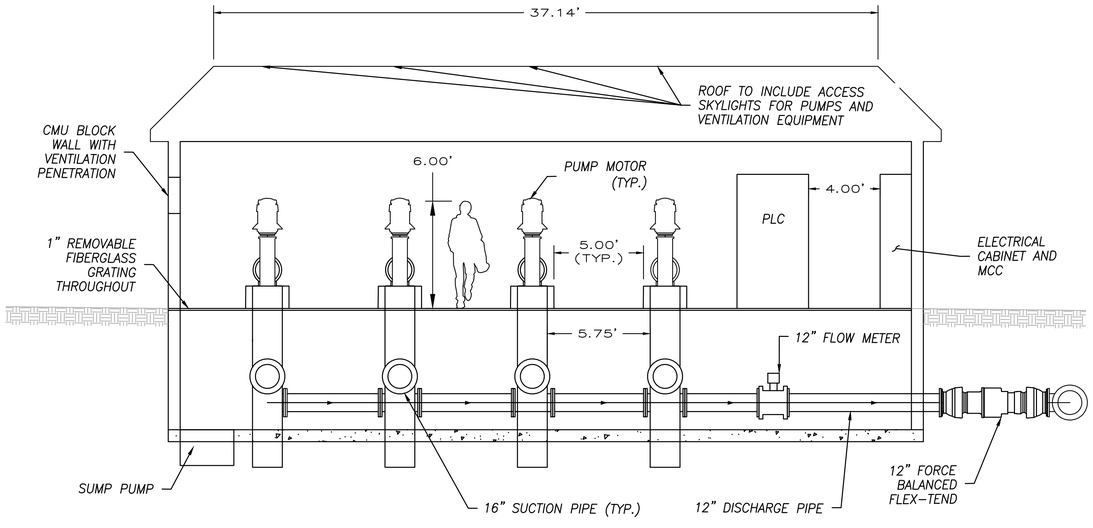


A-A
-

PUMP HOUSE SECTION VIEW

SCALE: 1" = 4'





B-B
-

PUMP HOUSE SECTION VIEW

SCALE: 1" = 4'

NOTES:

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5. ALL ELECTRICAL CABINETS SHALL HAVE 4 FOOT CLEAR SPACE IN FRONT.

NO.	DATE	REVISION	BY	APP.
	01/17/2024	CONCEPTUAL DESIGN		

NORTH MARIN WATER DISTRICT
NOVATO, CALIFORNIA

LYNWOOD PUMP STATION REPLACEMENT PROJECT

PUMP STATION SITE 2 ALTERNATIVE B

DES	DR	CH	SCALE : AS NOTED
			DATE : 01/17/2024
APPROVED: CHIEF ENGINEER			SHEET NO. : 13 OF 20 SHEETS
R.E. C78430			SERVICE AREA / JOB.NO. / NO. M2

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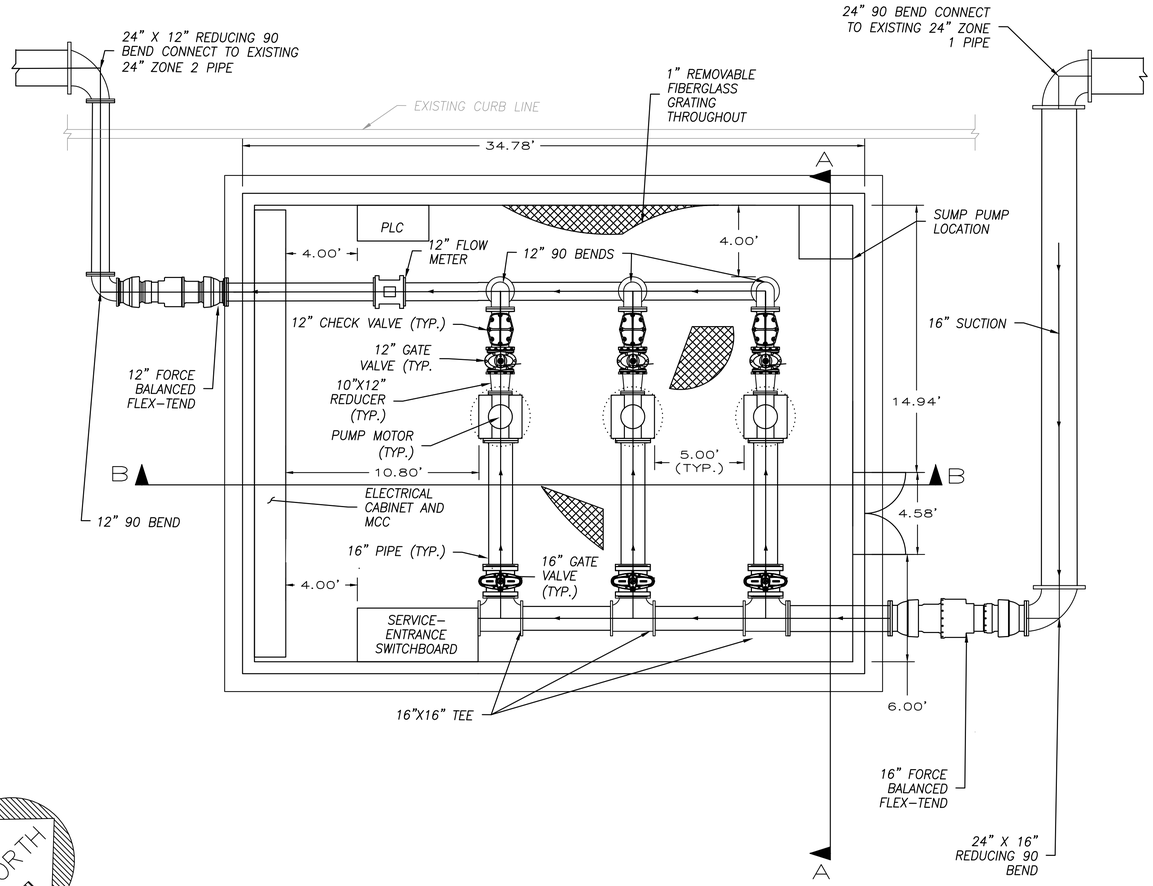

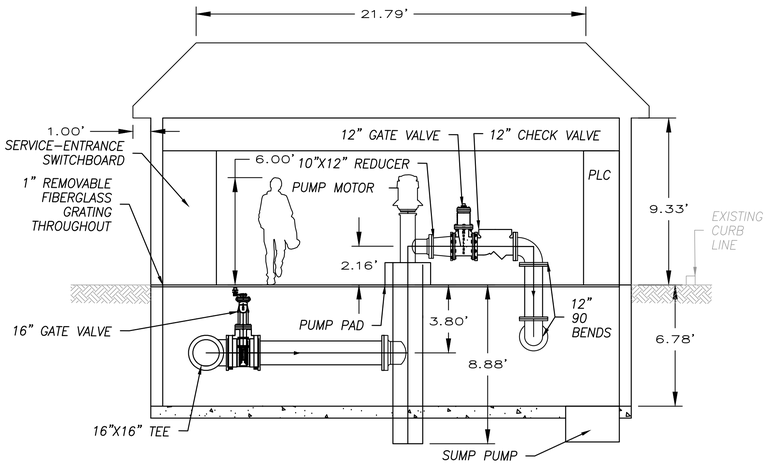

A-A
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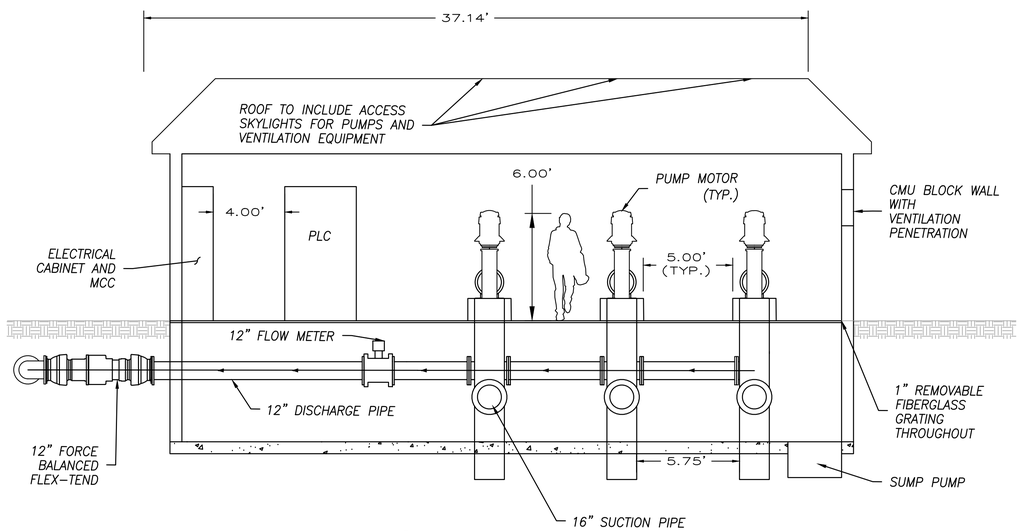
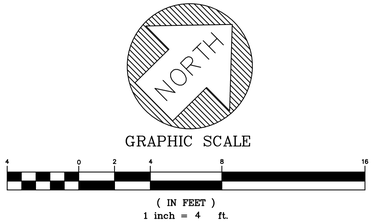
PUMP HOUSE SECTION VIEW
SCALE: 1" = 4'



B-B
-
PUMP HOUSE SECTION VIEW
SCALE: 1" = 4'



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NO.	DATE	REVISION	BY	APP.
	01/17/2024	CONCEPTUAL DESIGN		

NORTH MARIN WATER DISTRICT
NOVATO, CALIFORNIA

LYNWOOD PUMP STATION REPLACEMENT PROJECT

PUMP STATION SITE 2
ALTERNATIVE C, D, AND E

DES	DR	CH	SCALE : AS NOTED
			DATE : 01/17/2024
APPROVED: CHIEF ENGINEER			SHEET NO. : 14 OF 20 SHEETS
R.E. C78430			SERVICE AREA / JOB.NO. / NO. M3

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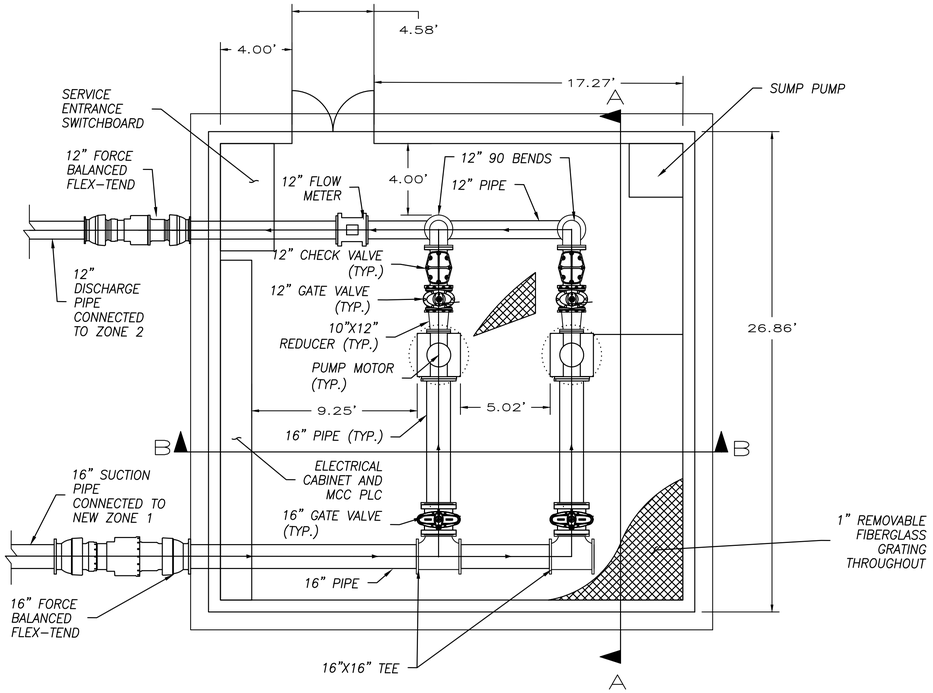
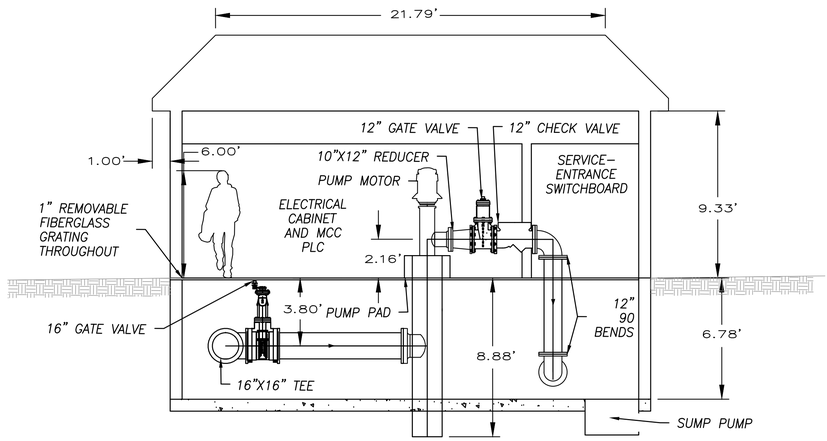




A-A
-

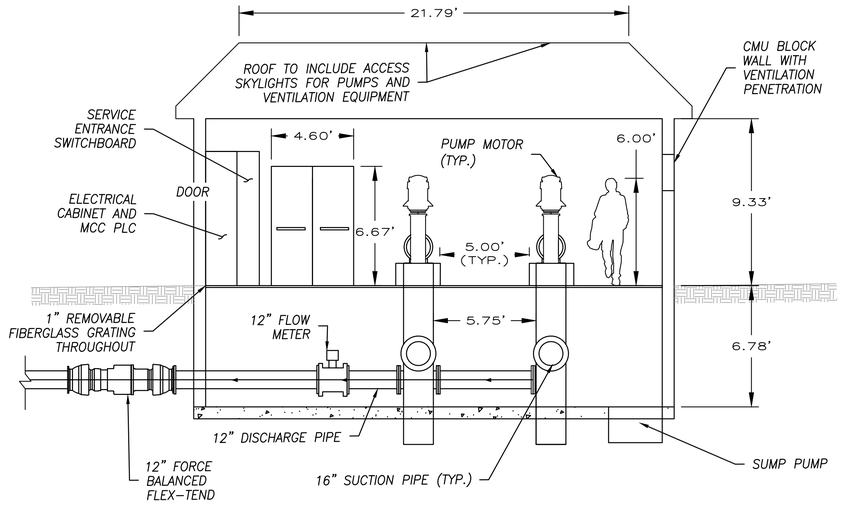
PUMP HOUSE SECTION VIEW

SCALE: 1" = 4'

GRAPHIC SCALE

4 0 2 4 8 16

(IN FEET)
1 inch = 4 ft.



B-B
-

PUMP HOUSE SECTION VIEW

SCALE: 1" = 4'

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NO.	DATE	REVISION	BY	APP.
	01/17/2024	CONCEPTUAL DESIGN		

NORTH MARIN WATER DISTRICT
NOVATO, CALIFORNIA

LYNWOOD PUMP STATION REPLACEMENT PROJECT

PUMP STATION SITE 4 ALTERNATIVE D

DES	DR	CH	SCALE : AS NOTED
			DATE : 01/17/2024

APPROVED: CHIEF ENGINEER — SHEET NO. : 15 OF 20 SHEETS

R.E. C78430 — SERVICE AREA — JOB.NO. — NO. M4

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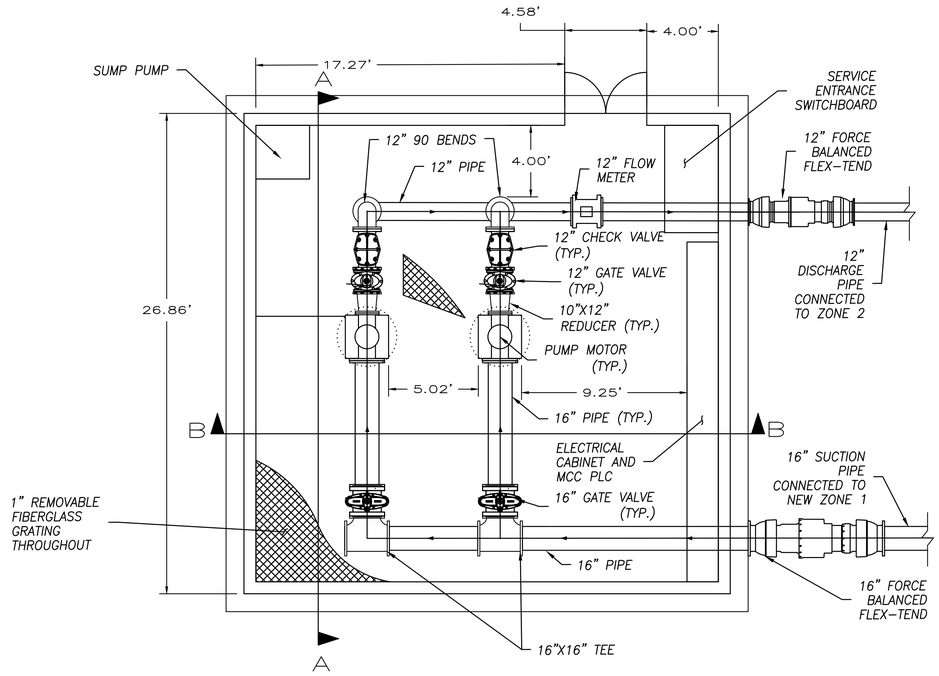
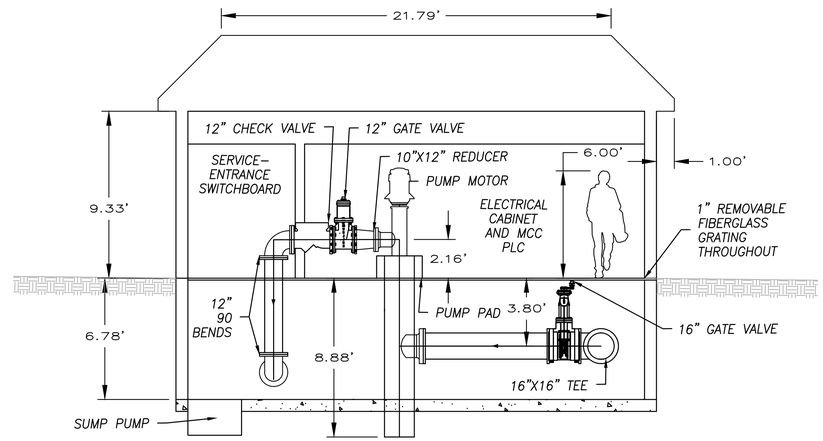
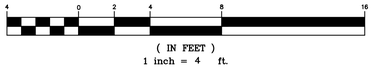
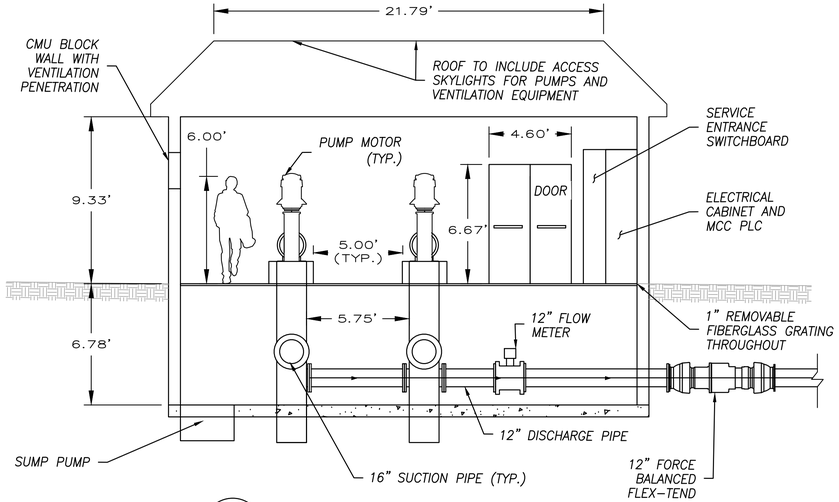




A-A
-
PUMP HOUSE SECTION VIEW
SCALE: 1" = 4'

GRAPHIC SCALE





B-B
-
PUMP HOUSE SECTION VIEW
SCALE: 1" = 4'

NOTES:

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NO.	DATE	REVISION	BY	APP.
	01/17/2024	CONCEPTUAL DESIGN		

NORTH MARIN WATER DISTRICT
NOVATO, CALIFORNIA

LYNWOOD PUMP STATION REPLACEMENT PROJECT

PUMP STATION SITE 3 AND 5 ALTERNATIVE C AND E

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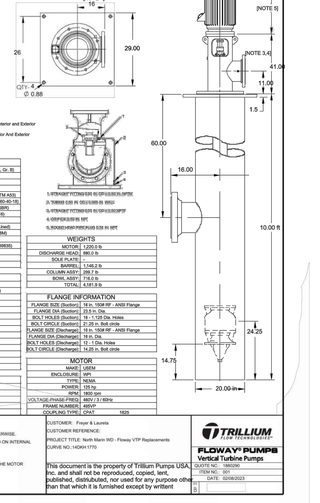
DES	DR	CH	SCALE : AS NOTED	
			DATE : 01/17/2024	
APPROVED: CHIEF ENGINEER			SHEET NO. : 16 OF 20 SHEETS	
R.E. C78430			SERVICE AREA	JOB.NO. / NO. M5

NOT TO BE USED FOR CONSTRUCTION UNLESS CERTIFIED.

GENERAL ARRANGEMENT DRAWING
VERTICAL TURBINE PUMP
14DKH ASSEMBLY



COATING:
BOWLS: Carboguard 891 Epoxy - Exterior Only
COLUMN: Carboguard 891 Epoxy - Interior and Exterior
DISCHARGE HEAD: Carboguard 891 Epoxy Coating - Interior and Exterior
BARREL: Carboguard 891 Epoxy Coating - Barrel - Interior And Exterior
BEARING RETAINER: Carboguard 891 Epoxy

MATERIALS	
DISCHARGE HEAD	Steel, Plate (A36), Pipe (A53, Gr. B)
SEAL HOUSING	Cast Iron (ASTM A48 CL30)
MECHANICAL SEAL	Chesterton 155
SOLE PLATE	Bird Supplied
COLUMN PIPE	Plate (ASTM A36), Pipe (ASTM A53)
BEARING RETAINER	Ductile Iron (ASTM A536 Gr 65-45-12)
LINESHAFT	416SS (ASTM A582 Type 416)
COUPLING	416SS (ASTM A582 Type 416)
BOWL SHAFT	ASTM A582-89a Type 416
BOWL	(ASTM A48 CL 35, Enamel Lined)
IMPELLER	316SS (ASTM A743 Gr. CF-8M)
IMPELLER WEAR RING	N/A
BOWL BEARING	Bismuth Tin Bronze (UNS C89835)
BOWL WEAR RING	N/A
STRAINER	316 SS
BOWL BOLTING	304SS

PUMP	
HEAD TYPE	Fabricated
HEAD SIZE	24" x 16.4" x 20" - "LH" Head
SEAL ARRANGEMENT	Special
LINESHAFT DIAMETER	1.25 in
COLUMN SIZE	10.00 in (Nominal)
ENCLOSING TUBE SIZE	N/A (Nominal)
LUBRICATION TYPE	Product
BOWL MODEL	14DKH
NUMBER OF STAGES	3STAGE TYPE 14DKH
RATED BOWL HEAD	170.0 ft
RATED BOWL SPEED	1770 RPM - 60ppm
IMPELLER RATED FLOW	1900
IMPELLER TYPE	Enclosed
STRAINER TYPE	Grip on basket type / 14DK

LIQUID	
LIQUID	Water
SPECIFIC GRAVITY	1.000 SG
VISCOSITY	1.00 cP
TEMPERATURE	68.00 deg F

WEIGHTS	
MOTOR	1,200.0 lb
DISCHARGE HEAD	880.0 lb
SOLE PLATE	-
BARREL	1,148.2 lb
COLUMN ASSY	282.7 lb
BOWL ASSY	710.9 lb
TOTAL	4,181.8 lb

FLANGE INFORMATION	
FLANGE SIZE (Suction)	16 in, 150# RF - ANSI Flange
FLANGE DIA (Suction)	23.5 in. Dia.
BOLT HOLES (Suction)	16 - 1.125 Dia. Holes
BOLT CIRCLE (Suction)	21.25 in. Bolt circle
FLANGE SIZE (Discharge)	16 in, 150# RF - ANSI Flange
FLANGE DIA (Discharge)	16 in. Dia.
BOLT HOLES (Discharge)	12 - 1.12a. Holes
BOLT CIRCLE (Discharge)	14.25 in. Bolt circle

MOTOR	
MAKE	USEM
ENCLOSURE	WPI
TYPE	NEMA
POWER	125 hp
RPM	1800 rpm
VOLTAGE-PHASE-FREQ	460V / 3 / 60Hz
FRAME NUMBER	405VP
COUPLING TYPE	OPAT 1625

NOTES:
1. DRAWING NOT TO SCALE.
2. ALL DIMENSIONS IN INCHES UNLESS NOTED OTHERWISE.
3. FINAL HEAD HEIGHT WILL BE DETERMINED BASED ON INTERNAL ANALYSIS AND SPECIFICATION REVIEW.
4. TYPICAL LOCATION FOR DISCHARGE NOZZLE.
5. FINAL MOTOR HEIGHT WILL BE DETERMINED BY THE MOTOR MANUFACTURER.

CUSTOMER: Freyer & Laureta
CUSTOMER REFERENCE:
PROJECT TITLE: North Marin WD - Floway VTP Replacements
CURVE NO.: 14DKH 1770

TRILLIUM FLOW TECHNOLOGIES
FLOWAY® PUMPS
Vertical Turbine Pumps
QUOTE NO.: 1880290
ITEM NO.: 001
DATE: 02/08/2023
REV: 0
SHEET: 1

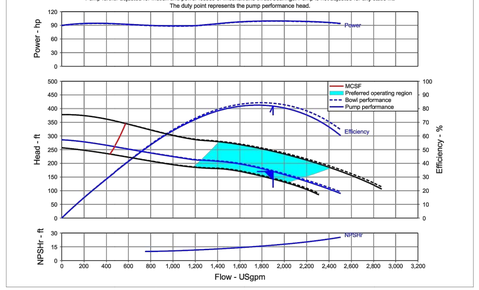
1 – 1,900 GPM PUMP CUT SHEET
SCALE: N.T.S.

FLOWAY® PUMPS — Pump Performance Datasheet

Customer	: Freyer & Laureta	Quote number	: 1880290
Customer reference	:	Size	: 14DKH
Item number	: 001	Stages	: 3
Service	: Duplicate Hydraulics to 53013, 50734-2 & 48398	Based on curve number	: 14DKH 1770 Rev. 0
Quantity	: 3	Date last saved	: 02/08/2023 12:01 PM

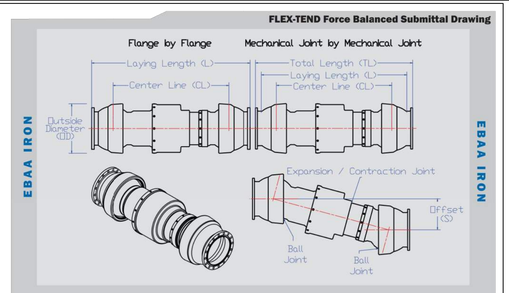
Operating Conditions		Liquid	
Flow, rated	: 1,900.0 USgpm	Liquid type	: Water - Potable
Differential head / pressure, rated (requested)	: 170.0 ft	Solids diameter, max	: -00.00 in
Differential head / pressure, rated (actual)	: 171.2 ft	Solids concentration, by volume	: 0.00 %
Suction pressure, rated / max	: 0.00 / 0.00 psi.g	Solids concentration, by weight	: 0.00 %
NPSH available, rated	: Ample	Temperature, max	: 68.00 deg F
Site Supply Frequency	: 60 Hz	Fluid density, rated / max	: 1.000 / 1.000 SG
Performance		Viscosity, rated	: 1.00 cP
Speed criteria	: Synchronous	Vapor pressure, rated	: 0.00 psi.a
Speed, rated	: 1770 rpm	**Material**	
Impeller diameter, rated	: 8.00 in	Bowl material selected	: Cast Iron
Impeller diameter, maximum	: 9.13 in	Impeller material selected	: 316SS
Impeller diameter, minimum	: 7.50 in	**Pressure Data**	
Efficiency (bowl / pump)	: 83.92 / 81.84 %	Maximum working pressure	: See the Additional Data page
NPSH required / margin required	: 16.78 / 0.00 ft	Component pressure limit	: See the Additional Data page
Ns (imp. eye flow) / Nss (imp. eye flow)	: 3,083 / 9,013 US Units	Maximum allowable suction pressure	: N/A
MCSF	: 473.7 USgpm	Hydrostatic test pressure	: See the Additional Data page
Head, maximum, rated diameter	: 286.0 ft	**Driver & Power Data (@15% density)**	
Head rise to shutoff (bowl / pump)	: 64.88 / 68.24 %	Driver sizing specification	: Max power + 4%
Flow, best eff. point (bowl / pump)	: 1,790.0 / 1,757.6 USgpm	Margin over specification	: 0.00 %
Flow ratio, rated / BEP (bowl / pump)	: 106.14 / 108.10 %	Service factor	: 1.15
Diameter ratio (rated / max)	: 87.67 %	Power, hydraulic	: 83.23 hp
Head ratio (rated dia / max dia)	: 70.13 %	Power (bowl / pump)	: 99.18 / 99.66 hp
Cq/Ch/CeCn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00	Power, maximum, rated diameter	: 99.67 hp
Selection status	: Acceptable	Minimum recommended motor rating	: 125 hp / 93.21 kW

Pump and bowl (clashed) performance. Bowl adjusted for construction and viscosity.
Pump further adjusted for friction and power losses of lineshaft and thrust bearings. Pump is not adjusted for any static lift.
The duty point represents the pump performance head.



2 – 1,900 GPM PUMP PERFORMANCE CURVE
SCALE: N.T.S.

FLEX-TEND Force Balanced Submittal Drawing



*DIMENSIONS ARE IN INCHES

Nominal Pipe Size	OD	D*	E**	CL	S	Flange by Flange: Series Number	Flange by Flange: L	Flange by Flange: Weight (lbs)	Mechanical Joint by Mechanical Joint: Series Number	Mechanical Joint by Mechanical Joint: L	Mechanical Joint by Mechanical Joint: TL	Mechanical Joint by Mechanical Joint: Weight (lbs)
3	10.2	20°	8	42.5	15.9	4403F20B	53.7(±4)	210	4403M20B	50.3 (±4)	55.3 (±4)	204
4	10.2	20°	8	42.5	15.9	4404F20B	53.8(±4)	167	4404M20B	49.7 (±4)	54.7 (±4)	206
6	12.3	20°	8	44.0	16.5	4406F20B	56.8(±4)	275	4406M20B	52.4 (±4)	57.4 (±4)	316
8	14.9	20°	8	48.1	17.8	4408F20B	62.9(±4)	377	4408M20B	57.8 (±4)	62.8 (±4)	496
10	18.1	20°	8	50.6	18.7	4410F20B	67.0(±4)	594	4410M20B	63.0 (±4)	68.0 (±4)	635
12	20.8	20°	8	52.9	19.4	4412F20B	72.0(±4)	786	4412M20B	66.3 (±4)	71.3 (±4)	880
14	26.5	15°	10	65.3	17.5	4414F20B	93.5(±5)	1,846	4414M20B	84.6 (±5)	91.5 (±5)	1768
16	26.5	15°	10	65.3	17.5	4416F20B	91.5(±5)	1,779	4416M20B	86.0 (±5)	93.0 (±5)	1709
18	29.8	15°	10	69.5	18.6	4418F20B	95.4(±5)	2,573	4418M20B	87.6 (±5)	94.6 (±5)	2431
20	33.1	15°	12	75.0	20.1	4420F20B	98.3(±6)	2,885	4420M20B	95.7 (±6)	102.7 (±6)	2697
24	39.1	15°	12	81.7	20.6	4424F20B	110.9(±6)	4,394	4424M20B	109.0 (±6)	116.0 (±6)	4340
30	47.8	15°	16	103.5	28.9	4430F20B	136.8(±8)	9,224	4430M20B	127.2 (±8)	135.2 (±8)	9156
36	59.3	15°	16	105.9	29.5	4436F20B	140.1(±8)	11,158	–	–	–	–
48	79.4	12°	24	148.0	33.2	4448F20B	193.0(±12)	26,680	–	–	–	–

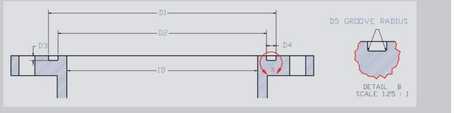
NOTE: Dimensions are in inches, and are subject to change without notice.
End connection combinations available (14 inch - 24 inch).
*Deflection Angle is per ball.
**Maximum expansion.

Additional Applications

Applicable
- Potable or Non-Potable Water (no solids or debris)
- Fire Service Mains
- Fire Sprinkler Systems
- Chilled or Heated Water Systems (HVAC)
- Above or Below Ground

Not Applicable
- Water with solids, such as storm or waste-sewage (use standard FLEX-TEND)
- Petroleum liquids or gas
- Steam

FLEX-TEND, EX-TEND, and FLEX-900 O-ring Groove



Size	D1	D2	D3	D4	D5	O-ring Diameter	O-ring Part Number
3	4.885	4.185	0.175	0.350	0.0625	0.25	983003
4	5.900	4.700	0.300	0.600	0.0625	0.5	983004
6	8.00	6.800	0.300	0.600	0.0625	0.5	983006
8	10.100	8.900	0.300	0.600	0.0625	0.5	983008
10	12.200	11.000	0.300	0.600	0.0625	0.5	983010
12	14.300	13.100	0.300	0.600	0.0625	0.5	983012
14	16.200	15.00	0.300	0.600	0.0625	0.5	983014
16	18.500	16.900	0.400	0.800	0.1250	0.625	983016
18	20.700	19.100	0.400	0.800	0.1250	0.625	983018
20	23.000	21.400	0.400	0.800	0.1250	0.625	983020
24	27.200	25.600	0.400	0.800	0.1250	0.625	983024
30	33.500	31.700	0.400	0.900	0.1250	0.75	983030
36	40.000	38.300	0.400	0.850	0.1250	0.75	983036
42	46.580	44.080	0.650	1.250	0.1250	N/A	983042
48	52.720	50.220	0.650	1.250	0.1250	1	983048

Sample Specification
1. Flexible expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron conforming to the material requirements of ASTM A536 and ANSI/AWWA C153/A21.53. Foundry certification of material shall be readily available upon request.
2. Each flexible expansion joint shall be pressure tested prior to shipment against its own restraint to a minimum of 350 PSI for 3 inch through 16 inch and 250 PSI for 18 inch and greater. A minimum 2:1 safety factor, determined from the published pressure rating, shall apply.
3. Each flexible expansion joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of: 20° for sizes 4-inch through 12-inch; 15° for sizes 14-inch through 36-inch and 12 ° for size 48-inch. The flexible expansion fitting shall not expand or exert an axial imparting thrust under internal water pressure. The flexible expansion fitting shall not increase or decrease the internal water volume as the unit expands or contracts. The minimum total linear travel shall be 8-inches.
4. All internal surfaces (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213. Sealing gaskets shall be constructed of EPDM. The coating shall meet ANSI/NSF-61.
5. Exterior surfaces shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C116/A21.16.
6. Polyethylene sleeves, meeting ANSI/AWWA C105/A21.5, shall be included for direct buried applications.
7. Manufacturer's certification of compliance to the above standards and requirements shall be readily available upon request. The purchaser (or owner) shall reserve the right to inspect the manufacturer's facility for compliance. All flexible expansion joints shall be The Force Balanced FLEX-TEND as manufactured by EBAA Iron, Inc. Eastland, TX., U.S.A.

Important Notes
The EBAA Force Balanced Flex-Tend® is particularly suited for use in above ground applications where unbalanced thrust forces are neither desirable nor easily accommodated. These applications require special attention to the overall forces and restraint of the piping system.

The installation of a Force Balanced Flex-Tend requires the restraint of all adjacent pipe joints in order to transfer expansion/contraction forces to the unit and to produce the desired force-balancing effect without undue movement or separation of the adjacent joints. Lock-ring type pipe and fitting joints are required to have the assembly clearance removed by extending the joint prior to the installation of the Force Balanced Flex-Tend and pressurization of the system.

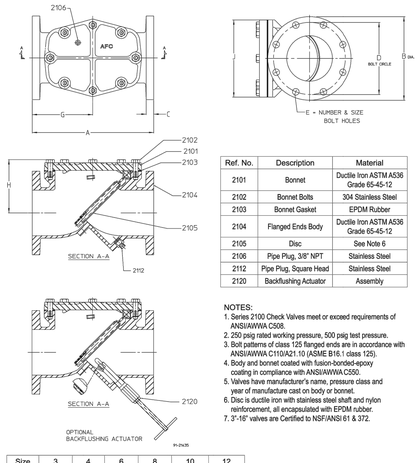
Joint restraint and clearance removal of adjacent joints is necessary in both above and below ground Force Balanced Flex-Tend installations.

When connecting a Force Balanced FLEX-TEND to HDPE pipe, a flanged end connection is required. This is to be joinec to a fused flange adapter on the HDPE pipe. A filler flange between the two gaskets is necessary to assure proper seal contact.

3 – FLEX–TEND FORCE BALANCED FLEXIBLE EXPANSION JOINTS
SCALE: N.T.S.

AMERICAN Flow Control Submittal Information

3" - 12" SERIES 2100 RESILIENT SEATED CHECK VALVE



Ref. No.	Description	Material
2101	Bonnet	Ductile Iron ASTM A536 Grade 65-45-12
2102	Bonnet Bolts	304 Stainless Steel
2103	Bonnet Gasket	EPDM Rubber
2104	Flanged Ends Body	Ductile Iron ASTM A536 Grade 65-45-12
2105	Disc	See Note 6
2106	Pipe Plug, 3/8" NPT	Stainless Steel
2112	Pipe Plug, Square Head	Stainless Steel
2120	Backflushing Actuator	Assembly

NOTES:
1. Series 2100 Check Valves meet or exceed requirements of ANSI/AWWA C508.
2. 250 psig rated working pressure, 500 psig test pressure.
3. Bolt patterns of class 125 flanged ends are in accordance with ANSI/AWWA C110/A21.10 (ASME B16.1 class 125).
4. Body and bonnet coated with fusion-bonded-epoxy coating in compliance with ANSI/AWWA C550.
5. Valves have manufacturer's name, pressure class and year of manufacture cast on body or bonnet.
6. Disc is ductile iron with stainless steel shaft and nylon reinforcement, all encapsulated with EPDM rubber.
7. 3"-16" valves are Certified to NSF/ANSI 61 & 372.

Size	3	4	6	8	10	12
A	11.00	13.00	16.00	19.50	24.50	27.50
B	7.50	9.00	11.00	13.50	16.00	19.00
C	0.75	0.94	1.00	1.13	1.19	1.25
D	6.00	7.50	9.50	11.75	14.25	17.00
E	4 - 0.75	8 - 0.75	8 - 0.88	8 - 0.88	12 - 1.00	12 - 1.00
G	5.50	6.50	8.00	9.75	12.25	13.75
H	4.50	5.19	7.00	8.41	10.19	11.94
J	5.31	6.75	10.25	12.06	14.88	17.63
Weight	31 lbs.	53 lbs.	110 lbs.	165 lbs.	268 lbs.	390 lbs.

AMERICAN FLOW CONTROL
THE RIGHT WAY

AMERICAN Flow Control
P.O. Box 2727
Birmingham, AL 35202-2727
Phone: 800-423-1951
Fax: 800-543-0868
Email: afcsales@american-usa.com

Waterous Company
125 Hardman Avenue South
South St. Paul, Mn. 55075-1191
Phone: 800-328-1906
Fax: 800-543-0868
Email: afcsales@american-usa.com

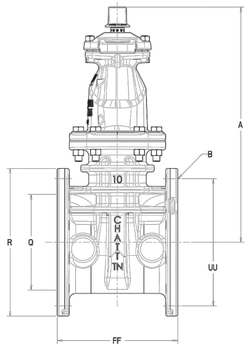
WWW.AMERICAN-USA.COM

4 – 12 IN CHECK VALVE
SCALE: N.T.S.

3"- 12" A-2361 RESILIENT WEDGE GATE VALVES - FL. x FL.

MUELLER **10.7**

Rev. 1-22



Dimensions

Dimension	Nominal Size 3"	4"	6"	8"	10"	12"
A	12.38	14.19	18.00	21.50	25.50	28.62
R	7.50	9.00	11.00	13.50	16.00	19.00
FF	8.00	9.00	10.50	11.50	13.00	14.00
Q (bore)	3.30	4.30	6.30	8.30	10.30	12.30
UU (bolt circle diameter)	6.00	7.50	9.50	11.75	14.25	17.00
B (number and size of holes)	4--.75	8--.75	8--.88	8--.88	12--1.00	12--1.00
Turns to open	11	14	20.5	28.5	33	38.5
Weight*	73	81	136	213	326	440
Closing Torque (FT-LBS), Non-Geared	52	75	110	150	185	225
Closing Torque (FT-LBS), Bevel	31	44	65	88	109	132
Closing Torque (FT-LBS), Spur	N/A	41	60	82	101	123

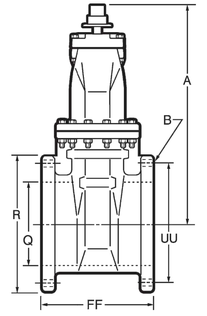
*All dimensions are in inches. All weights are in pounds and are approximate.

5 – 12 IN GATE VALVE
SCALE: N.T.S.

14"- 54" A-2361 D.I. RESILIENT WEDGE GATE VALVES - FL. x FL.

MUELLER **10.25**

Rev. 1-22



Dimensions

Dimension*	Nominal Size 14"	16"	18"	20"	24"	30" †	36" †	42" †	48" †	54" †
A	32.75	37.88	44.19	48.25	53.88	See A for Spur or Bevel Gear				
R	21.00	23.50	25.00	27.50	32.00	38.75	46.00	53.00	59.50	66.34
FF	15.06	16.06	17.00	18.00	20.00	26.00	30.00	38.00	43.00	48.00
Q (bore)	14.38	16.00	18.38	20.38	24.38	30.38	36.38	42.38	48.38	48.38
UU (bolt circle diameter)	18.75	21.25	22.75	25.00	29.50	36.00	42.75	49.50	56.00	62.76
B (number and size of holes)	12--1.125	16--1.125	16--1.25	20--1.25	20--1.38	28--1.38	32--1.63	36--1.63	44--1.63	44--2.00
A- Spur Gear	40.49	43.58	49.41	53.01	59.15	70.81	83.08	97.74	109.70	109.70
A - Bevel Gear**	34.55	37.77	44.50	47.69	54.06	64.93	77.19	90.75	102.61	102.61
Turns to open (without gearing)	43.5	49	57	63	75	-	-	-	-	-
Turns to open (Spur gearing)††	178	201	234	258	308	381	455	524	596	596
Turns to open (Bevel gearing)††	174	196	228	252	300	372	444	524	596	596
Weight*	690	859	1284	1774	2481	6390	8220	13400	19978	20900
Closing Torque (FT-LBS), Non-Geared	225	275	275	300	325	N/A	N/A	N/A	N/A	N/A
Closing Torque (FT-LBS), Bevel	66	81	81	88	96	132	162	206	235	294
Closing Torque (FT-LBS), Spur	61	75	75	81	88	122	149	199	227	284

*All dimensions are in inches. All weights are in pounds and are approximate. Weights for 30"-54" valves are with gearing; for all others without gearing.
**Center line of operating nut to center line of valve.
†Spur or Bevel Gear must be used with 30", 36", 42", 48" & 54" valves.
††Turns shown are for Rotoric gearing supplied by Mueller Co.

6 – 16 IN GATE VALVE
SCALE: N.T.S.

NO.	DATE	REVISION	BY	APP.
	01/17/2024	CONCEPTUAL DESIGN		

NORTH MARIN WATER DISTRICT
NOVATO, CALIFORNIA

LYNWOOD PUMP STATION REPLACEMENT PROJECT

DETAILS

FREYER & LAURETA, INC.
CIVIL ENGINEERS • SURVEYORS • CONSTRUCTION MANAGERS
350 Executive Park Blvd • Suite 4200 • San Francisco, CA 94134
(415) 534-7070 • www.freyerlaureta.com

DES	DR	CH	SCALE : AS NOTED
			DATE : 01/17/2024
APPROVED: CHIEF ENGINEER			SHEET NO. : 17 OF 20 SHEETS
R.E. C78430			SERVICE AREA / JOB.NO. / NO. M6

APPENDIX G

Pump Station Components Cut Sheets

Trillium Flow Technologies – Floway Pumps

FLOWAY® PUMPS

Pump Performance Datasheet

Customer	: Freyer & Laureta	Quote number	: 1880290
Customer reference	:	Size	: 14DKH
Item number	: 001	Stages	: 3
Service	: Duplicate Hydraulics to 53013, 50734-2 & 48398	Based on curve number	: 14DKH 1770 Rev. 0
Quantity	: 3	Date last saved	: 02/08/2023 12:01 PM

Operating Conditions

Flow, rated	: 1,900.0 USgpm
Differential head / pressure, rated (requested)	: 170.0 ft
Differential head / pressure, rated (actual)	: 171.2 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz

Performance

Speed criteria	: Synchronous
Speed, rated	: 1770 rpm
Impeller diameter, rated	: 8.00 in
Impeller diameter, maximum	: 9.13 in
Impeller diameter, minimum	: 7.50 in
Efficiency (bowl / pump)	: 83.92 / 81.84 %
NPSH required / margin required	: 16.76 / 0.00 ft
Ns (imp. eye flow) / Nss (imp. eye flow)	: 3,083 / 9,013 US Units
MCSF	: 473.7 USgpm
Head, maximum, rated diameter	: 286.0 ft
Head rise to shutoff (bowl / pump)	: 64.88 / 68.24 %
Flow, best eff. point (bowl / pump)	: 1,790.0 / 1,757.6 USgpm
Flow ratio, rated / BEP (bowl / pump)	: 106.14 / 108.10 %
Diameter ratio (rated / max)	: 87.67 %
Head ratio (rated dia / max dia)	: 70.13 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water - Potable
Solids diameter, max	: -60.00 in
Solids concentration, by volume	: 0.00 %
Solids concentration, by weight	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.00 psi.a

Material

Bowl material selected	: Cast Iron
Impeller material selected	: 316SS

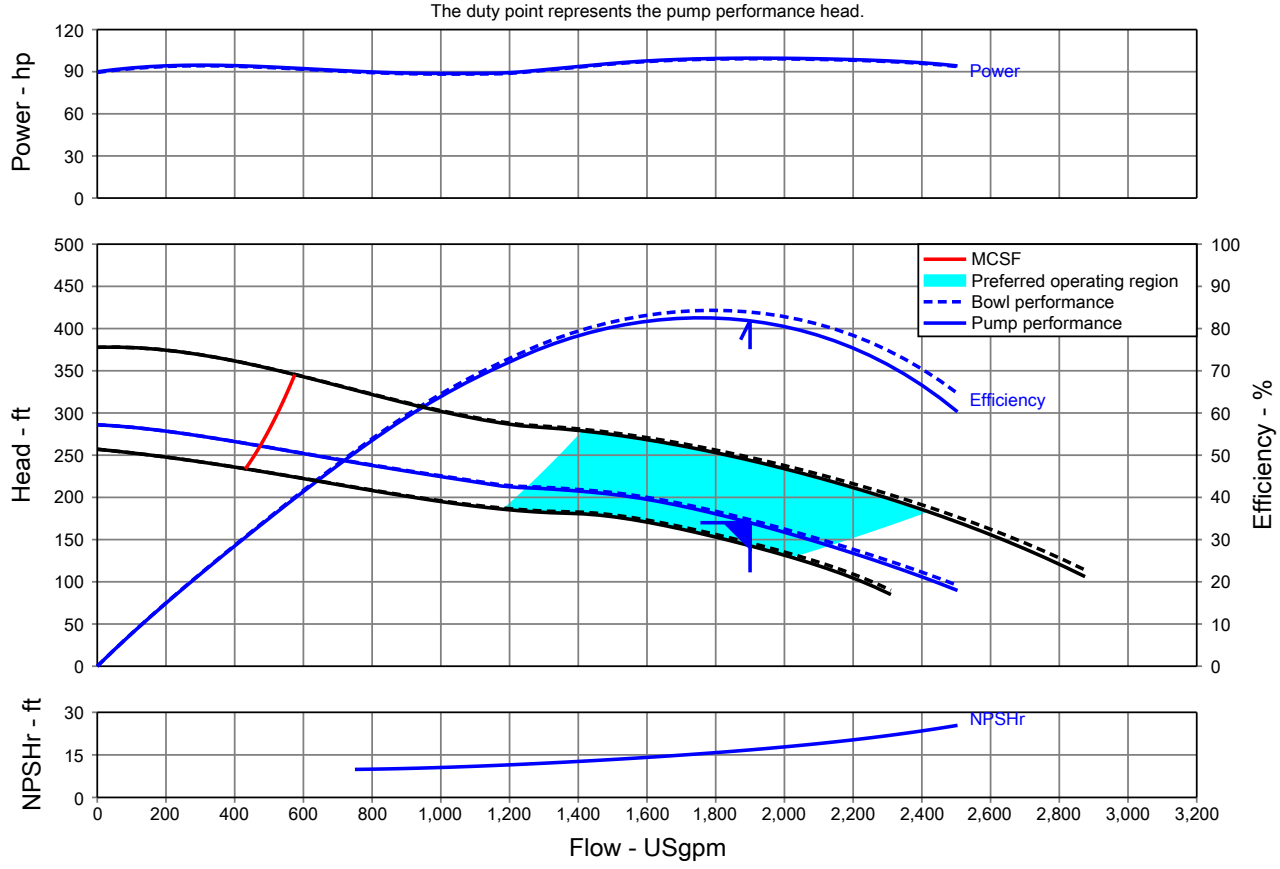
Pressure Data

Maximum working pressure	: See the Additional Data page
Component pressure limit	: See the Additional Data page
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: See the Additional Data page

Driver & Power Data (@Max density)

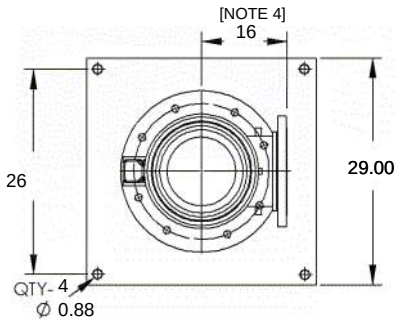
Driver sizing specification	: Max power + 4%
Margin over specification	: 0.00 %
Service factor	: 1.15
Power, hydraulic	: 83.23 hp
Power (bowl / pump)	: 99.18 / 99.66 hp
Power, maximum, rated diameter	: 99.67 hp
Minimum recommended motor rating	: 125 hp / 93.21 kW

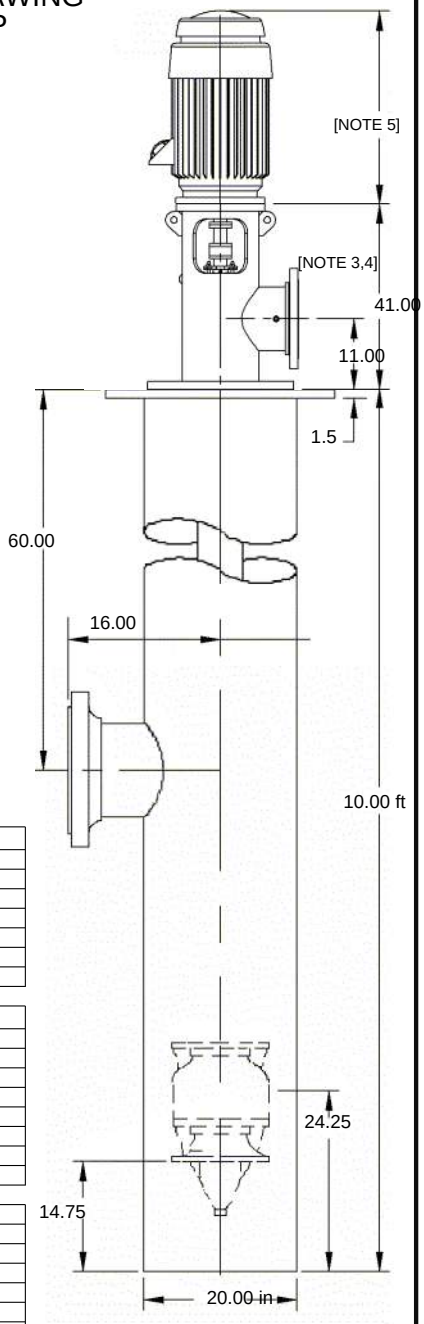
Pump and bowl (dashed) performance. Bowl adjusted for construction and viscosity.
Pump further adjusted for friction and power losses of lineshaft and thrust bearings. Pump is not adjusted for any static lift.
The duty point represents the pump performance head.

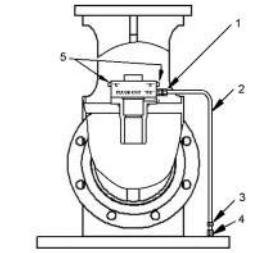


NOT TO BE USED FOR CONSTRUCTION UNLESS CERTIFIED.

GENERAL ARRANGEMENT DRAWING
VERTICAL TURBINE PUMP
14DKH ASSEMBLY







1. STRAIGHT FITTING 0.50 IN. OD x 0.50 IN. NPTM
2. TUBING 0.50 IN. OD x 0.065 IN. WALL
3. STRAIGHT FITTING 0.50 IN. OD x 0.50 NPTF
4. ORIFICE 0.50 IN. NPT
5. ROUND HEAD PIPE PLUG 0.38 IN. NPT

COATING:

BOWLS: Carboguard 891 Epoxy - Exterior Only
COLUMN: Carboguard 891 Epoxy - Interior and Exterior
DISCHARGE HEAD: Carboguard 891 Epoxy Coating - Interior and Exterior

BARREL: Carboguard 891 Epoxy Coating - Barrel - Interior And Exterior
BEARING RETAINER: Carboguard 891 Epoxy

MATERIALS	
DISCHARGE HEAD:	Steel, Plate (A36), Pipe (A53, Gr. B)
SEAL HOUSING:	Cast Iron (ASTM A48 Cl.30)
MECHANICAL SEAL:	Chesterton 155
SOLE PLATE:	Not Supplied
COLUMN PIPE:	Plate (ASTM A36), Pipe (ASTM A53)
BEARING RETAINER:	Ductile Iron (ASTM A536 Gr 60-40-18)
LINESHAFT BEARING:	Styrene Butadiene Rubber (SBR)
LINESHAFT:	416SS (ASTM A582 Type 416)
BOWL SHAFT:	ASTM A582-88a Type 416
BOWL:	(ASTM A48 CL 30, Enamel Lined)
IMPELLER:	316SS (ASTM A743 Gr. CF-8M)
IMPELLER WEAR RING:	N/A
BOWL BEARING:	Bismuth Tin Bronze (UNS C89835)
BOWL WEAR RING:	N/A
STRAINER:	316 SS
BOWL BOLTING:	304SS

PUMP	
HEAD TYPE:	Fabricated
HEAD SIZE:	10" x 16.5" x 20" - "VF" Head
SEAL ARRANGEMENT:	Special
LINESHAFT DIAMETER:	1.25 in
COLUMN SIZE:	10.00 in (Nominal)
ENCLOSING TUBE SIZE:	N/A (Nominal)
LUBRICATION TYPE:	Product
BOWL MODEL:	14DKH
NUMBER OF STAGES:	3STAGE TYPE 14DKH
RATED BOWL HEAD:	173.5 ft
RATED RATE OF FLOW:	1,900.0 USgpm
NPSHR AT RATED FLOW:	16.76 ft
IMPELLER TYPE:	Enclosed
STRAINER TYPE:	Clip on basket type / 14DK

LIQUID	
LIQUID:	
SPECIFIC GRAVITY:	1.000 SG
VISCOSITY:	1.00 cP
TEMPURATURE:	68.00 deg F

WEIGHTS	
MOTOR:	1,220.0 lb
DISCHARGE HEAD:	890.0 lb
SOLE PLATE:	-
BARREL:	1,146.2 lb
COLUMN ASSY:	209.7 lb
BOWL ASSY:	716.0 lb
TOTAL:	4,181.9 lb

FLANGE INFORMATION	
FLANGE SIZE (Suction):	16 in. 150# RF - ANSI Flange
FLANGE DIA (Suction):	23.5 in. Dia.
BOLT HOLES (Suction):	16 - 1.125 Dia. Holes
BOLT CIRCLE (Suction):	21.25 in. Bolt circle
FLANGE SIZE (Discharge):	10 in. 150# RF - ANSI Flange
FLANGE DIA (Discharge):	16 in. Dia.
BOLT HOLES (Discharge):	12 - 1 Dia. Holes
BOLT CIRCLE (Discharge):	14.25 in. Bolt circle

MOTOR	
MAKE:	USEM
ENCLOSURE:	WPI
TYPE:	NEMA
POWER:	125 hp
RPM:	1800 rpm
VOLTAGE-PHASE-FREQ:	460V / 3 / 60Hz
FRAME NUMBER:	405VP
COUPLING TYPE:	CPAT 1625

NOTES:
1. DRAWING NOT TO SCALE.
2. ALL DIMENSIONS IN INCHES UNLESS NOTED OTHERWISE.
3. FINAL HEAD HEIGHT WILL BE DETERMINED BASED ON INTERNAL ANALYSIS AND SPECIFICATION REVIEW.
4. TYPICAL LOCATION FOR DISCHARGE NOZZLE.
5. FINAL MOTOR HEIGHT WILL BE DETERMINED BY THE MOTOR MANUFACTURER

CUSTOMER: Freyer & Laureta
CUSTOMER REFERENCE:
PROJECT TITLE: North Marin WD - Floway VTP Replacements
CURVE NO.:14DKH 1770

TRILLIUM FLOW TECHNOLOGIES

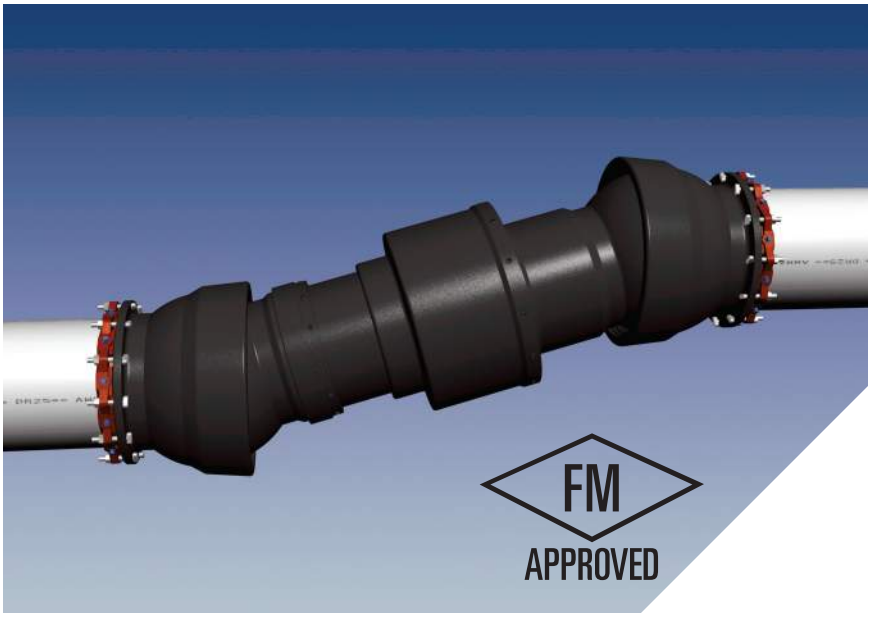
FLOWAY® PUMPS
Vertical Turbine Pumps

QUOTE NO.: 1880290
ITEM NO.: 001
DATE: 02/08/2023
SIZE B

Flex-Tend Force Balanced

Force Balanced FLEX-TEND®

Force Balanced Flexible Expansion Joint



Force Balanced FLEX-TEND; Series 4418M20B, 18 inch Double Ball with Mechanical Joint Ends

Image depicts 8 inch Force Balanced FLEX-TEND

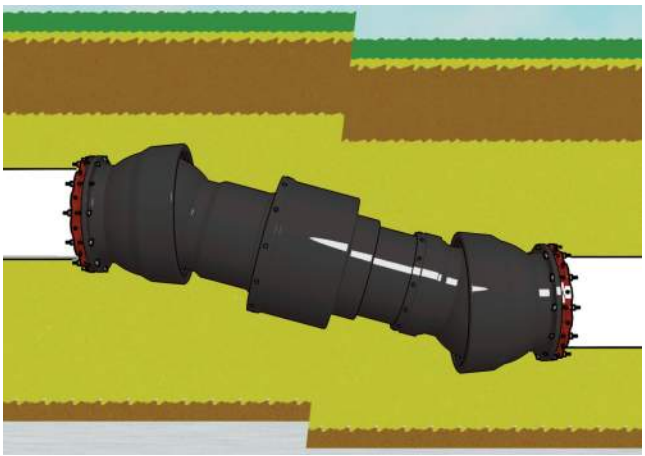


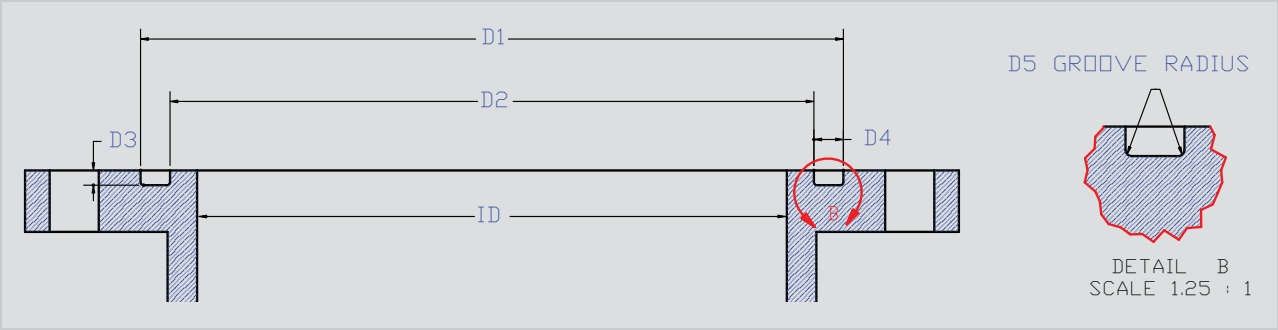
Image depicts direct burial application (Polyethylene wrap not depicted). Refer to "Connections" FT-2 for more details.

Features and Applications:

- Sizes 3 inch through 48 inch
  Sizes 3 inch through 16 inch rated at 350 PSI
  Sizes 18 inch and above rated at 250 PSI
- For Ductile Iron, Steel, PVC or HDPE pipe
- Expansion unit will NOT impart a thrust force while under internal pressure
- Designed to give Deflection and or Expansion/ Contraction needs to protect pipeline systems from shear. Refer to submittal drawings for "offset" capability
- Constructed of ASTM A536 Ductile Iron
- Up to 20° Deflection per ball
- Each unit tested to rated working pressure prior to shipment
- Due to the design of the seals, no periodic maintenance is required
- End connections:
  Flanged; 3 inch through 48 inch
  Mechanical Joint; 3 inch through 24 inch
- Flange outlets conform to the dimensional requirements of ANSI/AWWA C110/A21.10 (class 150) with the addition of an O-ring gasket which is provided to ensure a watertight seal.
- Mechanical Joint end connections conform to the dimensional requirements of either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53 depending on size.
- FLEX-TEND assemblies are suitable for direct burial. Polyethylene wrap is provided with each unit. If installed in a vault, the design must be such that movement is not impeded. Refer to *Connections* FT-2 found at www.ebaa.com.
- NOT for use on pipelines containing solids and debris.

For use on water pipelines subject to hydrostatic pressure and tested in accordance with either AWWA C600, C605, or ASTM D2774.

FLEX-TEND, EX-TEND, AND FLEX-900 O-ring Groove



Size	D1	D2	D3	D4	D5	O-ring Diameter	O-ring Part Number
3	4.885	4.185	0.175	0.350	0.0625	0.25	983003
4	5.900	4.700	0.300	0.600	0.0625	0.5	983004
6	8.00	6.800	0.300	0.600	0.0625	0.5	983006
8	10.100	8.900	0.300	0.600	0.0625	0.5	983008
10	12.200	11.000	0.300	0.600	0.0625	0.5	983010
12	14.300	13.100	0.300	0.600	0.0625	0.5	983012
14	16.200	15.00	0.300	0.600	0.0625	0.5	983014
16	18.500	16.900	0.400	0.800	0.1250	0.625	983016
18	20.700	19.100	0.400	0.800	0.1250	0.625	983018
20	23.000	21.400	0.400	0.800	0.1250	0.625	983020
24	27.200	25.600	0.400	0.800	0.1250	0.625	983024
30	33.500	31.700	0.400	0.900	0.1250	0.75	983030
36	40.000	38.300	0.400	0.850	0.1250	0.75	983036
42	46.580	44.080	0.650	1.250	0.1250	N/A	983042
48	52.720	50.220	0.650	1.250	0.1250	1	983048

Sample Specification

1. Flexible expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron conforming to the material requirements of ASTM A536 and ANSI/AWWA C153/A21.53. Foundry certification of material shall be readily available upon request.
2. Each flexible expansion joint shall be pressure tested prior to shipment against its own restraint to a minimum of 350 PSI for 3 inch through 16 inch and 250 PSI for 18 inch and greater. A minimum 2:1 safety factor, determined from the published pressure rating, shall apply.
3. Each flexible expansion joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of: 20° for sizes 4-inch through 12-inch; 15° for sizes 14-inch through 36-inch and 12 ° for size 48-inch. The flexible expansion fitting shall not expand or exert an axial imparting thrust under internal water pressure. The flexible expansion fitting shall not increase or decrease the internal water volume as the unit expands or contracts. The minimum total linear travel shall be 8-inches.
4. All internal surfaces (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213. Sealing gaskets shall be constructed of EPDM. The coating shall meet ANSI/NSF-61.
5. Exterior surfaces shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C116/A21.16.
6. Polyethylene sleeves, meeting ANSI/AWWA C105/A21.5, shall be included for direct buried applications.
7. Manufacturer's certification of compliance to the above standards and requirements shall be readily available upon request. The purchaser (or owner) shall reserve the right to inspect the manufacturer's facility for compliance. All flexible expansion joints shall be The Force Balanced FLEX-TEND as manufactured by EBAA Iron, Inc. Eastland, TX., U.S.A.

Important Notes

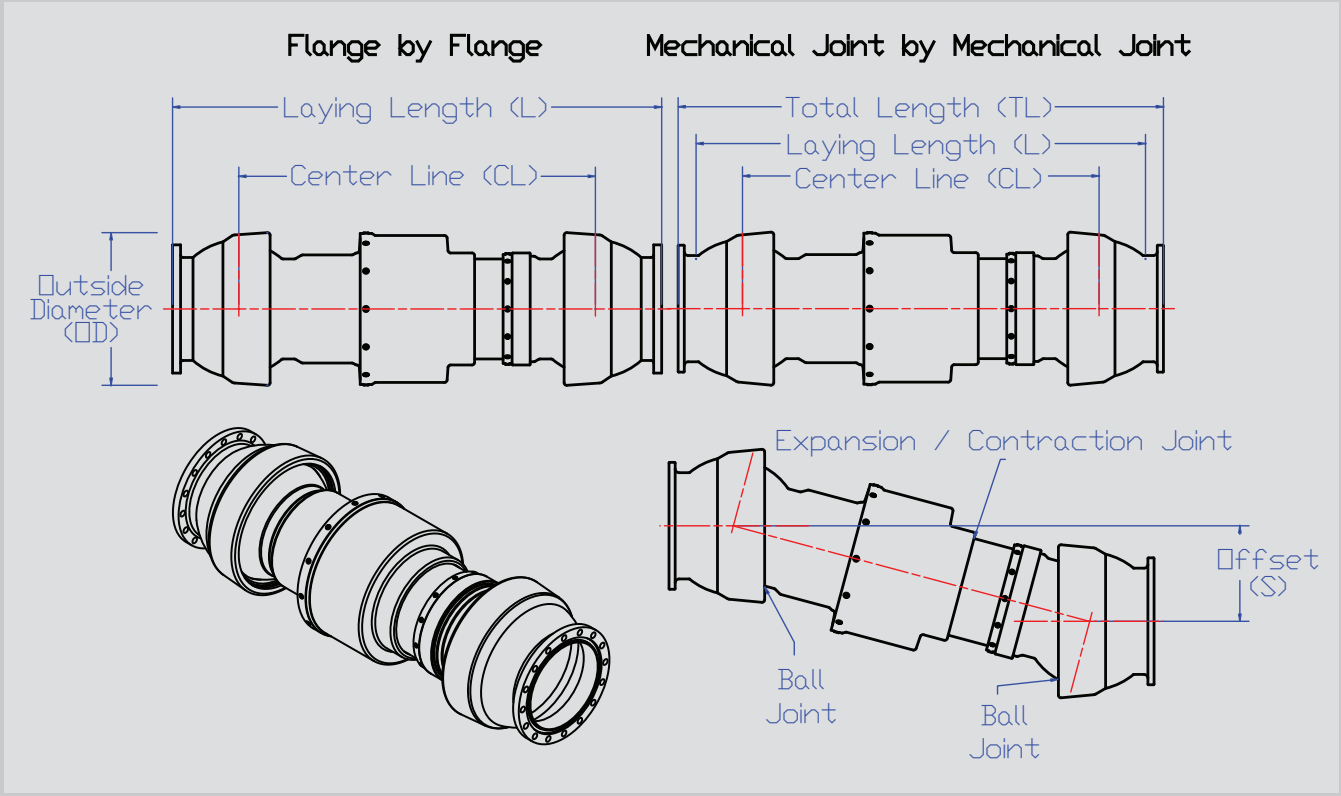
The EBAA Force Balanced Flex-Tend® is particularly suited for use in above ground applications where unbalanced thrust forces are neither desirable nor easily accommodated. These applications require special attention to the overall forces and restraint of the piping system.

The installation of a Force Balanced Flex-Tend requires the restraint of all adjacent pipe joints in order to transfer expansion/contraction forces to the unit and to produce the desired force-balancing effect without undue movement or separation of the adjacent joints. Lock-ring type pipe and fitting joints are required to have the assembly clearance removed by extending the joint prior to the installation of the Force Balanced Flex-Tend and pressurization of the system.

Joint restraint and clearance removal of adjacent joints is necessary in both above and below ground Force Balanced Flex-Tend installations.

When connecting a Force Balanced FLEX-TEND to HDPE pipe, a flanged end connection is required. This is to be joined to a fused flange adapter on the HDPE pipe. A filler flange between the two gaskets is necessary to assure proper seal contact.

EBAA IRON



EBAA IRON

Nominal Pipe Size	OD	D*	E**	CL	S	Flange by Flange			Mechanical Joint by Mechanical Joint			
						Series Number	L	Weight (lbs)	Series Number	L	TL	Weight (lbs)
3	10.2	20°	8	42.5	15.9	4403F20B	53.7(±4)	210	4403M20B	50.3 (±4)	55.3 (±4)	204
4	10.2	20°	8	42.5	15.9	4404F20B	53.8(±4)	167	4404M20B	49.7 (±4)	54.7 (±4)	206
6	12.3	20°	8	44.0	16.5	4406F20B	56.8(±4)	275	4406M20B	52.4 (±4)	57.4 (±4)	316
8	14.9	20°	8	48.1	17.8	4408F20B	62.9(±4)	377	4408M20B	57.8 (±4)	62.8 (±4)	496
10	18.1	20°	8	50.6	18.7	4410F20B	67.0(±4)	594	4410M20B	63.0 (±4)	68.0 (±4)	635
12	20.8	20°	8	52.9	19.4	4412F20B	72.0(±4)	786	4412M20B	66.3 (±4)	71.3 (±4)	880
14	26.5	15°	10	65.3	17.5	4414F20B	93.5(±5)	1,846	4414M20B	84.6 (±5)	91.5 (±5)	1768
16	26.5	15°	10	65.3	17.5	4416F20B	91.5(±5)	1,779	4416M20B	86.0 (±5)	93.0 (±5)	1709
18	29.8	15°	10	69.5	18.6	4418F20B	95.4(±5)	2,573	4418M20B	87.6 (±5)	94.6 (±5)	2431
20	33.1	15°	12	75.0	20.1	4420F20B	98.3(±6)	2,885	4420M20B	95.7 (±6)	102.7 (±6)	2897
24	39.1	15°	12	81.7	20.6	4424F20B	110.9(±6)	4,394	4424M20B	109.0 (±6)	116.0 (±6)	4340
30	47.8	15°	16	103.5	28.9	4430F20B	136.8(±8)	9,224	4430M20B	127.2 (±8)	135.2 (±8)	9156
36	59.3	15°	16	105.9	29.5	4436F20B	140.1(±8)	11,158	~	~	~	~
48	79.4	12°	24	148.0	33.2	4448F20B	193.0(±12)	26,680	~	~	~	~

NOTE: Dimensions are in inches, and are subject to change without notice.
End connection combinations available (14 inch - 24 inch).
*Deflection Angle is per ball.
**Maximum expansion.

Additional Applications

Applicable

- Potable or Non-Potable Water (no solids or debris)
- Fire Service Mains
- Fire Sprinkler Systems
- Chilled or Heated Water Systems (HVAC)
- Above or Below Ground

Not Applicable

- Water with solids, such as storm or waste-sewage (use standard FLEX-TEND)
- Petroleum liquids or gas
- Steam

Force Balanced FLEX-TENDS

Flexible expansion joints have been used for many years with great success. They protect pipelines while crossing shear plains such as seismic faults or protection of a structure's pipeline system from either a seismic event or from gradual soil subsidence. They have however one drawback; they generate an axial imparting force while under pressure. While this imparting force or thrust is easy to accommodate with a pipeline that stretches across a rural landscape, it becomes cumbersome and costly in municipal settings to engineer and build a restraint system that can isolate these imparting thrusts without interfering with the purpose of the unit, which is to protect the pipeline from sudden or gradual movement generated by the environment and not the imparting thrust.

The Force Balanced FLEX-TEND® Flexible Expansion Joint can accommodate pressure induced thrust forces by utilizing an additional water chamber piston that acts in the equal and opposite direction of the imparting thrust and hence neutralizes the thrust forces. This neutralization of the pressure thrust allows designers to use flexible expansion joints in applications were bulky cumbersome thrust blocks or other means of force restricting devices are not applicable. Finally, a flexible expansion joint can now be placed into a system as easily as putting in a spool piece of pipe, rather than having to either dig out large areas for a thrust retaining walls and blocks, or by engineering costly lateral bracing that must be supported by structures that may not have been designed to take these forces.

Another concern is the addition of a needed flexible expansion joint to protect a pipeline system that serves a structure or uses a structure to make a crossing of some type. Most structures, such as water storage tanks, base isolated buildings, and bridges, were not designed to restrain the imparting thrust of a typical expansion joint, thus adding considerable cost in developing a restraint that can isolate the thrust without hampering the unit's ability to move as needed to protect the pipeline. The Force Balanced FLEX-TEND solves all these problems while giving the designer and owner the security of knowing his pipeline systems were protected from shear.

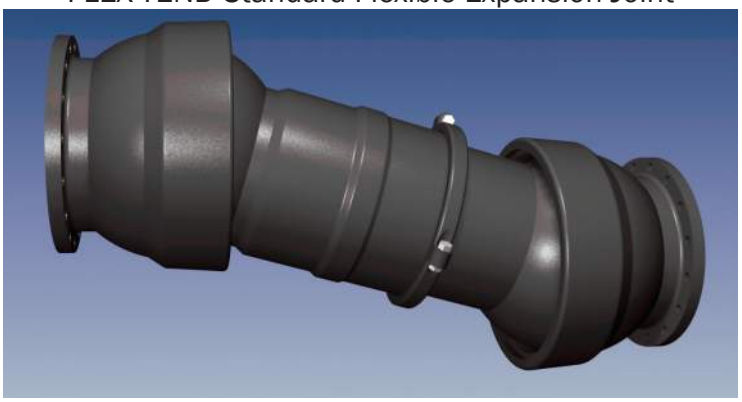
Additionally and just as important, as the unit expands and contracts to accommodate the needs of the pipeline system, the volume inside the unit never changes unlike traditional expansion joints. This is exceptionally important when protecting base isolated structures such as buildings. A normal expansion unit will increase its volume of water during the expansion stroke, and then reduce that volume during the contraction stroke, in essence creating a 'pumping' action drawing water through the distribution pipe system, through the back flow preventers and forcing it into the structure, possibly causing water damage.

Municipalities are also experiencing a common theme in their maintenance and expansion programs for their water and wastewater needs: Congestion. The shear amount of buried utilities is already staggering and the future only holds more as cities grow and not only add more buried utilities but increase the size of the existing water and wastewater pipeline systems. In this existing and anticipated congestion, the Force Balanced FLEX-TEND Flexible Expansion Joint can not only protect pipeline systems from movement as any other flexible expansion joint, it can do so with a smaller and overall less expensive footprint, allowing room for the existing or future utilities that may one day join it.

Additional information can be found in *Connections Bulletin* FT-4

Additional FLEX-TEND Family Products

FLEX-TEND Standard Flexible Expansion Joint



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Rosemount Magnetic Flowmeter

Product Data Sheet
January 2014
00813-0100-4727, Rev UE

Keco Engineered Controls
1200 River Avenue, Bldg. 3A
Lakewood, NJ 08701
ph. 732 901-5900
e-mail: keco@optonline.net

Rosemount 8700 Series Magnetic Flowmeter Systems

- Industry leading performance with standard reference accuracy of 0.25% of rate with an optional High Accuracy of 0.15% of rate
- Rosemount 8732 Transmitter - Integral-mount design, backlit display, and explosion-proof housing. Available with HART®, FOUNDATION™ fieldbus, or PROFIBUS PA, Device Diagnostics, and Smart™ Meter Verification to improve reliability and performance
- Rosemount 8712 HART Transmitter - available with Device Diagnostics including Smart Meter Verification to improve reliability and performance. Quick setup with easy-to-use local operator interface
- Rosemount 8712H/8707 High-Signal System - Pulsed DC solutions for the most demanding flow measurement applications
- Rosemount 8705 Flanged sensor - Fully welded sensor for maximum protection
- Rosemount 8711 Wafer sensor - Economical, compact, and lightweight sensor, provided with alignment spacers for easy installation
- Rosemount 8721 Hygienic sensor - Specifically designed for food, beverage, and life sciences applications

ROSEMOUNT

EMERSON. Process Management

Product selection guide

Several sensor types, liner types, electrode materials, electrode types, grounding options, and transmitters are available for the Rosemount 8700 Series Magnetic Flowmeter System to ensure compatibility with virtually any application and installation. See Table 16 for information on liner types, Table 17 for information on electrode materials and electrode types, Table 18 and Table 19 for grounding options and installation, and Table 1 for transmitter selection. Other material options not mentioned here may be available. Contact your local sales representative for alternative material selection. For further guidance on selecting materials, refer to the Magnetic Flowmeter Material Selection Guide located on Rosemount.com (Technical Data Sheet Number 00816-0100-3033). For more information regarding product offering and ordering information, refer to "Ordering information" on page 6 in this product data sheet.

Table 1. Transmitter selection

Transmitter	General Characteristics
8732 	• Ideal for integral mount transmitter installations • HART / Analog, FOUNDATION fieldbus, or PROFIBUS PA fieldbus output available • Advanced Diagnostics available • Optical Switch LOI • Optional DI/DO available (HART only)
8712 	• Remote mount transmitter • Easy to use LOI with dedicated configuration buttons • Advanced Diagnostics available • Perfect for wall or panel mount
8712H 	• Remote mount transmitter • High-Signal Pulsed DC for use with the High-Signal 8707 Sensor • Ideal for high solid applications - mining/pulp stock/other slurries • 120 VAC power only • Not CE Marked

Table 2. Sensor selection

Sensor	General Characteristics
8705 	• Standard Process Sensor • Flanged Process Connections • Welded, sealed coil housing • 1/2-in. (15mm) to 36-in. (900mm) • Pulse DC Technology • Standard, grounding, and bullet-nose electrodes available
8707 	• High Signal Sensor • Flanged Process System Sensor • Welded, sealed coil housing • 3-in. (80mm) to 36-in. (900mm) • High current pulsed DC technology ideal for high solids or slurry applications • Standard, grounding, and bullet-nose electrodes available
8711 	• Wafer (flangeless) design • Economical, compact, and lightweight alternative to flanged sensors • 0.15-in. (4mm) to 8-in. (200mm) • Pulsed DC technology • Standard, grounding, and bullet-nose electrodes available
8721 	• Hygienic sensor • Designed for food, beverage, and pharmaceutical applications • 3-A and EHEDG certified • 1/2-in. (15mm) to 4-in. (100mm) • Pulsed DC technology • Variety of industry standard process connections • Suitable for CIP/SIP

Contents

Dimensional drawings

Figure 8. Rosemount 8732 Transmitter

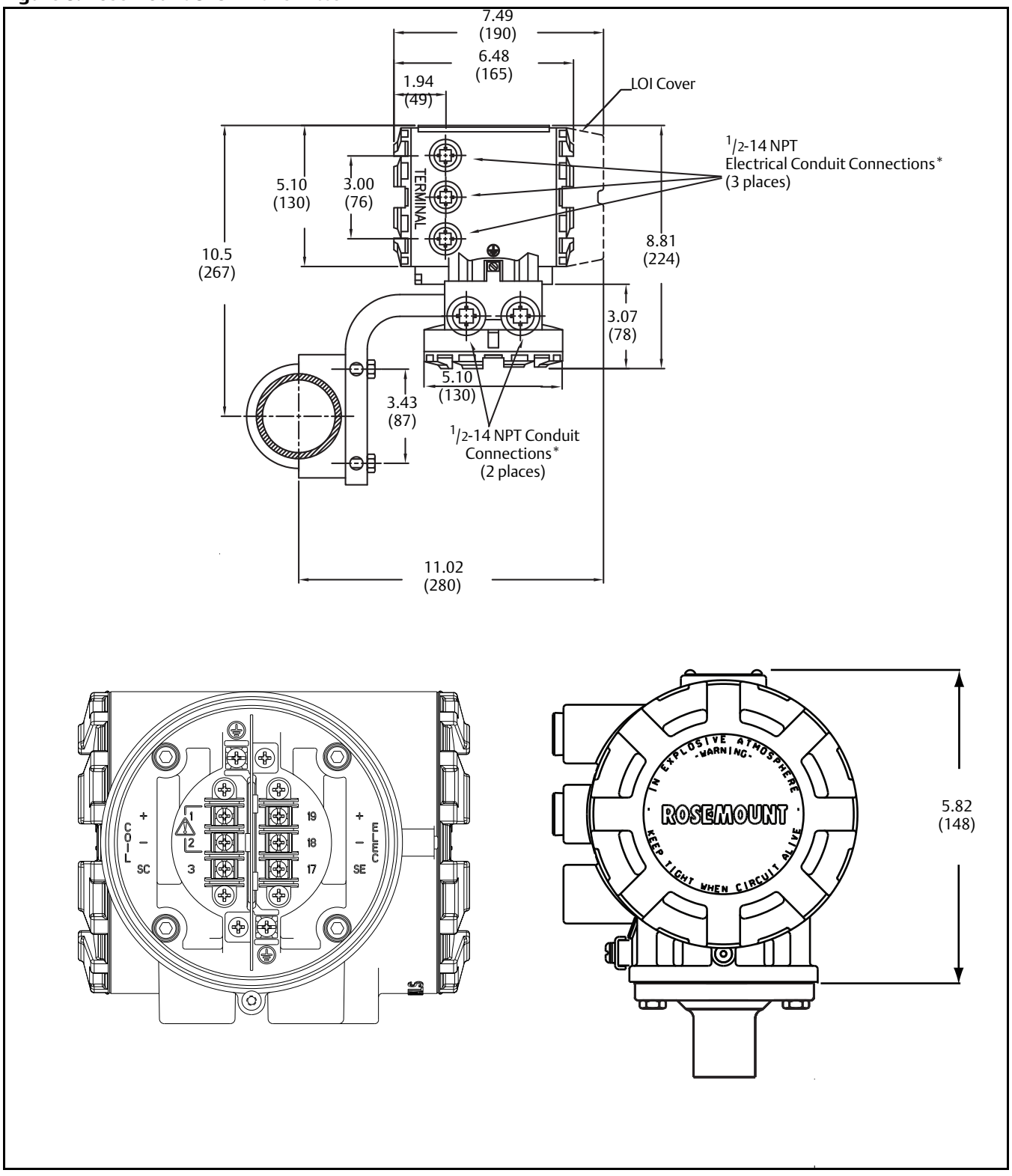

Figure 11. 3-in. to 36-in. (DN80 mm to 900 mm) slip-on flanges -low pressure (P ≤ Class 300)

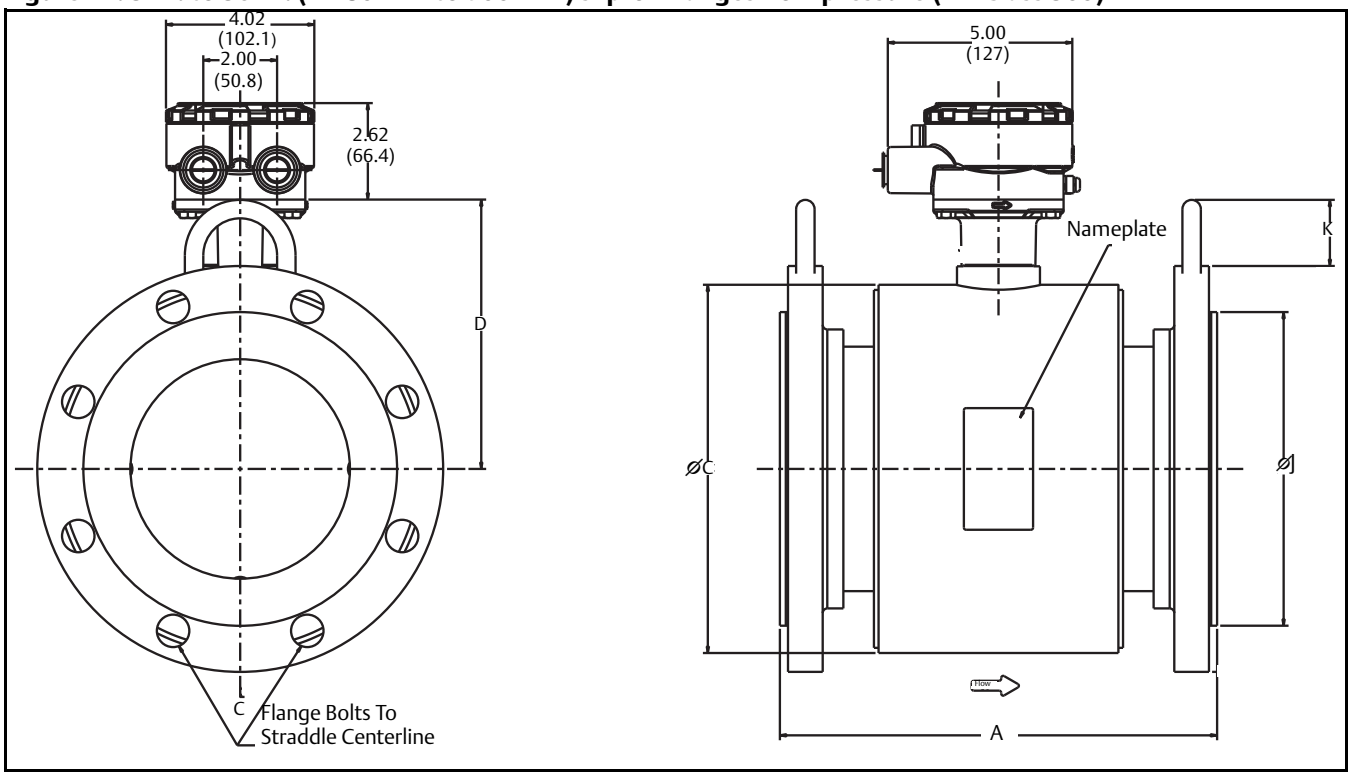

Table 33. 3-in. to 36-in. slip-on flanges (inches)

Size, description	Overall length						Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Lift ring height DIM "K"	Tube weight (lbs)
	DIM "A" PTFE	DIM "A" ETFE	DIM "A" Neoprene	DIM "A" Linatex	DIM "A" Poly"	DIM "A" PFA					
8 (200) ASME - 150#	13.78	13.69	13.53	13.63	13.65	13.78	11.92	8.27	10.62	1.70	105
8 (200) ASME - 300#	15.60	15.54	15.42	15.51	15.54	15.60	11.92	8.27	10.62	1.70	183
8 (200) EN 1092-1 - PN10	13.78	13.69	13.53	13.63	13.65	13.78	11.92	8.27	10.55	1.70	97
8 (200) EN 1092-1 - PN16	13.78	13.69	13.53	13.63	13.65	13.78	11.92	8.27	10.55	1.70	96
8 (200) EN 1092-1 - PN25	13.78	13.69	13.53	13.63	13.65	13.78	11.92	8.27	10.94	1.70	120
8 (200) EN 1092-1 - PN40	15.60	15.54	15.42	15.51	15.54	15.60	11.92	8.27	11.22	1.70	158
8 (200) AS2129 TABLE D	13.78		13.53	13.63	13.65		11.92	8.27	10.55	1.70	77
8 (200) AS2129 TABLE E	13.78		13.53	13.63	13.65		11.92	8.27	10.39	1.70	86
8 (200) JIS B2220 - 10K	13.90		13.53	13.63	13.65		11.92	8.27	10.32	1.70	81
8 (200) JIS B2220 - 20K	15.60		15.42	15.51	15.54		11.92	8.27	10.83	1.70	134
8 (200) JIS B2220 - 40K	16.72		16.54	16.63	16.66		11.92	8.27	11.42	1.70	232
8 (200) AS4087 PN16	13.78		13.53	13.63	13.65		11.92	8.27	10.55	1.70	73
8 (200) AS4087 PN21	13.78		13.53	13.63	13.65		11.92	8.27	11.65	1.70	136
8 (200) AS4087 PN35	15.60		15.42	15.51	15.54		11.92	8.27	10.24	1.70	241
10 (250) ASME - 150#	15.00	14.85	14.63	14.73	14.75	15.00	14.64	9.69	12.75	2.00	152
10 (250) ASME - 300#	17.13	17.08	16.86	16.95	16.95	17.13	14.64	9.69	12.75	2.00	267
10 (250) EN 1092-1 - PN10	15.00	14.85	14.63	14.73	14.75	15.00	14.64	9.69	12.60	2.00	134
10 (250) EN 1092-1 - PN16	15.00	14.85	14.63	14.73	14.75	15.00	14.64	9.69	12.60	2.00	138
10 (250) EN 1092-1 - PN25	15.00	14.85	14.63	14.73	14.75	15.00	14.64	9.69	13.19	2.00	174
10 (250) EN 1092-1 - PN40	17.13		16.86	16.95	16.98	17.13	14.64	9.69	13.58	2.00	244
10 (250) AS2129 TABLE D	15.00		14.63	14.73	14.75		14.64	9.69	12.91	2.00	122
10 (250) AS2129 TABLE E	15.00		14.63	14.73	14.75		14.64	9.69	12.91	2.00	137
10 (250) JIS B2220 - 10K	15.00		14.63	14.73	14.75		14.64	9.69	12.76	1.70	129
10 (250) JIS B2220 - 20K	17.13		16.86	16.95	16.98		14.64	9.69	13.58	3.13	218
10 (250) JIS B2220 - 40K	19.54		19.34	19.43	19.46		14.64	9.69	13.98	2.00	382
10 (250) AS4087 PN16	15.00		14.63	14.73	14.75		14.64	9.69	12.91	2.00	96
10 (250) AS4087 PN21	15.00		14.63	14.73	14.75		14.64	9.69	13.74	2.00	176
10 (250) AS4087 PN35	17.13		16.86	16.95	16.98		14.64	9.69	12.24	2.00	299
12 (300) ASME - 150#	18.01	17.90	17.68	17.78	17.80	18.00	16.80	10.77	15.00	2.00	231
12 (300) ASME - 300 #	20.14	20.02	19.80	19.89	19.92	20.14	16.80	10.77	15.00	2.00	387
12 (300) EN 1092-1 PN10	18.01	17.90	17.68	17.78	17.80	18.00	16.80	10.77	14.57	2.00	178
12 (300) EN 1092-1 PN10	18.01	17.90	17.68	17.78	17.80	18.00	16.80	10.77	14.88	2.00	192
12 (300) EN 1092-1 PN25	18.01	17.90	17.68	17.78	17.80	18.00	16.80	10.77	15.55	2.00	242
12 (300) EN 1092-1 PN40	20.14		19.80	19.89	19.92	20.14	16.80	10.77	16.14	2.00	351
12 (300) AS2129 TABLE D	18.01		17.68	17.78	17.80		16.80	10.77	14.88	2.00	172
12 (300) AS2129 TABLE E	18.01		17.68	17.78	17.80		16.80	10.77	14.72	2.00	185
12 (300) JIS B2220 - 10K	18.01		17.68	17.78	17.80		16.80	10.77	14.49	2.00	166
12 (300) JIS B2220 - 20K	20.14		19.80	19.89	19.92		16.80	10.77	15.55	2.00	285
12 (300) JIS B2220 - 40K	22.08		21.88	21.98	22.00		16.80	10.77	16.14	2.00	546
12 (300) AS4087 PN16	18.01		17.68	17.78	17.80		16.80	10.77	14.88	2.00	138
12 (300) AS4087 PN21	18.01		17.68	17.78	17.80		16.80	10.77	15.98	2.00	225
12 (300) AS4087 PN35	20.14		19.80	19.89	19.92		16.80	10.77	14.25	2.00	370
14 (350) ASME - 150#	20.91	20.93	20.71	20.80	20.83	21.00	18.92	11.83	16.25	2.00	300
14 (350) ASME - 300#	23.16	23.18	22.96	23.05	23.08		18.92	11.83	16.25	2.00	517
14 (350) EN 1092-1 - PN10	20.91	20.93	20.71	20.80	20.83	21.00	18.92	11.83	16.93	2.00	252
14 (350) EN 1092-1 - PN16	20.91		20.71	20.80	20.83	21.00	18.92	11.83	17.24	2.00	276
14 (350) EN 1092-1 - PN25	20.91		20.71	20.80	20.83		18.92	11.83	17.72	2.00	359
14 (350) EN 1092-1 - PN40	23.16		22.96	23.05	23.08		18.92	11.83	18.31	2.00	480
14 (350) AS2129 TABLE D	20.91		20.71	20.80	20.83		18.92	11.83	17.24	2.00	230
14 (350) AS2129 TABLE E	20.91		20.71	20.80	20.83		18.92	11.83	17.24	2.00	257

APPENDIX H

Electrical Next Steps

ELECTRICAL NEXT STEPS
BEECHER ENGINEER, INC.
APRIL 21, 2023

Electrical Equipment Lead Times:

In the post-pandemic world, lead times for industrial electrical equipment such as the type required for this project (i.e. switchboard, MCC, VFDs) have become significantly long. Prior to the pandemic, equipment such as a switchboard or motor control center could be procured in 6 months or less, including development of shop drawings, fabrication and delivery to the project site. In present times, however, this lead time has grown to well beyond a year in most cases with a high degree of uncertainty of when equipment will actually be fabricated and delivered. This is putting owners in a very difficult situation with respect to present day construction projects. If the decision is made to include the electrical equipment as part of the bidding Contractor's scope of work, owners are facing the risk of escalation costs from contractors and significant delays in project construction completion. If the decision is made to pre-purchase the equipment and delay construction bidding until the equipment is near the date of delivery to the owner's site, owners then face the risk of taking responsibility for the equipment that the Contractor will be install. For either approach, owners are faced with heightened project risk. For this project, the risk for each approach should be considered so that the best option can be selected prior to moving the project into the final design stage.

PG&E Service Coordination:

The new PG&E service required for this station is relatively large in comparison with the predominantly residential customer loads in the vicinity. For this reason, obtaining a service of this size at any of the alternative locations will likely be a challenging process.

PG&E coordination is often-times a very time-consuming endeavor and sometimes frustrating to owners that are not familiar with their communication processes. In the water and wastewater industry, when it comes to electrical power system design, the procedure is usually one where the electrical engineer provides options for construction implementation in conjunction with preliminary construction cost estimates so that project managers can make "go/no-go" decisions before moving forward and investing too much time in final design detail. Along with this, project managers also typically will set design and construction schedules to better fit with external financial and regulatory requirements. This approach, unfortunately, is nearly opposite of how things work when it comes to PG&E interaction. For example, take the case where a service upgrade is being requested, as will likely be the case for this project. When it comes to PG&E coordination, the first step is to submit an online application along with certain **NEAR-COMPLETE** (i.e. 90%+) drawings including a site plan, main single line diagram and comprehensive facility load list. PG&E will then take this request along with the drawings/load list and determine if the information is complete and clear before even passing it on to another person or group that will take the first "technical" look at the request. But, before they take this step, PG&E will require an engineering deposit to move to this "technical review" step (typically a $2500 to $10,000 deposit is required). Thus, before even talking "technical" with PG&E, owners have already invested a significant amount of time and money on a "maybe" that the design is acceptable to PG&E. Then, after the documentation is passed on to PG&E's technical group, the wait time is presently sitting at about 6 to 8 months for PG&E to engage with the application request. Finally, once PG&E starts looking at the technical aspects of the requested service upgrade, they will often times require additional

documentation and in some cases require design changes to the submitted drawings before approving a service upgrade request to move forward. This very prescriptive interaction procedure can be very time consuming, often taking up to one year to complete from start-to-finish.

The key to dealing with these challenges is to first and foremost be prepared for these requirements and plan project work and budgeting accordingly BEFORE beginning the process of designing any system changes or upgrades. All too often, project managers set up design and construction project schedules before they consider the time and cost impacts that may (and likely will) be imposed during the PG&E coordination process. When overly optimistic PG&E coordination time and cost impacts come to light during a project's design and/or construction period, this is where issues often occur that lead to project budget and schedule overruns.

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